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Getting women active using the COM-B model and the Behaviour Change Wheel

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Getting women active using the COM-B model and the Behaviour Change Wheel

Madeleine Louise Dora Leather

A thesis submitted in partial fulfilment of the requirements of

Sheffield Hallam University

for the degree of Doctor of Philosophy

September 2025

Candidate Declaration

I hereby declare that:

1. I have not been enrolled for another award of the University, or other academic or professional organisation, whilst undertaking my research degree.

2. None of the material contained in the thesis has been used in any other submission for an academic award.

3. I certify that this thesis is my own work. The use of all published or other sources of material consulted have been properly and fully acknowledged.

4. The work undertaken towards the thesis has been conducted in accordance with the SHU Principles of Integrity in Research and the SHU Research Ethics Policy, and ethics approval has been granted for all research studies in the thesis, as shown in the table below.

Ethics review reference number	Title of research study	Approval date	Date of any post approval amendments
ER28012805	Women's barriers and facilitators to physical activity in the East Midlands, UK: Focus Groups	13/04/2021	12/07/2021
	Co-designing a physical activity intervention for women from the East Midlands: Co-design Workshops		
ER47741740	Intervention outcomes and treatment fidelity: A quantitative evaluation	13/12/2022	N/A
	Exploring women's Experience of pilot intervention participation through exit interviews: Barriers & facilitators, acceptability & feasibility, reasons & remedies for attrition		

5. The word count of the thesis is 79,175

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Award	PhD
Date of submission	28th September 2025
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Director(s) of Studies	Professor Maddy Arden & Professor Abigail Millings

Dedication and acknowledgement

Dedicated to Pip, with thanks to my supervisors: Laura and Maddy. Most especially, thank you to my Mum - The best and most educated friend a girl could have.

Abstract

Physical inactivity negatively impacts physical and mental health, whilst physical activity (PA) protects against almost all non-communicable diseases. Women are less active than men and face more barriers to PA, so PA interventions for women provide a cost-effective public health solution. In this thesis, a 4-week pilot PA intervention for women was co-designed with target end-users, using the Theoretical Domains Framework (TDF), the COM-B model and the Behaviour Change Wheel. The TDF was considered incomplete for categorising PA determinants, so an additional domain ('biomechanical capability') has been proposed. Qualitative evidence syntheses revealed women's barriers to PA to be gender-centric, with PA determined by factors related to SES, culture, body image and motherhood. Many women prefer single sex spaces for PA, which can be difficult to achieve in line with the religious teachings of Islam, within Western society. During focus groups, women from the East Midlands appeared capable of and motivated to be active but described limited opportunity for PA. Two co-design workshops supported development of a pilot intervention design that included hybrid (online and in-person) circuit classes, daily PA challenges and goal-setting support/education. The intervention could tentatively be described as effective, eliciting best results for women who were 'fairly active' at baseline. Women considered the intervention acceptable and feasible but those who were inactive at baseline seemed more likely to withdraw/not participate and less likely to maintain increased PA at follow-up, whilst those who engaged in co-design appeared more likely to engage. Exploration of reasons for dropout revealed that temporary reductions in capability or opportunity (usually elicited by short-term injury or adverse personal circumstances) frequently created permanent reductions in motivation. Although women's PA promotion can be ethically complex, self-compassion coaching might provide one ethical intervention option to increase the likelihood of women maintaining PA long-term, by addressing the characteristically female experience of guilt.

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Thesis Overview

This thesis outlines the co-design, development, delivery and evaluation of a pilot physical activity (PA) intervention for women from the East Midlands. This was undertaken using a range of complementary theoretical frameworks; primarily the Theoretical Domains Framework (TDF; Atkins et al., 2017), the COM-B model of health-related behaviour change (Michie et al., 2011) and the Behaviour Change Wheel (BCW) intervention development model (Michie et al., 2014).

In 'Chapter 1: Introduction', the research aims are outlined and my positionality as a researcher is considered. The need for an efficacious PA intervention for women is explained and the rationale for the approach taken to its development justified. The knowledge gaps that this thesis aims to address and the ways in which they have been addressed are explained.

In 'Chapter 2: Methodology' the methodological approaches and the ontological and epistemological approaches employed are introduced, critiqued and discussed. Following brief critique of traditional behaviour change theories and an evaluation of the contemporary alternative (COM-B), the complementary framework (TDF), intervention development model (BCW) and taxonomy (Taxonomy of BCTs) are introduced. The methods, models, guidance, tools, checklists, constructs and frameworks used during the design, implementation and evaluation of the 4-week pilot PA intervention for women from the East Midlands are then discussed alongside the application of each to the relevant phase of research.

'Chapter 3: Study 1' provides a systematic evidence synthesis of the available qualitative evidence that was published in the English language, which explores healthy women's barriers and facilitators to PA, outside the context of pregnancy between 2015 and 2020.

'Chapter 4: Study 2' builds upon the findings of Study 1, by taking a refined approach to the synthesis of the qualitative evidence exploring healthy women's barriers and

facilitators to PA, outside the context of pregnancy and/or Covid-19, between 2020 and 2025.

'Chapter 5: Study 3' provides an outline of the first primary research study within this thesis. Focus groups enabled a localised understanding of women's barriers and facilitators to PA in the East Midlands, UK. Findings have been mapped onto the COM-B model, to act as a basis for pilot intervention development.

'Chapter 6': Study 4' documents the co-design of a pilot PA intervention for women from the East Midlands.

In 'Chapter 7: Study 5', the intervention is evaluated in terms of its efficacy at increasing PA, improving physical fitness and enhancing psychological wellbeing. Treatment fidelity is assessed and characteristics shared by women with differing levels of participation are highlighted.

'Chapter 8: Study 6' involves women who signed up to the intervention undertaking interviews about their experiences of participation, non-participation and/or withdrawal. The intervention is assessed in terms of its acceptability to end-users and with respect to women's barriers and facilitators to participation. Reasons for attrition are discussed and potential strategies that could remedy this proposed.

In 'Chapter 9: Discussion and conclusions', the main research aims are recapped and how they were achieved is described. The main findings of this PhD research are discussed and strengths and limitations of this work and its findings highlighted. Original contributions to knowledge are outlined, future direction for research in this area is proposed, the real-world implications of findings are elucidated and the associated recommendations for practice are clarified. A reflection of the learning undertaken throughout this PhD research is provided, before the thesis is summarised and concluded.

Chapter 1: Introduction

1.1. Introduction

1.1.1. Chapter Overview

In this chapter, the research aims of this PhD are outlined and my positionality is considered. The role that physical activity (PA) plays in health promotion is discussed, followed by consideration of gender differences in respect of PA. PA interventions and their impact are described, their cost-effectiveness is evaluated and features of successful PA interventions are examined. Gaps in knowledge are identified and approaches that might fill these are described, before the chapter is summarised and concluded.

1.1.2. Research aims

This PhD programme of research aims to achieve the following:

1. Evaluate the existing academic literature to establish what is currently known about determinants of PA for women
2. Understand determinants of PA for women locally, within the East Midlands
3. Identify strategies that enable women from the East Midlands to overcome barriers, capitalise on facilitators and manage divergent determinants of PA in ways that promote the behaviour
4. Co-design an efficacious evidence-based pilot PA intervention for and with women from the East Midlands, using appropriate theoretical frameworks and models of behaviour change
5. Evaluate the intervention considering its efficacy, its feasibility to be implemented in a local community context and its acceptability to the women who signed up to participate
6. Identify reasons for withdrawal/non-participation and remedies to alleviate these phenomena.

1.1.3. Positionality

My positionality has been influential throughout this research, particularly for the specific intervention that was produced.

When beginning this PhD programme of research, I worked within health and fitness settings teaching exercise classes and delivering one-to-one and small group personal training, primarily for overweight and obese women. The intervention, which was co-designed by participants and myself reflects this and I must acknowledge that another researcher, without the same professional background, qualifications and insurances could not have delivered this intervention.

I have worn multiple metaphorical hats throughout, which is likely to have been particularly impactful during the intervention and its evaluation when participants' awareness of my position as researcher, intervention deliverer, interviewer, evaluator and PhD student will undoubtedly have impacted their behaviour, perceptions and willingness to criticise the programme. The prolonged time I spent with participants throughout the research process (particularly throughout the intervention) is considered a strength of the work, as prolonged engagement enhances the credibility of qualitative data. However, this might also have enhanced participants' awareness of my positionality, reducing their willingness to be critical.

Because of my academic background in Psychology, alongside my background as a 1:1 personal trainer, I originally focussed strongly on the individuals who make up the demographic group this research aims to understand. However, I have since begun working in Public Health within Local Authority. This has helped me to contextualise my work and to better understand population health and the pragmatics of delivering public health interventions in the real world. I therefore now have a better understanding of the wider determinants of health and the responsibility that society, the wider system and governing bodies have, to facilitate positive health-related behaviour for communities and to implement policies and practices that support this. I am therefore increasingly aware of the determinants of PA, such as laws and policy, that this intervention was unable to address but which have potential to contribute to positive change nonetheless.

Finally, I must also acknowledge my position as a queer, left-wing feminist of White Jewish heritage, whose parents are University educated. These demographic

factors have the potential to impact participants, the data they have provided, my interpretations of that data and my analyses. My left-wing, queer and intersectional feminist status is likely to have been particularly impactful during the write-up phase of my research, when shortly prior to submission of this thesis, a Supreme Court ruling redefined the legal definition of a woman in the context of the Equality Act (2010), to exclude trans women.

1.1.4. The definition of a woman

Within this thesis, in line with the Equality Act (2010) at the time of data collection, the term 'woman' has been considered to describe women's gender, as opposed to their biological sex. Trans women were therefore eligible to participate. This decision was further impacted by my positionality and I believe the findings within this thesis, which conclude that women's barriers to PA centre primarily around their gendered and not biological, female experience, further validate the inclusion of trans women within this work.

1.2. The implications of activity levels

1.2.1. Differentiating between key terms

Physical activity (PA) is any movement that requires energy expenditure and is distinguishable from *exercise;* a sub-category of PA that must be performed with the goal of improving one or more component of physical fitness (Caspersen et al., 1985). *Physical inactivity* refers to a lack of PA, but should not be confused with *sedentary behaviour*, which the National Institute for Health and Care Excellence (NICE) considers "activities that do not increase energy expenditure much above resting levels, for example, sitting, lying down, sleeping, watching TV and reading" (NICE, 2014, p 26).

1.2.2. Physical activity, health and wellbeing

Public Health data shows that PA is protective against more than 20 chronic diseases (Public Health England, 2015; updated 2019). Meta-analysis from Ramakrishnan et al. (2020) confirmed a relationship between increased PA and reduced all-cause mortality. Systematic reviews reliably confirm a robust beneficial dose-response effect of PA on various markers of physical and psychological wellbeing (e.g. Reiner et al., 2013; Warburton & Bredin, 2017). Specifically, reviews

have found PA to improve coronary heart disease, Alzheimer's disease and Type 2 Diabetes. Research demonstrates that increasing PA improves blood pressure (Zou et al., 2020) and helps prevention of, and survival from, cancer (McTiernan et al, 2019). Light-intensity PA (activity with between 1.5 and 2.9 metabolic equivalents, such as walking or stretching) is related to important markers of cardiometabolic health, including obesity and mortality (Füzéki et al., 2017), demonstrating that reasonably small changes requiring relatively low effort levels can positively impact health.

The psychological benefits of PA include, but are not limited to, improvements in anxiety (Hiles et al., 2017), depression (McDowell et al., 2018), self-esteem (Kandola et al., 2019), quality of life (Slimani et al., 2020) and psychological distress (Awick et al., 2017). PA was comparable to psychotherapy and medication for treating clinical depression (Blumenthal et al., 2012) and meta-analysis supports the benefits of PA for treating clinical conditions including depression and schizophrenia (Rosenbaum et al., 2014). PA is therefore useful for prevention and treatment of poor psychological health and wellbeing.

1.2.3. Sedentary behaviour, inactivity and health

Sedentariness is not equal to '*inactivity*'. Sedentary behaviour directly negatively impacts health-related outcomes independent of (in)activity and short bouts of activity do not offset the negative impact of daily sitting-time (Teychenne et al., 2010). Sedentariness correlates with current smoking, obesity, number of chronic health conditions, poor self-reported health, disability level, mobility, pain/discomfort, affect, sleep/energy and cognition (Koyanagi et al., 2018). When controlling for moderate to vigorous PA, the negative health effects of sitting time remained until 'high' activity levels were reached (Biddle et al., 2019). These findings signal the importance, of encouraging short bouts of higher-intensity exercise and limiting periods of inactivity by turning sedentary time (e.g. driving to work) into active time (e.g. cycling to work).

1.2.4. The cost of physical inactivity

Physical inactivity is the fourth leading risk factor for death worldwide (WHO, 2010), described as the biggest public health problem of the 21st century (Blair, 2009).

Using population-attributable fraction analysis of the most recent health and economic data available for 194 countries, the direct public healthcare costs of non-communicable diseases and mental health conditions between 2020 and 2030 were estimated to be around $520billion, $47.6 billion of which could be attributed to physical inactivity (Santos et al., 2023). It was estimated that 499.2 million new preventable cases of major non-communicable disease globally would occur between 2020 and 2030 if no change in global PA levels were observed. In England, just over 67% of adults self-report meeting the 2019 recommended PA guidelines of '*at least 150 minutes of moderate intensity activity in bouts of 10 minutes or more, or 75 minutes of vigorous intensity activity spread across the week, as well as strength training on two days each week'* (OHID, 2025). This is likely overestimated, as physical inactivity is associated with one in every six UK deaths (OHID, 2022), costing the UK an estimated £7.4 billion annually, £0.9 billion of which the NHS funds.

1.2.5. Summary of the implications of activity levels

PA promotes and protects good health, whilst preventing and improving poor health. Sedentary behaviour negatively impacts health, with high PA levels required to offset this. Physical inactivity is therefore a leading cause of death, so PA interventions aiming to increase active time and reduce sitting time offer a cost-effective health promotion and protection opportunity.

1.3. Gender differences

Here, the term 'gender' will be used to refer to both gender and sex-based research, as the two are rarely differentiated within psychological research. Most of the research discussed below did not provide an explicit definition of the term *woman*, leaving it unclear whether trans women were included or excluded within these samples. This ambiguity may, to some extent, reflect my own positionality, insofar as trans women may have been implicitly categorised as women. However, it is equally plausible that the lack of definitional clarity indicates the exclusion of trans women from research on women's physical activity, which could in turn represent a potential inequality affecting trans women.

1.3.1. Gender differences in physical activity levels

Activity levels differ significantly according to various sociodemographic factors, with gender differences in activity being widely documented and pervasive. Using accelerometer data from diverse countries, boys were significantly more active than girls in childhood and adolescence, with girls aged 15 consistently being the least likely group to be meeting current PA recommendations (Riddoch et al., 2004). More recently, accelerometer data confirmed that adolescent boys are more active than girls during physical education, recreational playtime and outside of school (Viciana et al., 2016). The World Health Organisation (WHO) states that 1 in 4 men globally are insufficiently active for health, but this rises to 1 in 3 for women (WHO, 2020). Britain therefore self-reports being less active than the global average, with 1 in 3 UK men and 1 in 2 UK women, self-reporting being inactive (Office for National Statistics, 2020). Guthold et al. (2018) identified a discrepancy of 8% in activity levels between men and women, to women's detriment. Women from high income Western Countries were identified as some of the least active globally (42.3% insufficient PA). This paper concluded that more attention should be paid to reducing discrepancies in activity levels between subgroups, after surveys from 51 (mostly developing) countries revealed women to be less active than men in almost 90% of locations. The WHO highlights the average difference globally to be 5%, with women being less active than men and no change having been observed since 2000 (WHO, 2024). Whilst much of the PA data is self-reported and the limitations of data collection methods in respect of PA must be considered, objectively measured evidence confirms that females are less active than males across the globe and the lifespan (Troiano et al., 2008; Trost et al., 2002; Ruiz et al., 2011; Davis et al., 2011; Sun et al., 2013; Ferrari et al., 2020). Women appear to experience a greater risk reduction for all-cause mortality based on equivalent leisure-time PA compared to men (Ji et al., 2024) and parental activity level is one of the biggest determinants of offspring activity level into middle-age (Kaseva et al., 2017). Mothers' PA may impact offspring PA more than fathers' (Pahkala et al., 2007; Karppanen et al., 2012), so increasing women's PA will positively impact women's health and may also prompt positive intergenerational health behaviour change and practices.

1.3.2. Gender differences in barriers to physical activity

Females are more likely to report experiencing barriers to PA both in adulthood (Reichert et al., 2007) and adolescence (Rosselli et al., 2020). One significant barrier for women arises because of traditional gender roles and expectations. In their paper entitled '"Uncool to do sport": A focus group study of adolescent girls' reasons for withdrawing from physical activity', Slater & Tiggemann (2010) labelled their most frequently cited barrier **"**not being 'cool' or feminine for girls to play sport" (p. 623). In their scoping review, Spencer et al. (2015) identified pursuit of femininity as a barrier to PA for girls, who referenced gender norms and stereotypes that opposed the concept of active women. Bantham et al. (2021) identified gender roles to negatively influence leisure-time PA, particularly for women from cultural groups including Latinas and African American women. These women described leisure-time PA as "selfish" in the face of competing priorities associated with stereotypical female roles, usually related to their social identity as a wife, mother or caregiver. Similarly, El Masri et al. (2020) found traditional gender roles to be a barrier to PA by limiting available time. Competing priorities regularly appear to be a barrier to PA for women (e.g. Bantham et al., 2020; Sørensen & Gill, 2008;). For Arab women, marriage presented further barriers to PA as this necessitated additional domestic and household responsibilities, with a cultural expectation to fulfil further caregiving responsibilities by satisfying the needs of their children and husband (Donnelly et al., 2018). Women are increasingly beginning to complete paid work outside of the home, which further adds to their list of competing priorities. Other barriers related to competing priorities that appear more pronounced for women include the financial cost of engaging in PA (Sequiera, 2011), tiredness (Rosselli et al., 2020) and perceived lack of time (Herazo-Beltrán et al., 2017). Women's barriers to PA therefore most pervasively relate to female gender roles, the associated responsibilities, competing priorities and the limited time, energy and resources these leave available for PA.

1.3.3. Gender differences in facilitators to physical activity

In a systematic review of systematic reviews, which explored barriers and facilitators to PA for UK-based adults, the most persistently reported facilitators were knowledge of PA benefits, social interaction/participation and safety of the

environment (Mbabazi, 2023). However, women identify different facilitators to PA than men. Australian women (Hoare, 2017), women aged 60-67 (van Uffelen et al.,2017), and Arab women living in Qatar (Donnelly et al., 2018) were significantly more likely than men to report weight loss/maintenance as their main motivation for PA. Arab women from Qatar also highlighted the mood-enhancing and energy-boosting effects of PA whilst older women identified spending time with others and meeting friends as pertinent facilitators. Further, older women were most motivated to undertake PA with others their own age, in a single-sex environment with instructor supervision, at a fixed time, whilst female participants with knee pain better followed medical advice to be active than males (Shah et al., 2020). A systematic review and thematic synthesis of qualitative literature exploring young adult women's barriers and facilitators to PA found maintaining/improving health, weight control, appearance/body image enhancement, support from friends and socialising during PA to be the most frequently identified PA facilitators (Peng et al., 2023). Social support, which can come in many different forms, is therefore important for promoting women's PA but a desire to alter and manage physical appearance/physique/bodyweight is another pervasive facilitator to PA for females of different ages, health statuses, ethnicities and cultural backgrounds.

1.3.4. Summary of gender differences

Women are less active than men and report experiencing more barriers to PA, many of which relate to traditional gender roles, responsibilities and expectations. Women from certain cultural and ethnic groups, where traditional gender roles are more deeply ingrained, experience a particularly complex set of barriers to PA. Women's PA is motivated differently to men's, often by a desire to alter or manage physical appearance, to conform with Western beauty ideals. Social influences may be more impactful for women's PA than men's, regarding the social element that PA can bring to women's lives and because of the impact and perceived importance of advice from medical professionals to increase PA.

1.4. Physical activity interventions

1.4.1. Impact of physical activity interventions

Santos and colleagues (2023) highlighted the avoidable nature of the health and economic burden of physical inactivity, proposing investment in and application of effective policy interventions to improve this. One systematic review and meta-analysis found PA interventions to be effective at eliciting and maintaining PA (Howlett et al., 2019). A review by Williams and French (2011) found PA interventions for healthy adults to have small but significant positive effects on PA, identifying action planning, provision of instruction and reinforcing effort towards the target behaviour to be associated with significantly higher PA levels, whilst relapse prevention and setting graded tasks were associated with significantly lower PA levels. A systematic review and meta-analysis of the effectiveness of smartphone apps at increasing PA found modest evidence to support their efficacy (Romeo et al., 2019), with best results in the short-term (up to 3 months). Joseph et al. (2014) completed a comprehensive review of internet-based PA interventions and found around 61% to report statistically significant increases in PA, but no significant differences compared to in-person or print-based PA interventions, suggesting mode of delivery had little impact on intervention efficacy. Prochaska et al. (2008) recommend that PA interventions aiming to elicit meaningful and lasting change should run for six months minimum, yet Singh et al. (2022) found intervention effectiveness to diminish as duration increased. A systematic narrative review of PA interventions aiming to prevent obesity in Hispanic adults found improvements in PA for a) 72% of all included interventions at follow-up, b) 78.6% of community-based interventions and c) 60% of interventions built on the assumption of social support as a facilitator to PA (Ickes & Sharma, 2012). Just six of the 20 interventions lasted over six months and impact was inconsistent. The long-term impact of PA interventions for PA maintenance therefore remains unclear, despite the documented efficacy of PA interventions at eliciting meaningful short-term change.

PA interventions aim to increase PA, usually to promote positive physical and psychological health and wellbeing. An overview of Cochrane systematic reviews found a 13% reduction in mortality rates because of involvement in PA interventions for healthy and medically compromised individuals, with the greatest effect sizes for patients with mental health conditions (Posadzki et al., 2020). For women with breast cancer, a 12-week PA intervention was associated with increased objectively measured PA 3-months post-intervention, eliciting sustained improvements in strength, waist to hip ratio and social wellbeing alongside delayed reduction in lower extremity function (Rogers et al., 2009). A systematic review exploring the effectiveness of smartphone-based PA interventions on health found 56% of studies to result in successful interventions that positively impacted at least one of moderate to vigorous PA, step count, sedentary behaviour and/or cardiorespiratory fitness (Emberson et al., 2021). Five of the six smartphone-based interventions that assessed weight or waist circumference saw positive outcomes and four of the six that assessed psychological outcomes identified improvements in self-efficacy, life enjoyment/satisfaction and intrinsic PA motivation. Research exploring these psychological outcomes was identified as requiring further development. An overview of systematic reviews with meta-analyses of randomised control trials (RCTs) found PA interventions to produce medium positive effects in respect of depression, anxiety and psychological distress compared to usual care (Singh et al., 2023). This provides strong support for the benefits of PA interventions for psychological health and wellbeing, based on scientific research that sits firmly at the top of the evidential hierarchy (Murad et al., 2016). Thus, although the necessary duration and longevity of the impact of effective PA interventions remains unclear, PA interventions can be considered effective for promotion of PA, health and wellbeing.

1.4.2. Cost effectiveness of PA interventions

Despite relatively large variance in the cost per beneficiary of the 14 brief PA interventions included for systematic review (Vijay et al., 2016), the estimated cost of moving a person from inactive to active, based on the 8 studies where the relevant information was available was calculated as being between £96 and £986. This review revealed that the cost-effectiveness of PA interventions was estimated

to be between £1,104 and £14,002 per Quality Adjusted Life Year (QALY)[1]. National Institute for Health and Care Excellence (NICE) guidelines consider a health-related intervention costing around £20,000-£30,000 per QALY cost-effective (NICE, 2012), so PA interventions can be considered likely to be economically advantageous for health promotion. WHO (2021) identified the implementation of "community-wide public education and awareness campaigns for PA, including mass media campaigns combined with other community-based education, motivational and environmental programmes aimed at supporting behavioural change around PA levels" (p. 1) to be one of their 16 'best buys'. These PA promotion strategies are therefore considered some of the most cost-effective interventions for improving global health, as endorsed by the World Health Assembly.

When considering the high cost of physical inactivity, the cost-effectiveness of PA interventions and the potential for PA interventions to reduce the financial and health-related burden of inactivity, identifying and implementing specific interventions that successfully promote PA should be a public health priority. This impactful and cost-effective solution should support the most inactive demographic groups. Although the application of PA in health-related treatment and recovery should not be overlooked, PA interventions that promote PA in the interests of health protection, rather than treatment, are likely to be most cost-effective to deliver and to best reduce the economic burden of PA for health-related services over time.

1.4.3. Behavioural Science: The intervention development approach

Behavioural science integrates contributions from numerous disciplines including psychology, economics, sociology, political science and anthropology (Gillies et al., 2021). Concerned with how and why human behaviour occurs, when applied to health, behavioural science involves merging cross-disciplinary theories, methods and knowledge to ensure the evidence-based design, delivery, evaluation and reporting of health-related interventions. Affecting behaviour change is crucial to

[1] QALYs provide a measure of health that considers both the quality and quantity of life. To calculate QALYs, each year of life following the intervention is multiplied by a weighted quality-of-life score, which can range from 0 (death) to 1 (perfect health). One QALY is equivalent to one year of perfect health and would be counted as equal to two years with a quality-of-life score of 0.5.

improve global public health. Behavioural interventions have focussed on diverse health behaviours including but not limited to: vaccine uptake (Ellingson et al., 2019), smoking cessation (Villanti et al., 2020), oral health behaviours (Sivertsen et al., 2018), medical appointment attendance (Lee et al., 2020) and social distancing during Covid-19 (Piovani et al., 2021). However, when aiming to elicit behaviour change, no single discipline can encompass all holistic factors that impact health-related behaviour. Where psychological perspectives have traditionally failed to consider the impact that wider social and environmental factors have on health-related behaviour, newer psychological models aiming to address this are simultaneously complex and generic (Linke et al., 2014). Sociological perspectives of health by their very nature, view health issues as social problems, so understate the influence of individual and genetic factors in determining health and health-related behaviour (Amzat & Razum, 2014). Health economic perspectives show limited consideration of how sociocultural factors impact health and health-related behaviour, often failing to address the complexities and nuances of morals and ethics in health-related decision-making (Al Meslamani, 2024). Anthropologic perspectives have limited ability to predict cultural changes and focus on highly specific circumstances, which limits generalisability/transferability of findings (Lambert & McKevitt, 2022) but interdisciplinary teams and approaches appear to elicit greater success when developing community-based PA interventions (Haggis et al., 2013). Behavioural science therefore aims to integrate cross-disciplinary knowledge, to develop a holistic view of health and health-related behaviours, to capitalise on the strengths of each discipline, whilst compensating for its shortfalls. Nonetheless, despite the intent of behavioural science to ameliorate the shortfalls associated with existing intervention development approaches, the field remains imperfect. A scoping review of theories of behaviour and behaviour change across the social and behavioural sciences, informed by psychology, sociology, anthropology and economics identified 82 relevant theories. Most were not frequently applied across the literature and 63% of studies included for review implemented just four theories, all of which were psychological (Davis et al., 2015). Despite comment that psychological theory is disproportionately implemented, this might instead indicate that psychological theories appropriately complement

behavioural science approaches and have better utility for behavioural interventions than other theoretical bases.

Theoretical frameworks are integral to behavioural science intervention design. One article combined findings from literature review and case study to explore the role of theoretical frameworks within mixed methods health sciences research (Evans et al., 2011). Close alignment of each phase of research with a relevant and appropriate theoretical framework created theory-based and transferable findings, with increased credibility. Garvey and Jones (2021) found theoretical frameworks useful for guiding qualitative research, provided the acceptability of the framework was thoughtfully reflected on, that analyses were methodical and there was no overreliance on the framework that creates rigid/restrictive approaches. Meta-analysis of RCTs revealed that theory-based PA interventions significantly but variably impacted PA, with best results for interventions that used just one theoretical basis throughout (Gourlan et al., 2016). Behaviour change techniques (BCTs) are evidence-based strategies that can be integrated into intervention design to alter the target behaviour. Michie et al. (2013) identified 93 empirically grounded BCTs, organised into 16 clusters. Meta-analysis by McEwan et al. (2019) identified that PA interventions that used three or more clusters of BCTs were more effective for PA promotion and that on average, theory-based interventions contained more clusters. Theory-based interventions that included BCTs from just one cluster significantly impacted PA levels, whilst interventions not based on theory that only incorporated one BCT cluster did not. The importance of integrating multiple BCTs when developing interventions, alongside the documented benefit of implementing just one theoretical framework at all stages of the development process may at first seem contradictory. However, implementing the most appropriate theoretical framework should enable selection of relevant BCTs that align with appropriate theory and address the target behaviour, in ways that are acceptable to the target group. This should streamline and target the intervention development process, which evidence suggests should enhance intervention efficacy. Theory-based interventions are therefore more effective at promoting PA than those that fail to incorporate appropriate theory. Behavioural science provides a multidisciplinary and empirically grounded means of achieving this. This PhD

research has therefore taken a theoretically driven approach to understanding women's PA, co-designing a relevant intervention and to delivering, reporting and evaluating that intervention, through a behavioural science lens.

1.4.4. Features of successful PA interventions

It is important to identify which component parts are most closely linked with PA intervention success. Horodyska et al. (2015) undertook an umbrella review whilst developing a 53-item checklist of good practice characteristics for diet and PA interventions and policies. Eighteen items on the checklist were considered important for good practice when developing the main intervention. These included having a well-defined target audience; a well-defined target behaviour which is adjusted to suit the target population; tailoring the relevant content and materials to suit the target audience and the target behaviour; a multidimensional approach that considers individual, social and environmental factors; the application of theory during intervention development; the use of theory-based BCTs and implementing the specific BCTs of 'self-monitoring' (keeping a record of the target behaviour) and 'self-management' (assuming greater responsibility for health and the target health-related behaviour). For adults aged 55-70, a systematic review and meta-analysis revealed 'feedback' to be the BCT most closely associated with maintenance of PA (O'Brien, 2015). Greaves et al. (2011) completed a systematic review of reviews and found interventions that were individually tailored and implemented self-regulatory techniques such as goal setting, prompting self-monitoring and providing feedback on performance best promoted PA for adults at risk of diabetes.

Short et al. (2014) explored the individual characteristics associated with PA intervention delivery mode preferences for adults. They identified that web-based PA intervention delivery was generally preferred by people living in rural areas, those with high internet use and those aged 35-44 (compared to 18-34 years). Online PA interventions were dispreferred by females, people living with obesity and those with higher PA participation, whilst print-based PA interventions were preferred by older people and dispreferred by females and people living with obesity. A group-based PA intervention was preferred by those living in a regional town but

dispreferred by those who were living with obesity or who were maritally separated. A review from Harden et al. (2015) found effective group-based PA interventions for people living with obesity, people with chronic conditions, people on low income, university students, cancer survivors, postnatal women, women attending University who were at risk for or living with chronic disease and older adults, particularly those at risk of or living with chronic disease. Group-based PA interventions targeting minority groups were largely ineffective, although authors posited that this may be linked to researcher bias. However, 75% of ineffective interventions included in this review were RCTs, so intervention success may be overstated within non-RCT designs. RCTs are highly rigorous, meaning the nature of their design may be incompatible with PA intervention design so RCTs might routinely lack elements that efficacious PA interventions provide. Digital PA interventions effectively increased PA for people of high but not low socioeconomic status (SES) regardless of the number or type of BCTs (Western et al., 2021). Tailoring PA interventions to the target demographic to enhance outcomes, particularly for groups experiencing the greatest inequality should therefore be prioritised. Important personal characteristics that might determine PA intervention preferences and success include, but are not limited to, weight status, age, gender, marital status/living situation, health status and ethnicity.

1.4.5. Physical activity intervention co-design

To ensure PA interventions and their component parts are suitably bespoke, it seems sensible to involve end-users in their design. Research into healthcare and health promotion would benefit from amplifying patient voices, rather than implementing hierarchical models of evidence that favour scientific/medical knowledge (Ferlie et al., 2012). Based on a systematic methods overview, a taxonomy of approaches for the development of health-related interventions identified 11 approaches across eight categories (O'Cathain et al., 2019). Despite no comparison of the success of each approach, 'partnership' approaches, which allow end-users to have at least equal power to researchers in decision-making, were identified. One example of a partnership approach is 'co-design', although it's definition has been somewhat contentious, often having been used interchangeably with the terms co-creation and co-production. Whilst these

various ‘co-’approaches can all be categorised as ‘partnership’, each differs. This distinction has particular importance within health and social care (Masterson et al., 2022) and Public Health (Vargas et al., 2022), where pragmatism of intervention delivery is paramount for ensuring large scale intervention uptake. Co-creation, co-design and co-production differ in terms of focus, key stakeholders, the role of stakeholders, when and how stakeholder participation occurs, methods/styles of communication, value creation, the resultant initiative and possible outcomes.

- *Co-creation* is a type of partnership approach that acts as an umbrella term, encompassing both co-design and co-production.

- *Participatory Action Research (PAR*) is the body of research pertaining to co-creation.

- *Co-design* involves centralising participants’/end-users’ needs, expertise and knowledge during design.

- *Co-production* involves participants/end-users during design, knowledge construction and intervention delivery.

So, whilst a co-designed intervention would involve service users during its design, the final intervention would be delivered by other key stakeholders who are invested from research, organisational and/or bureaucratic perspectives. There remains no single accepted definition of co-design, but emphasis is placed on the importance of its inherent, underlying, original principles: distribution of power in research, amelioration of the human experience and positive societal impact (Moll et al., 2020). Based on these principles, co-design can also be categorised as ‘target population-centred’ (as the intervention is based on the views and actions of end-users) therefore also rendering this a combination approach, according to O’Cathain et al.’s (2019) categorisation of health-related intervention development approaches.

Co-design has been implemented in diverse contexts and populations including the development of a smartphone app for people living with dementia (Fox et al., 2022), a social media suicide prevention campaign targeting young people (Thorn et al., 2020) and theory-based interventions for safer medicine use for patients (Fylan et al., 2021). End-user involvement in co-creation of public health interventions has long-since been considered to improve intervention adherence, effectiveness and end-user empowerment (Green et al., 1996). Key stakeholder involvement strengthens innovation, implementation and overall success of public health initiatives (Vargas et al., 2022). Rigorous evidence demonstrates that the inclusion of community members during research promotes intervention effectiveness and community engagement (Andersson et al., 2015). Co-created interventions may be superior to homogeneous intervention designs (Durand et al., 2014) and these collaborative approaches have been praised for their efficacy in developing more person-centred public services (Farr, 2018). Co-design results in interventions that are more engaging, satisfying and useful (Thabrew et al., 2018). Despite a paucity of research exploring the longer-term effects, meta-analysis indicates that co-creation methods could improve health-related outcomes and public health (Halvorsrud et al., 2021).

A scoping review of co-designed PA interventions for older adults highlighted issues with variations in the labelling and implementation of co-design with no included studies that directly assessed the effectiveness of the co-design process (Constantin et al., 2022). Based on systematic review findings, Grindell et al. (2022) propose that the lack of robust evaluation of co-created health-related interventions explains the lack of empirical evidence exploring the effectiveness of co-participatory approaches, such as co-design. A further explanation for the documented variability in the effectiveness of co-created interventions in public health settings may relate to the paucity of appropriate frameworks for co-creation. Whilst some have been developed (e.g. PRODUCES – Leask et al., 2019), these are infrequently implemented and remain in their relative infancy.

1.4.6. Summary of physical activity interventions

High quality empirical evidence shows that PA interventions have positive outcomes including reduced mortality, improved physical health and better psychological health and wellbeing. PA interventions effectively elicit PA behaviour change, but the evidence around their efficacy for PA maintenance is less convincing. Nonetheless, PA interventions are generally considered cost-effective compared to usual care and have promise for health protection and improvement. Multidimensional and multidisciplinary interventions appear most effective, making behavioural science approaches to intervention development promising. Incorporating appropriate theoretical foundations, including evidence-based BCTs and appropriately tailoring interventions to the target demographic is likely to enhance intervention efficacy. Although the measurable impact of co-design on intervention effectiveness is unclear, there is evidential support for using this approach within intervention development. Co-design can be considered a promising strategy for enhancing participant engagement and satisfaction by involving end-users in the development of interventions that promote equity, positive health-related behaviour and improved health outcomes.

1.5. Knowledge gaps

1.5.1. Evidence of knowledge gaps

Despite research increasingly exploring PA and public health interventions, little progress has been made regarding PA policy, practice, programmes and recommendations compared to other equally impactful public health priorities, such as HIV prevention, maternal mortality and tobacco control (Pratt et al., 2020). Much of the PA behaviour literature has been undertaken with children and young people, the elderly and/or in the context of the treatment/management of health conditions/illnesses or pregnancy. The prevalence of research exploring children's PA is illustrated by the high number of articles (129) that met the inclusion criteria for a systematic review exploring PA behaviour in school settings (Demetriou & Höner, 2012). More recently, a systematic review and meta-analysis of longitudinal studies that assessed changes in moderate-to-vigorous PA in children and adolescents identified 52 eligible studies (Farooq et al.,2020), despite the relative

sparsity of longitudinal, compared to short-term, research. Based on the link between PA and health, unsurprisingly, a large volume of research aims to explore the PA of people with health conditions and illnesses. There are particularly large bodies of research exploring PA for people living with cancer (e.g Jochem & Leitzmann, 2022; Miyamoto et al.., 2022; McTiernan et al., 2019), diabetes (e.g. Beltran-Valls et al., 2023; De La Fuente et al., 2021; Palermi et al.,2022), osteoporosis (e.g.Alhussein & Hadjileontiadis, 2022; Lyu et al., 2024; Zhang et al., 2022) cardiovascular disease (e.g.Bae et al., 2021; Coull & Pugh, 2021; Dibben et al., 2023) and mental illness such as depression (e.g. Glowacki et al., 2017; Pearce et al., 2022; Wolf et al., 2021) and anxiety (e.g. Aylett et al., 2018; Henriksson et al.,2022; McDowell et al., 2019). There is ample exploration of the PA behaviour of women who are planning for pregnancy, currently pregnant or who are postnatal (e.g. Chen, 2023; Cilar Budler & Budler, 2022; Román-Gálvez et al., 2021; Ryan et al., 2022; Silva-Jose et al., 2022; Tinius et al., 2021), yet comprehensive literature searching reveals relatively little research exploring PA for healthy adult women in other contexts. Whilst there is some evidence exploring barriers and facilitators to PA for healthy adult women, this is somewhat sparse, often focussing on specific sub-populations such as women in university (e.g.Lovell et al., 2010; Burton et al., 2021; Othman et al., 2022) or older women (e.g. Bjornsdottir et al., 2012; Tinker et al., 2017; López-Benavente et al., 2018). The only identified synthesis of the body of research exploring the PA of healthy women between the ages of 18 and 65, outside of any specific contexts (Peng et al., 2023) is limited in respect of participant age (18-40 years).

Whilst co-design approaches are widespread in health-related intervention development, a rapid review reveals that they are rarely well described or evaluated (Slattery et al., 2020). There is limited guidance on how to conduct co-design and a dearth of evidence directly assessing the impact of stakeholder involvement. An integrative review revealed that in a nutrition context, intervention studies using participatory research approaches were more likely to report positive health behaviour outcomes than others (Tay et al., 2021). Whether this can be generalised to PA remains unclear. Anderson et al. (2022) developed six key principles and 27 associated best practices for co-design in health with first nations Australians.

Findings were described as a “valuable starting point for the future development of guidelines, toolkits, reporting standards and evaluation criteria to guide applications of co-design” (p. 147). However, culture played an important role in developing these principles, so findings may have limited generalisability in this regard. Despite the current ongoing development of the PRECISE (Preferred Components for Co-design in Research) checklist for co-design (Munce et al., 2023), this tool is yet to be produced and aims to support with the transparent reporting of co-design research, rather than providing guidance on how best to practically conduct co-design.

A systematic review exploring predictors of dropout in weight loss interventions found no consistent pattern of predictors but clarified that identification of those at risk of dropout would enhance weight loss intervention effectiveness and cost-effectiveness (Moroshko et al., 2011). Meta-analysis and meta-regression of dropout from exercise RCTs for people with depression found studies with proportionately more female participants had higher dropout rates (Stubbs et al., 2016). Dishman (1986) found dropout rates from exercise to be between 25% and 50%. Over 25 years later, Biddle & Mutrie (2007) estimated that around 50% of people stop exercising within six months of starting and less than a decade ago, systematic review and meta-analysis found dropout from RCTs using yoga to exceed 40% for some populations (Cramer et al., 2016). Dropout rates from exercise generally and from PA intervention research specifically therefore remain notoriously high, indicating little progress in respect of strategies for participant retention, enabling PA maintenance and preventing withdrawal from PA.

1.5.2. Filling identified knowledge gaps

This PhD research has employed mixed methods to contribute to existing knowledge and fill identified gaps. Qualitative syntheses of the available English-language peer-reviewed evidence exploring barriers and facilitators to PA for healthy women aged 18-65 has enabled identification of key features that impact women’s PA determinants. Focus groups with women from the East Midlands have enabled an understanding of women’s PA determinants at the local level. Co-design workshops with target end-users have enabled the collaborative

development of a pilot PA intervention. The content and outcomes of the co-design workshops have been reported in detail, to add to the sparse body of literature that adequately describes this process. The pilot intervention has been quantitatively evaluated, to assess its efficacy at improving the target behaviour and associated outcomes, such as fitness and psychological wellbeing. Demographic characteristics of women who signed up to participate have been assessed, to identify those that might be associated with intervention attrition. One-to-one interviews have enabled detailed exploration of participants' experiences of the intervention. Women without full participation were gave explanations for their attrition and all participants were able to propose remedial strategies that might reduce attrition, if the intervention were to run at full-scale.

1.5.3. Summary of knowledge gaps

Within the empirical evidence, there exist some knowledge gaps in respect of understanding and promoting the PA of healthy adult women outside the context of pregnancy and surrounding times. The impact of co-design on intervention effectiveness is unclear and limited guidance exists for practically undertaking co-design to develop interventions. Notably, the phenomena of attrition in PA interventions and the tendency for PA not to be maintained require attention. This PhD research has therefore aimed to amalgamate a pre-existing body of evidence, to summarise what women perceive their barriers and facilitators to PA to be. Data has been collected from women from the East Midlands, to allow a locally relevant understanding of women's barriers and facilitators to PA. The pilot intervention has been co-designed with target end-users and the process has been documented and reported in detail, to facilitate an understanding of the pragmatic considerations required during intervention co-design. The pilot intervention has been assessed in terms of efficacy and outcomes, with particular attention paid to identifying common features of participants without full engagement, the reasons for attrition and the strategies that women perceived might prevent attrition within a future full-scale iteration of the intervention.

1.6. Summary and conclusion

Physical activity improves physical and psychological health and wellbeing. Sedentary behaviour and physical inactivity damage health to such a degree, that

inactivity majorly contributes to global mortality, placing a large economic burden on health services. PA interventions therefore offer a cost-effective public health solution, which compares to and sometimes outperforms usual care for many health conditions, illnesses and diagnoses. Women are less active than men, they experience more barriers and different facilitators to PA compared to men. Women experience barriers to PA in relation to gender typical roles and responsibilities, which are often culturally governed. Women are frequently motivated to be active based on a desire to change their appearance to conform to Western beauty ideals and because of social influences.

PA interventions effectively elicit PA but achieving PA maintenance is more challenging. Best outcomes appear to result from multidimensional and multidisciplinary approaches to intervention design alongside delivery of tailored interventions that implement appropriate theoretical foundations and include multiple, appropriate, evidence-based BCTs. Co-design is one promising approach for the development of a tailored PA intervention for women, despite limited guidance on how best to conduct this and a lack of evidence around the impact of co-design on intervention effectiveness. PA intervention design, development, delivery and evaluation can be challenging, particularly regarding participant recruitment and retention, measurement of PA, evaluation of intervention effectiveness and managing competing needs within and between target groups. This PhD thesis has taken a theoretically grounded approach to understanding and promoting the target behaviour of PA for women. It aims to fill knowledge gaps by summarising the existing literature around healthy women's PA globally and collecting primary data from women from the East Midlands to develop an understanding of women's PA determinants regionally. The pilot PA intervention was co-designed with the target group, implemented and evaluated. Participant characteristics have been compared according to level of intervention engagement, to enable identification of common features associated with attrition. Exit interviews were conducted, to illuminate women's experiences of participation. Those without full participation were invited to interview such that reasons for attrition could be identified. Strategies that might limit or prevent withdrawal if the intervention were to run at full-scale were also proposed.

To conclude, this PhD thesis aims to document the development of an efficacious pilot PA intervention for women that has the potential to be redeveloped and run at full-scale. By empowering women to participate in the intervention design, incorporating appropriate theoretical foundations and taking a systematic approach to intervention development, it is proposed that an appropriately tailored pilot intervention that increased PA, improved associated health outcomes and has potential for full scale redevelopment was produced.

Chapter 2: Methodology

2.1. Introduction

2.1.1. Overview

This chapter introduces, critiques and discusses the methodological approaches used throughout this PhD research. The ontological and epistemological approaches are outlined, mixed methods research and its utility in this work are discussed and traditional behaviour change theories (the Transtheoretical model, Social cognitive Theory and the Theory of Planned Behaviour) critiqued. Contemporary behaviour change theory (COM-B) is introduced and evaluated alongside its complementary framework (the Theoretical Domains Framework), intervention development model (the Behaviour Change Wheel) and taxonomy (the Taxonomy of Behaviour Change Techniques). The methods, models, guidance, tools, checklists, constructs and frameworks that were used during the design, implementation and evaluation of a 4-week pilot PA intervention for women from the East Midlands are discussed. The application of each to the relevant phase of research is then clarified. A mixed methods approach to understanding reasons for attrition and remedies for the same are described, before the chapter closes with a summary and conclusion.

2.1.2. Ontology and Epistemology: The nature of reality and theory of knowledge

This PhD research has implemented the ontological and epistemological perspective of critical realism (e.g. Bhaskar, 1975; Archer et al., 2013). Critical realism posits that observable events sometimes happen because of unobservable structures, processes and occurrences. A critical realist perspective therefore understands ‘reality’ to be mediated phenomena that exist and are understood through the lens of the perceiver. Yucel (2018) conducted an exploratory study using Bhaskar’s (1975) critical realism framework to elicit and analyse the ontological and epistemological views of academic scientists. This research found critical realism to be a relevant and applicable lens that reflected the way academic scientists hold realist ontological commitments about knowledge alongside fallibilist epistemological commitments, concluding that by finding a middle ground, critical realism addresses many criticisms of alternative approaches.

Critical realism has relevance in healthcare settings (Koopmans & Schiller, 2022), whereby doctors endeavour to explain observable events in the form of symptoms (e.g. a rash) by identifying a cause that is often difficult or impossible to observe or measure (e.g. an allergy exacerbated by stress). Further, critical realism is considered to underpin research that facilitates understanding of health behaviours, provide insights that can inform intervention development and allow for health-related intervention development (Kersey & Lyons, 2024). Kersey and Lyons concluded that critical realism provides health researchers with a powerful and flexible approach that helps to understand how social reality is formed, maintained and transformed. They highlighted the benefits of a critical realist perspective in enabling clarity around the multi-level factors that shape health behaviours and outcomes within a complex system, that is underpinned by relative power. They also noted that critical realism provided a perspective whereby understanding of these multi-level factors could be achieved using research methods and methodologies that were culturally safe for diverse communities. Kersey et al. (2023) implemented a critical realist approach to understanding women's alcohol consumption, identifying this philosophical perspective as useful for: 1) Implementing broad research perspectives, 2) Understanding the interrelationships between health behaviours, individual characteristics/experiences and the material, institutional and socio-cultural contexts in which women live and 3) underpinning and fostering interdisciplinary research collaboration to inform nuanced health promotion practices and policies for diverse women. The broad, multidisciplinary nature of Behavioural Science and its ability to place emphasis on the interrelationship between different factors and their impact on health-related behaviour (See Section 1.4.3.), therefore render it a complementary methodological approach for a critical realist ontological perspective. Critical realism asserts that qualitative methodologies enable rich explanations of existing mechanisms and that quantitative methods can enable greater clarity over the nature and strength of these mechanisms and identification of ways to redirect/change these (Lawani, 2021). Throughout this PhD research, qualitative methodologies including systematic evidence synthesis, focus groups and interviews were implemented to understand women's barriers and facilitators to PA, their experiences of participation in a pilot PA intervention, reasons for

attrition and proposed strategies for preventing/reducing this if the intervention were to run at full-scale. Quantitative approaches have enabled identification of features for intervention design and implementation, and assessment of intervention efficacy, acceptability and outcomes.

In the context of this research, through the application of critical realism, the 'real' can be considered to represent underlying causal mechanisms (such as systemic poverty or internalised gender norms) that produce 'actual' events (health behaviours), which can be observed in the 'empirical' data (e.g. participant quotes).

2.1.3. Mixed methods research

This research has adopted a mixed methods sequential approach, as defined by Östlund and colleagues (2011), which complements both behavioural science and critical realist approaches. Blending qualitative and quantitative methodologies is reminiscent and reflective of the interdisciplinary nature of behavioural science and complements critical realism (See Section 1.2.2.), because quantitative methods allow for measurement of the observable behaviour (PA) and its outcomes, whilst qualitative methods can facilitate understanding of the unobservable underlying thought processes and mechanisms that facilitate or inhibit engagement and maintenance. Growing in popularity since the early 21st century (Andrew & Halcomb, 2007), there is rising demand for mixed methodological approaches in research (Stern et al., 2021) and academics are increasingly acknowledging how mixed methodologies can enhance research findings by drawing upon the strengths of each contributing approach. Where qualitative data fails to provide evidence around the magnitude and statistical significance of any effect or outcome of intervention participation, the quantitative elements of mixed methodological research provide clarity in this regard. Where quantitative data might fail to explain a phenomenon, integration of the qualitative elements of mixed methods research can fill this gap by affording participants the freedom to express their own perceptions, attitudes and experiences, without stringent predetermined confinements and in ways the researcher may not anticipate. Thus, mixed methodologies are appropriate when implementing a critical realist approach, because they allow for data on both the quantifiable reality and the subjective

experience to be communicated, understood and reported. Based on a multiple case study, Zhang et al. (2014) found mixed methods to be beneficial for answering research questions, providing context to numerical data, understanding implementation processes and enhancing the methodological rigour of qualitative research elements. Authors highlighted a need for mixed methodological research to involve well-trained teams who can work collaboratively; support to overcome publication barriers and; proper guidelines to assist the rigorous implementation of mixed methodological research. Leviton (2017) discussed the importance of combining different statistical tools and logic when drawing inferences about study samples, to ensure that public health intervention research is externally valid and generalisable. Mixed methods have therefore been implemented throughout this research process, to enable understanding of the target behaviour of PA and throughout the development, delivery and evaluation of the 4-week pilot PA intervention for women from the East Midlands. This mixed methods approach aligns with the ontology and epistemology of critical realism and capitalises on the strengths, whilst compensating for the limitations of each of quantitative and qualitative methods. It thereby underpins the development of a PA intervention for women, in a way that promotes external validity, transferability and generalisability.

2.2. Traditional behaviour change theory

2.2.1 Forethought

Historically, models that have been designed to *predict* behaviour have been drawn on as a theoretical basis upon which interventions aiming to *change* behaviour have been built. The Transtheoretical model (Prochaska & Velicer, 1997), Social Cognitive Theory (Bandura, 1986) and the Theory of Planned Behaviour (Ajzen, 1985) have been extensively implemented within behaviour change research of varying quality, with varying levels of success. A comprehensive review has shown that these models have fallen short when it comes to eliciting change within the health behaviour literature generally (Taylor et al., 2006) and in a PA context specifically (Rhodes et al., 2019). Here, these widely applied models will be briefly evaluated in respect of their appropriateness as a theoretical basis for PA intervention design and development.

2.2.2 The Transtheoretical Model (Prochaska & Velicer, 1997)

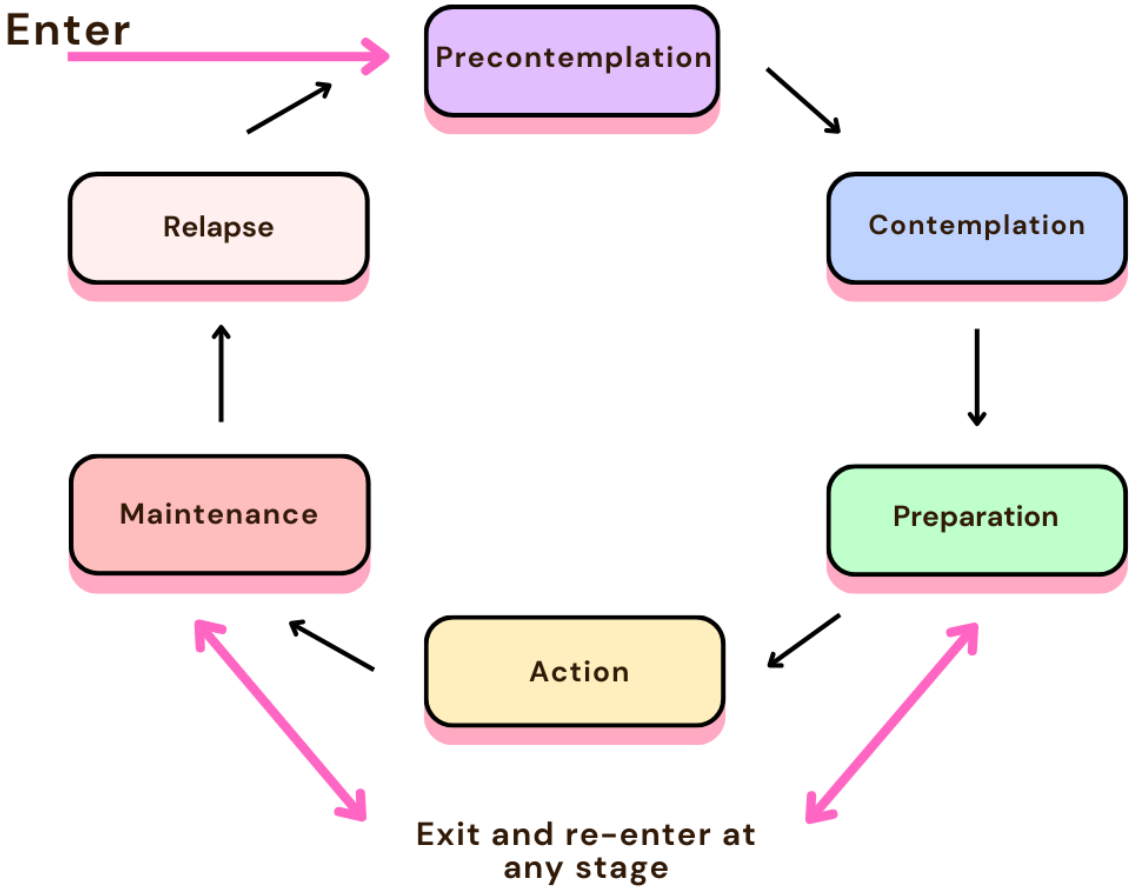


Figure 1: A diagram showing The Transtheoretical Model

The Transtheoretical model of behaviour (TTM) proposes that all behaviour change occurs on a step-by-step and sometimes cyclical basis, from pre-contemplation through to maintenance and potentially to relapse (See Figure 1). The model initially appears easy to understand without expertise, as much research implementing this model focuses primarily on progression through stages of change. However, this simplistic representation of the model so frequently seen within the literature is incomplete, as there are actually four dimensions to the model: stages of change, processes of change, self-efficacy and decisional balance. The TTM has undergone critique for failing to consider the factors that facilitate or inhibit progression from one stage to the next, referring to the stages as 'pseudo-stages' (Weinstein et al, 1998). Studies, which aimed to promote PA and which used the TTM as a theoretical foundation elicited but did not maintain PA (Adams & White, 2003). There was no additional long-term benefit of interventions that were grounded in Transtheoretical

theory (usually by grouping participants/designing interventions according to stage of change), compared to controls. Using the TTM can be challenging, as "constant assessment" of readiness for change is required to guide the intervention appropriately (de Freitas et al., 2020. p10). A systematic review of PA behaviour change interventions based on the TTM found that most failed to accurately represent the primary dimensions of the model (stages and processes of change), so the TTM may not be the best choice for informing intervention design (Hutchison et al., 2009). Similarly, whilst de Menezes and colleagues (2016) found support for the TTM's application in a PA context, they highlighted the poor methodological quality of studies included in their systematic review; further indication that this theoretical model is not entirely appropriate for use during practical intervention design.

2.2.3 Social Cognitive Theory (SCT)

Social Cognitive Theory (Bandura, 1986) states that self-efficacy is the most crucial component in determining behaviour and that this directly impacts outcome expectations, sociocultural factors and behaviours, with a complex 3-way interplay occurring between these variables and with goals mediating this relationship (See Figure 2). Research consistently evidences self-efficacy to be impactful in determining general PA and purposeful exercise (Guntzviller et al., 2017; Lewis et al., 2016; Reuter et al., 2010). This is confirmed by meta-analysis (Sheeran et al., 2016). SCT has been found useful for predicting health behaviour in varying domains and populations (e.g. Godin et al., 2008; Guillaumie et al., 2010), but has been critiqued for its limited capacity and use of theory in determining within-person differences in self-efficacy (Beauchamp et al., 2019). Further, SCT is often treated as a "one-factor theory" (Luszczynska et al., 2005, p.127), in which self-efficacy is the star whilst the other components of SCT are underrepresented. A systematic literature review found a mixed, yet largely non-significant impact of SCT-informed obesity interventions on PA for adolescents (Bagherniya et al., 2018). Young et al. (2014) conducted a systematic review and meta-analysis exploring the relationship between PA and all SCT variables, concluding that although SCT helped to explain PA behaviours, the methodological quality of studies aiming to be informed by SCT remained poor. SCT therefore appears somewhat useful for behavioural prediction

and some aspects of intervention design, but has limited utility for behavioural manipulation, so is considered an incomplete theoretical basis for intervention design.

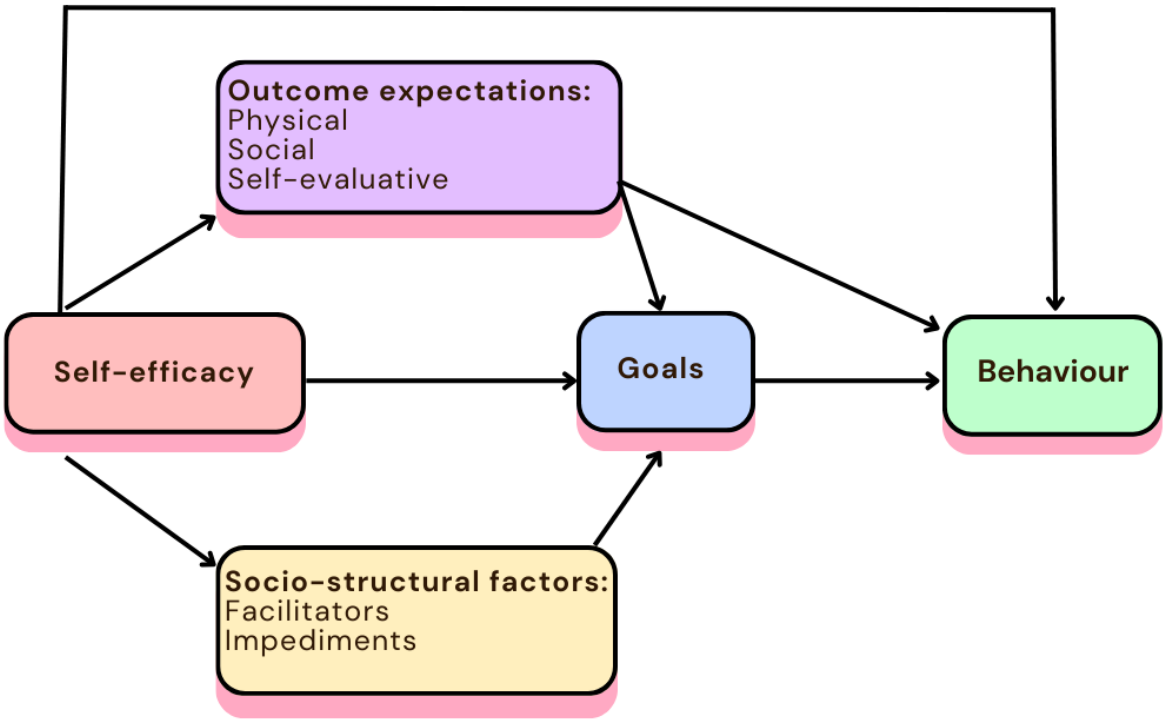


Figure 2: A diagram showing Social Cognitive Theory

2.2.4. The Theory of Planned Behaviour (Ajzen, 1985)

Ajzen's (1985) Theory of Planned Behaviour (TPB; See Figure 3) shares commonalities with SCT but suggests that attitudes, subjective norms and perceived behavioural control are interrelated and impact upon intention which in turn, predicts behaviour. Intentions do not reliably predict behaviour however (Sheeran, 2002) and a conclusive body of literature documents the scale of 'the intention-behaviour gap' (Sheeran & Webb, 2016). Further, TPB disregards the role of habits and automaticity in behaviour change (Gardner et al., 2020), has limited predictive validity, ignores the impact of sociodemographic factors and has poor utility for intervention design (Sniehotta et al., 2014; Miller, 2017). This model fails to outperform SCT, as self-efficacy (a key feature of SCT) was a better predictor of weight management behaviour than perceived behavioural control (a key feature of TPB; Parkinson et al., 2017). A systematic review from Hardeman et al. (2002) found

only sparse evidence to support the mediation of effects by components of TPB during behaviour change interventions. Further, these components were rarely explicitly stated or operationalised during intervention design and when this occurred, researchers disagreed during categorisation of components targeted by interventions. The TPB is therefore considered flawed as a theoretical basis for practical intervention design.

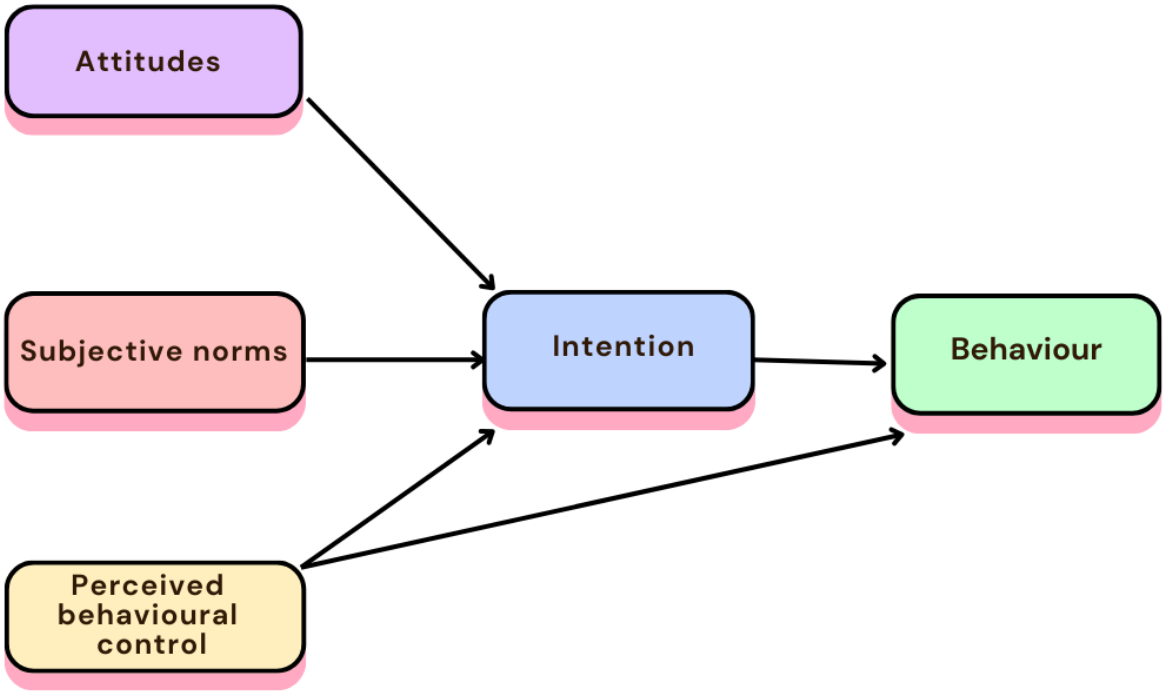


Figure 3: A diagram showing the Theory of Planned Behaviour

2.2.5. Application of traditional behaviour change models in a physical activity context

A systematic review revealed a long-term effect of PA interventions (up to 12-14 months), but only the most comprehensive and well conducted studies were effective (Müller-Riemenschneider et al., 2008) and few (N=4) were considered 'good' or 'high' quality. Another review identified no difference in the efficacy of online PA interventions, whether behaviour change theory was used during intervention design or not (van den Berg et al., 2007). One systematic review found community-based PA interventions within economically deprived communities to

initiate only small changes, even when interventions were designed with a theoretical basis (Cleland et al., 2012), whilst a UK-specific review of deprived populations was inconclusive in assessing PA intervention efficacy (Everson-Hock et al., 2013). Michie and Prestwich (2010) described behaviour change theories as 'a loose framework' upon which interventions are built, after retrospective analysis identified a questionable relationship between theory and intervention design, whether psychological theory had been drawn upon during early development or not. There is however evidential support for the efficacy of behaviour change interventions thatimplement psychological theory appropriately (e.g. Michie et al., 2009) by including numerous diverse, evidence-based BCTs for example (Eisele et al., 2019). PA intervention research aiming to elicit change on a long-term basis for populations at risk of inactivity should therefore pay special attention to ensuring methodological rigour and draw upon a relevant and theoretically complete model of behaviour change, which is prescriptive and practically useful for PA intervention design, but still allows the flexibility required to appropriately tailor the intervention.

2.2.6. Traditional behaviour change theory summary

Traditional models of behaviour change are useful for the prediction of behaviour but fall short when aiming to elicit behaviour change. These models have limited utility in respect of building interventions and so are not considered appropriate frameworks for behaviour change intervention development.

2.3. Contemporary behaviour change theory

2.3.1. The Theoretical Domains Framework (Cane et al., 2012): Describing determinants

The Theoretical Domains Framework (TDF) was developed by a group of behaviour change experts from various disciplines to enable "implementation research to identify influences on health professional behaviour related to implementation of evidence-based recommendations" (Atkins et al., 2017, p. 77). By synthesising 33 theories (comprising 128 theoretical constructs), an integrated theoretical framework that aims to be accessible to those working in implementation was developed. This comprised 14 theoretical domains encompassing 84 theoretical constructs. Following peer review and additional development of the original TDF (Michie et al., 2005), version 2 of the TDF was produced in 2012. Domains of the TDF

v2 are defined in Table 1, which is adapted from Atkins et al., (2017), alongside some examples of associated constructs – which allow for more granular categorisation of barriers and facilitators than domains.

Table 1: TDF domains with definitions and associated constructs – adapted from Atkins et al. (2017)

Domain: definition	**Constructs**
Knowledge: An awareness of the existence of something	Procedural knowledge Knowledge of task environment
Skills: An ability or proficiency acquired through practice	Skills Skill development Competence
Social/professional role and identity: A coherent set of behaviours and displayed personal qualities of an individual in a social or work setting	Professional identity/role Professional role Social identity Group identity Organisational commitment
Beliefs about capabilities: Acceptance of the truth, reality or validity about an ability, talent or facility that a person can put to constructive use	Self-confidence Perceived competence Perceived behavioural control Self-esteem Empowerment
Optimism: The confidence that things will happen for the best or that desired goals will be attained	Optimism Pessimism Unrealistic optimism
Beliefs about consequences: Acceptance of the truth, reality, or validity about outcomes of a behaviour in a given situation	Beliefs Outcome expectancies Anticipated regret
Reinforcement: Increasing the probability of a response by arranging a dependent relationship, or contingency, between the response and a given stimulus	Rewards Incentives Punishment Sanctions
Intentions: A conscious decision to perform a behaviour or a resolve to act in a certain way	Stability of intentions Stages of change model
Goals: Mental representations of outcomes or end stated that an individual wants to achieve	Goal priority Goal/target setting Action planning Implementation intention

Memory, attention and decision processes: The ability to retain information, focus selectively on aspects of the environment and choose between two or more alternatives	Memory Attention Decision making Cognitive overload/tiredness
Environmental context and resources: Any circumstance of a person's situation or environment that discourages or encourages the development of skills and abilities, independence, social competence and adaptive behaviour	Environmental stressors Resources/material resources Organisational culture/climate Salient events/critical incidents Person-environment interaction
Social influences: Those interpersonal processes that can cause individuals to change their thoughts, feelings, or behaviours	Social pressure Social norms Group conformity Social comparisons Social support Power Intergroup conflict Alienation
Emotion: A complex reaction pattern, involving experiential, behavioural and physiological elements, by which the individual attempts to deal with a personally significant matter or event	Fear Anxiety Stress Burn-out
Behavioural regulation: Anything aimed at managing or changing objectively observed or measures actions	Self-monitoring Breaking habit Action planning

The TDF provides a detailed framework for understanding barriers and facilitators to health-related behaviour, with descriptive labels that are intuitive for behavioural scientists and accessible for laypeople. One overview article revealed the breadth and cross-disciplinary impact of the framework in health-related behaviour research (Francis et al., 2012), finding that the TDF was used in 21 different studies of varying methodologies, many of which aimed to inform intervention design. The TDF is a useful starting point for the design of interventions aiming to change behaviour across a variety of health-related domains (e.g. Cadogan et al., 2015; Griffiths et al., 2022; Seale et al., 2020) and has been extensively used to explore barriers and facilitators to PA for diverse populations (e.g. Van Dijk-Husiman, 2022; Matthews et al., 2018; Haith-Cooper et al., 2018; Hayba & Allman-Farinelli, 2021).

Whilst not a critique of the TDF itself, studies using the TDF as their empirical basis typically employ interviews and focus groups for data collection. These methodologies rely on participants expressing their own perceptions of the influences on their behaviour, which may include attributional biases, rather than reflecting actual causes. Further, the TDF has undergone some critique, being termed descriptive as opposed to theoretical, because no relationship between domains is specified (Francis et al., 2012). However, the TDF is compatible with a range of other behavioural implementation frameworks, including the COM-B model (Michie et al., 2011 – See Section 2.3.2.), which addresses this critique by considering the relationship between different features identified within the model.

2.3.2. Capability, Opportunity, Motivation - Behaviour (Michie et al., 2011): A theoretical basis for understanding barriers & facilitators to PA

The COM-B model was developed by Michie et al. (2011) synthesising existing health behaviour models including the TPB, TTM and SCT, to develop one all-encompassing theoretical basis upon which behaviour change interventions could be built. The COM-B model proposes that for a person or population to engage in a behaviour, they must have the capability, opportunity and motivation to do so (See Figure 4).

Capability is a *personal* attribute that enables or facilitates health-related behaviour and which can be either physical or psychological. Physical capability depends upon an individual's physique and musculoskeletal functioning (e.g. strength), whilst psychological capability depends upon the individual's mental functioning (e.g. ability to make plans).

Opportunity is an *environmental* attribute that works together with capability and can be either physical or social. Physical opportunity refers to aspects of the environmental system that are inanimate (e.g. transport), whilst social opportunity relates to other people and organisations (e.g. social norms).

Motivation can be automatic or reflective and differs to the other key concepts within the COM-B model, based on being a combination of *mental processes* that energise and direct a person towards enacting a given behaviour. Automatic motivation occurs without effortful deliberation (e.g. habits), whilst reflective motivation involves conscious thought processes (e.g. planning and goal setting).

According to the COM-B model, for a person to enact a behaviour they must be more motivated to do so than they are to enact any other behaviour in that moment *and* they must have the capability and opportunity to do so. Greater capability and opportunity tend to elicit greater motivation, whilst an actual or perceived lack of capability and/or opportunity can negatively impact motivation and create a barrier to behavioural enactment. Behaviour therefore has a reciprocal relationship with capability, opportunity and motivation, with a constant complex interplay happening between constructs.

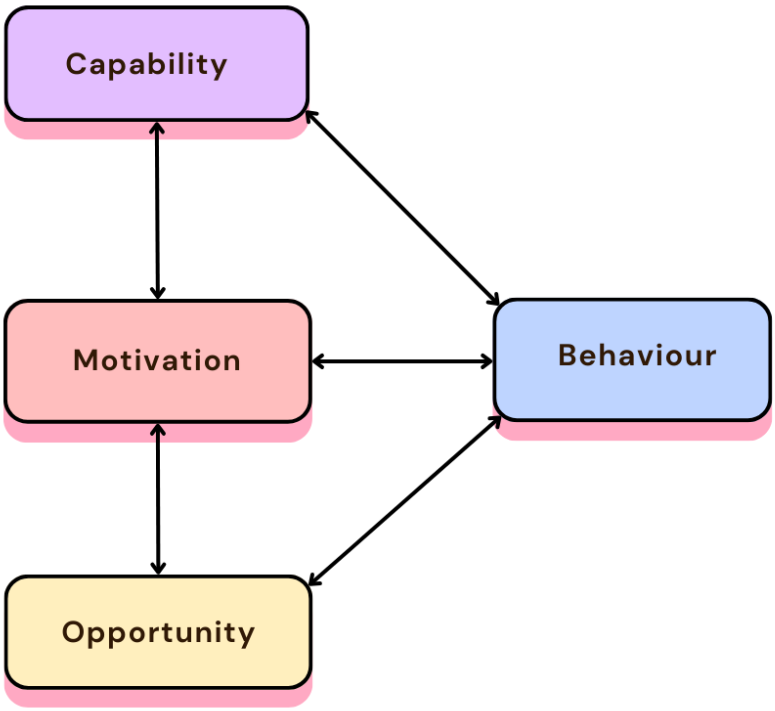


Figure 4: A diagram showing the COM-B model of health-related behaviour

The TDF domains map directly onto the COM-B model, which can be considered a more streamlined iteration of the TDF. Diagrams of the COM-B model's complementary intervention development model, the Behaviour Change Wheel (See Section 2.3.3.), therefore frequently include the TDF domains. Like the TDF,

this theoretical basis provides a blueprint that enables categorisation of barriers and facilitators to health-related behaviour. Cowdell and Dyson (2019) identified that 7/10 studies included in their narrative synthesis exploring how the TDF was applied during the development of health behaviour interventions, used the COM-B model as the basis for understanding determinants of health-related behaviour. It is therefore well documented that the two models complement one another. The COM-B model addresses a key limitation of the TDF, by accounting for and considering the relationships between constructs. Meanwhile, the detail provided by the TDF domains and constructs supplement the somewhat minimalist design of the COM-B model, ensuring that the nuances of personal and shared experiences of behavioural determinants are not lost during categorisation. The COM-B model further enhances the TDF, as it was specifically designed to enable categorisation of barriers and facilitators in a way that provides a practically useful starting point for the design and implementation of behaviour change interventions. This is because the COM-B acts as the 'hub' of the Behaviour Change Wheel (BCW; Michie et al., 2014; See Section 2.3.3.): An empirically grounded framework for designing behaviour change interventions.

2.3.3. The Behaviour Change Wheel (Michie et al., 2011; 2014): The intervention development model

The components of the COM-B model act as the hub of the BCW (See Figure 5), where they are aligned with intervention functions and policy categories, which are in turn aligned with evidence-based BCTs. The BCW's step-by-step approach to intervention design (See Figure 6) states that any intervention must begin by defining and understanding the problem in behavioural terms. Thus, intervention development cannot begin until comprehensive COM-B analysis of the target population has been undertaken. Findings should next be mapped onto the COM-B model and the TDF to allow in-depth understanding. This categorisation of barriers and facilitators alongside the mapping of findings on to the COM-B model and the TDF is a type of framework analysis (e.g. Furber, 2010). Once framework analysis has occurred, appropriate intervention functions and policy categories can be identified, which address the relevant barriers and facilitators to that behaviour, for

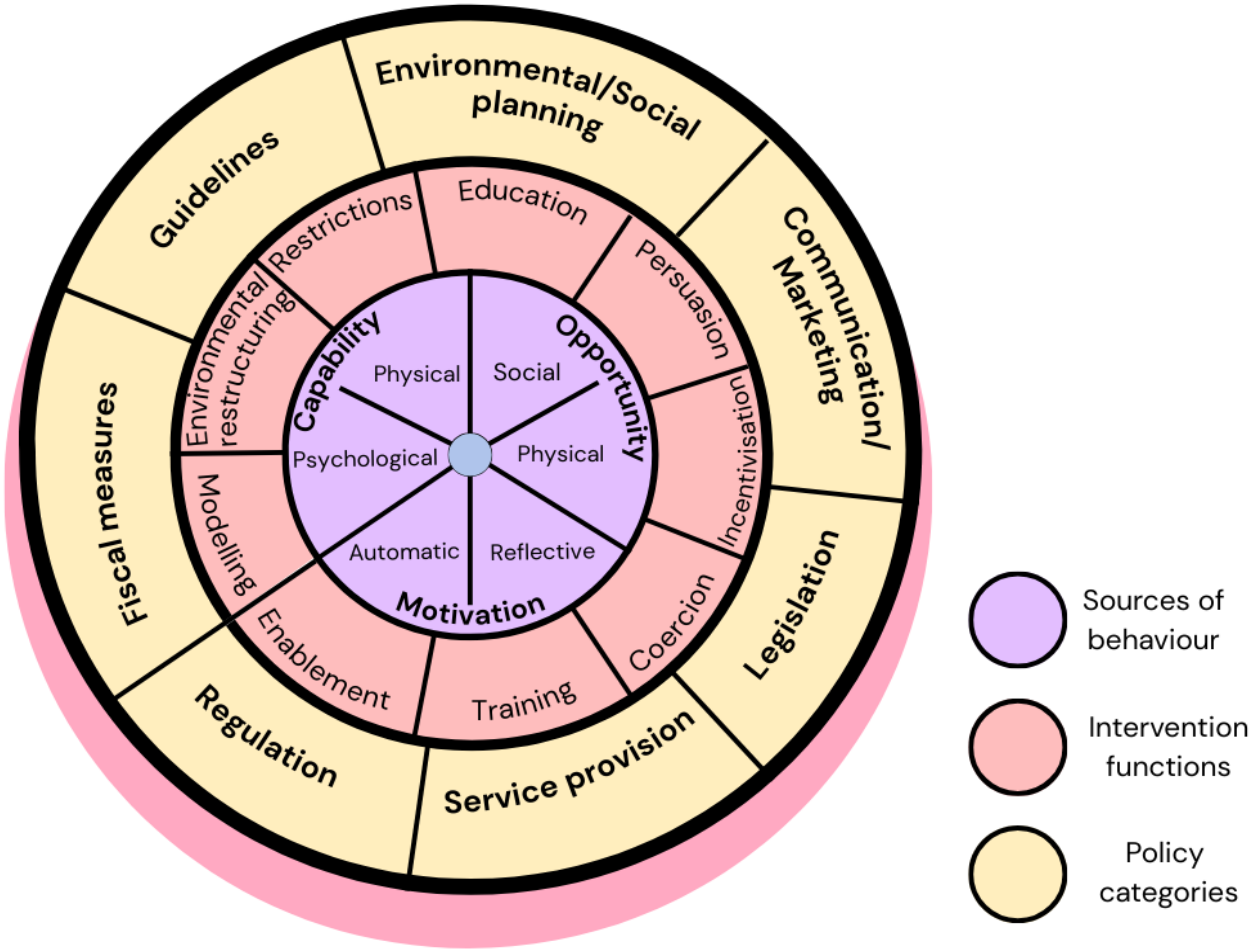


Figure 5: A diagram showing the Behaviour Change Wheel

that population, in that context. There are 9 intervention functions within the BCW: Education, persuasion, incentivisation, coercion, training, restriction, environmental restructuring, modelling and enablement.

Each is a broad descriptor for how an intervention may change behaviour. There are seven policy categories (e.g. communication/marketing and legislation) that represent decisions authorities might make to support behaviour change interventions, each is aligned with the intervention functions it might satisfy. Having identified relevant and appropriate intervention functions and policy categories, evidence-based BCTs that best serve the desired intervention functions under the relevant policy categories can be selected. The BCW therefore provides a well-documented, highly implemented, prescriptive and systematic approach to intervention development, which is highly applicable for this PhD aiming to promote women's PA.

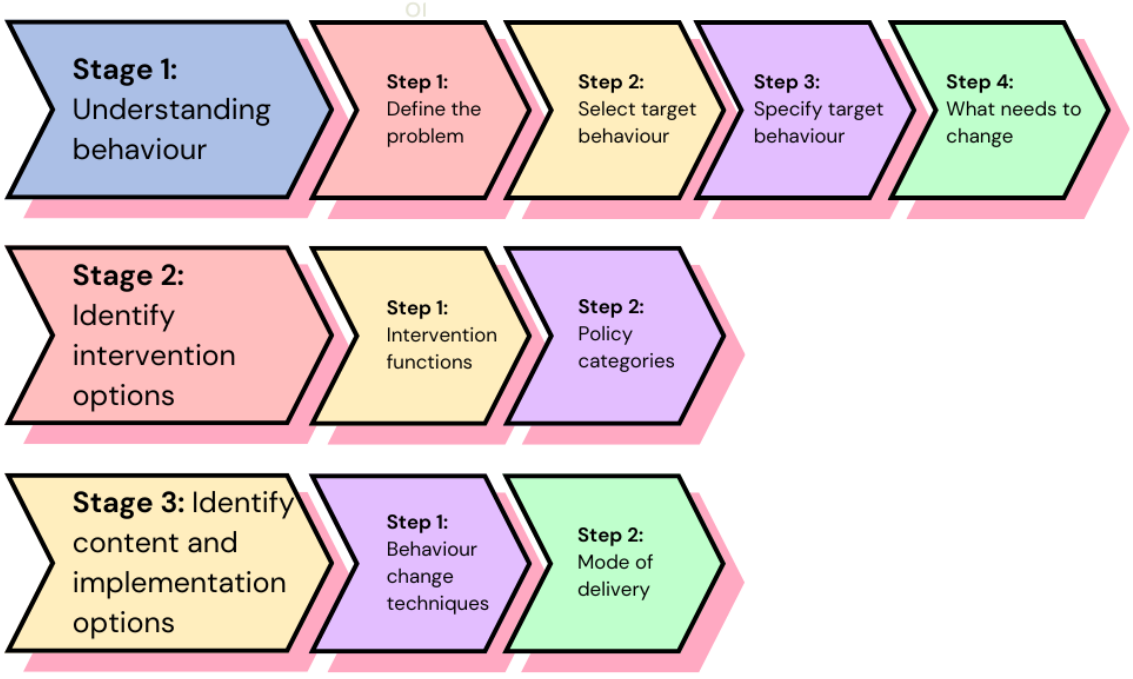


Figure 6: A diagram showing the step-by-step approach to intervention design, according to the Behaviour Change Wheel

2.3.4. The Taxonomy of Behaviour Change Techniques: The evidence-based strategies for achieving behaviour change

Abraham and Michie (2008) developed a theory-linked taxonomy of behaviour change techniques (BCTs) that are generalisable and applicable across all health-

related behaviour domains. Twenty-six techniques were identified across three systematic reviews. This taxonomy was developed into an extensive hierarchically organised taxonomy of 93 distinct BCTs, which are grouped into 16 clusters (BCTTv1; Michie et al., 2005). Examples of clusters included 'regulation', 'scheduled consequences', 'shaping knowledge', 'social support' and 'feedback and monitoring'. BCTs under the cluster of feedback and monitoring include feedback on behaviour, biofeedback, self-monitoring of the outcome of the behaviour and self-monitoring of the behaviour itself. The taxonomy allows for selection of empirically grounded BCTs that are relevant in terms of policy categories, intervention functions and behavioural determinants according to the COM-B analysis. Systematic review and meta-analysis revealed that internet-based health-related interventions were more effective when they included more BCTs (Webb et al., 2010). A systematic scoping review of childhood obesity interventions that apply the taxonomy of BCTs identified similar limitations, not with the taxonomy itself, but due to variable reporting of included BCTs (Chakraborty et al., 2022). The Taxonomy of BCTs provides a further tool for ensuring interventions are evidence-based. A systematic review and meta-analysis exploring PA interventions specifically however found PA interventions to be effective at changing and maintaining PA behaviour (Howlett et al., 2019[1]), with further analysis of the specific BCTs involved finding intervention effectiveness to be associated with the following specific BCTs: Biofeedback, demonstration of the behaviour, behaviour practice/rehearsal and graded tasks. Maintenance of PA at six or more months follow-up was associated with action planning, instruction on how to perform the behaviour, prompts/cues, behaviour practice/rehearsal, graded tasks and self-reward. Meta-analysis found PA and self-efficacy to be significantly higher when the specific BCTs of action planning, providing instruction and reinforcing effort towards behaviour were included in the intervention (Williams & French, 2011). Conversely, relapse prevention and setting graded tasks were associated with significantly lower levels of self-efficacy and PA. One systematic review found BCTs to moderate the effectiveness of behavioural interventions aiming to increase PA in people with Type 2 diabetes (Avery et al., 2012). Improved PA intervention effectiveness for this group was associated with combining BCTs with appropriate theory, including more BCTs and the specific BCTs of: prompting generalisation of

the target behaviour, use of follow-up prompts, prompting review of behavioural goals, providing information on where and when to perform PA, planning social support/social change, behavioural goal setting, time management, prompting focus on past success, barrier identification/problem solving and providing information on the consequences specific to the individual. Thus, despite mixed messages around which specific BCTs best elicit change in respect of PA, the Taxonomy of BCTs provides a meaningful and appropriate evidence-based toolkit from which features of PA interventions can be drawn [2].

2.3.5. Application of these complementary tools

The COM-B model was designed to be applicable and robust across diverse places, populations and behaviours. It has been found useful in contexts ranging from smoking cessation in pregnant Australian women (Gould et al., 2017), to mobilisation of vulnerable elders in Ontario (Moore et al., 2014). The COM-B model and the BCW have been found useful in varying health behaviour domains (e.g. Jackson et al., 2014; Coulson et al., 2016; Staniford & Schmidtke, 2020), so a growing body of literature uses the BCW during the design and development of PA interventions (e.g. Nyenhuis et al., 2017; Murtagh et al., 2018; Moore et al., 2019).

Howlett et al. found the components of the COM-B model to strongly predict moderate-vigorous PA (2019[2]) and sedentary behaviour (2020) for healthy adults. Similarly, Spence et al. (2020) surveyed over 1,500 UK adults and found the COM-B components to accurately predict shifts in PA during Covid-19. The TDF has been found useful for understanding barriers and facilitators to PA behaviour, alongside the COM-B model (Ndupu et al., 2023). In this study, all 14 TDF domains were found to promote and/or inhibit PA, with the six most positively impactful domains being environmental context and resources, social influences, knowledge, intentions, social/professional role/identity and beliefs about capabilities. Again, the COM-B model and the TDF were used together in a systematic review exploring the PA of university students (Brown et al., 2024) and a qualitative exploration of the PA of overweight and obese pregnant women (Flannery et al., 2018). A mixed methods

[2] Since this work has been undertaken, a new Behaviour Change Intervention Ontology (BCIO) has been published (See https://www.bciontology.org/). This ontology was not however utilised during the undertaking of this PhD research, because the work pre-dates its publication.

systematic review of barriers and facilitators to exercise adherence in community dwelling older adults integrated the TDF, the COM-B model and the taxonomy of BCTs to enhance understanding and provide practical recommendations for PA maintenance in this population (Yang et al., 2024). Together, the TDF, the COM-B model, the BCW and the taxonomy of BCTs can therefore be considered relevant and appropriate for understanding women's PA behaviour and for empirically grounded PA intervention design.

2.3.6. Summary of contemporary behaviour change theory, models and frameworks

The TDF provides an evidence-based tool for describing determinants of health-related behaviour. The COM-B model is useful for streamlining findings, considering the relationship between different constructs that impact behaviour and because it acts as the hub of the BCW. The BCW provides a step-by-step empirically grounded approach to intervention design, which is supported by the taxonomy of BCTs. The stages of the research process throughout this PhD have followed the stages of the BCW approach to intervention design and so the BCW therefore acts as the golden thread that weaves this PhD thesis together, supported by the COM-B model and the TDF.

2.4. Intervention design and development

2.4.1. Co-design

This pilot PA intervention was developed using co-design, which falls under the umbrella term of co-creation, as outlined previously (Section 1.4.5.). This approach involves end-users during intervention design and development, but not delivery.

Co-design has been used to develop PA interventions with diverse populations (e.g. Brown et al., 2020; Marini et al., 2021; Ramage et al., 2020). In an evaluation of two different community-based PA interventions – one with children and one with older adults - participatory research approaches that include target demographic groups during development were identified as one of three key elements for PA intervention success (Haggis et al., 2013), because they allow for consideration of political context, unlike traditional research models. Providing genuine opportunities for participation, to overcome the common issue of superficial engagement from key

stakeholders and stakeholders that do not properly represent the target population was highlighted as key.

Longworth et al., (2024) conducted a review in which 30 different frameworks for the development, implementation and evaluation of co-creation research and interventions were identified, classified and analysed. Primary recommendations from this review suggest that co-creation should consider implementation at the early stage of intervention planning, adopt whole systems thinking, involve the formation of partnership relationships between stakeholders, plan for iterative and cyclical evaluation, and focus on evaluating the experience of co-creators. Sendra (2024) proposes a charter for the ethical co-design of interventions, based on an expansion of the Principles of Fair Consultation. The charter states that co-design should:

1) Involve collective thinking
2) Design how partnerships between key stakeholders are created
3) Investigate and learn from existing social structures
4) Address power imbalances
5) Provide skills to involve communities in decision-making
6) Use inclusive events and language
7) Result in collective benefits for the communities affected
8) Be transparent and have clarity in respect of what the objectives of the co-design process are, which spaces the process is looking at, how the co-created proposals will be used and what can be expected from participation in the co-design process
9) Acknowledge the time and resources available and consider what will need to be allocated to the co-design process at the preliminary project planning stage
10) Implement a process that starts before any decision is made and that goes beyond generating proposals.

Thus, despite the absence of an agreed definition of co-design, there is consensus regarding some of its key principles, namely the importance of: involving key stakeholders, emphasising the views of end-users, acknowledging and addressing

power balances/imbalances and ensuring communities benefit from engagement and participation.

2.4.2. Double Diamond: A framework for collaborative design

The Design Council's evolved Double Diamond (Design Council, 2005; See Figure 7) is a framework for design and innovation across an infinite number of settings that rests on four core principles: putting people first, communicating visually and inclusively, collaboration/co-creation and iteration. This four-stage, iterative framework states that the design process should involve discovery, definition, development and delivery. There is sometimes an additional 'evolve' stage, which is analogous to repeating the 4-stage process. This visually descriptive framework is applicable in a range of contexts and has been successfully implemented across many industries ranging from tech development (Vuong, 2022) to environmental sustainability (Clune & Lockrey, 2014). The double diamond has been implemented in the design of interventions aiming to target various health-related issues and behaviours (e.g. Hardy et al., 2018; Elbers et al., 2021; Rodriguez et al., 2021), including PA (e.g. Daly-Smith, 2020). Wang et al. (2023) described the Double Diamond as comprehensive, systematic and useful when developing a new framework for guiding the design of solutions for future problems. Johnson et al. (2024) found it useful during healthcare intervention co-design for intensive care units, praising its utility for enhancing the structure and clarity of the co-design process and enabling even power distribution between stakeholders by affording all co-designers the authority to give constructive feedback. Doctoral thesis from Liu (2019) found inclusive design approaches for healthcare services that involve service users, to improve access, maximise understanding of service provision and improve services.

The stages of the Double Diamond can be considered analogous to the stages of intervention design and delivery within the BCW. 'Discover' and 'Define' within the Double Diamond align with 'Understanding the Behaviour' within the BCW, 'Develop' within the double Diamond aligns with 'Identifying intervention options' and 'Identifying content and implementation' following 'Delivery' or 'Implementation' of the intervention and both frameworks emphasise the importance of 'Evolution' and/or 'Evaluation'. These complementary frameworks can therefore be practically implemented simultaneously, to facilitate co-design of health-related interventions and services that are better accessed, understood and have better outcomes, including perspectives from multiple stakeholders.

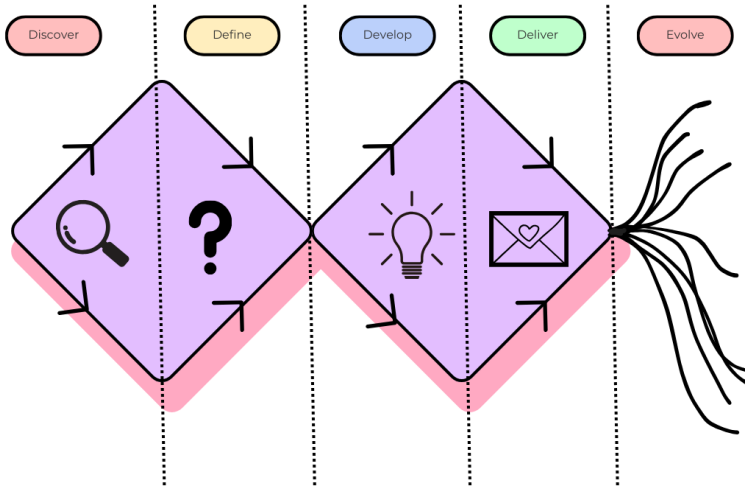


Figure 7: The Design Council's Double Diamond framework for collaborative design

2.4.3. APEASE

Interventions designed using the BCW should be assessed and understood in relation to the APEASE criteria as outlined by Michie and colleagues in their BCW guide to intervention design (Michie et al., 2014). APEASE stands for Acceptability, Practicability, Effectiveness, Affordability, Spillover effects and Equity. Criteria can be applied to the intervention as a whole and/or to individual features of the intervention. Assessing interventions against the APEASE criteria prospectively during their design, not just retrospectively during evaluation, is key for developing appropriate, acceptable, feasible and efficacious pilot interventions that are affordable, equitable and likely to be better aligned with the final intervention.

2.4.4. Summary of intervention design and development

Co-design provides an equitable approach to intervention development that promotes participation and centres the needs of end-users. The Double Diamond offers a well-used, appropriate and prescriptive framework for general collaborative design. APEASE allows prospective evaluation of intervention components, to improve the quality of pilot intervention design and reduce the likelihood of large redevelopment being necessary before any full-scale intervention.

2.5. Intervention implementation

2.5.1. The National Institute for Health Research and the Medical Research Council Framework for Complex Interventions: The Behaviour change intervention guidance

In 2000, the National Institute for Health Research (NIHR) and the Medical Research Council (MRC) first published a framework for the development and evaluation of complex interventions, which has been regularly updated (e.g. Skivington et al., 2024). The NIHR framework describes four phases of complex research: intervention identification and development, feasibility, evaluation and implementation. An intervention may be considered complex due to the number of components involved, the range of behaviours targeted, the expertise and skills required for delivery or receipt of the intervention, the number of groups/contexts or levels being addressed and/or how flexible/rigid an intervention or its components are. This framework can assist researchers to work with key stakeholders, identify key questions and design and conduct research with diverse perspectives and appropriate methodologies. It addresses the intervention design, the conditions needed to facilitate change and the resources needed for real-world implementation. It aims to overcome issues associated with assessing only intervention effectiveness, aspiring instead to deliver solutions that are implementable, cost-effective, transferable and scalable in real-world settings.

2.5.2. Treatment Fidelity Framework

Treatment fidelity refers to the extent to which an intervention is delivered as planned. The Treatment Fidelity Framework (Bellg et al., 2004) was developed to assess the reliability and validity of behavioural interventions and provide

recommendations for ways to incorporate techniques and best practices for treatment fidelity in terms of study design, provider training, treatment delivery, treatment receipt and treatment skill enactment. Features that have the greatest relevance during implementation are treatment receipt, behavioural enactment and behavioural adherence. According to Borrelli (2011):

- *Treatment receipt* refers to whether the participant understands the 'treatment' (i.e. the features of the intervention) and has the knowledge of, and ability to use, the skills or recommendations made. Here, this refers to the participants' understanding of how to complete the activities involved in the programme of PA and how to utilise the tools and skills learnt during the educational elements of the intervention.

- *Behavioural enactment* relates to whether the participant is enacting the behaviour correctly and at the appropriate time as instructed throughout the course of the intervention, rather than only measuring the behaviour at the end of the programme. Here, this involves participants attending the intervention and engaging with the process.

- *Behavioural adherence* differs slightly from enactment and should not be confused with efficacy. Here, this entails participants engaging with the intervention in their own time.

A systematic review revealed some issues with the methodological processes used to assess treatment fidelity of PA interventions for adults (Lambert et al., 2017), primarily because conceptualisation of the features of fidelity lacks clarity. However, whilst no concrete, valid or reliable measures of treatment fidelity are offered to remedy this, Sanetti et al. (2021) highlight the importance of delivering interventions that are true to their design, to ensure that findings can be properly interpreted.

2.5.3. Summary of intervention implementation

This pilot intervention has been implemented following the NIHR and MRC's Framework for Complex Interventions to ensure the intervention is truly implementable, cost-effective, transferable and scalable in real-world settings. Treatment fidelity has been considered during implementation, to ensure the intervention is delivered as planned.

2.6. Intervention evaluation

2.6.1. Framework analysis

Framework analysis (FA) involves mapping codes onto pre-existing constructs and establishing themes that are identified within a framework. Originally developed in the 1980's for use in large-scale policy research (Ritchie & Lewis, 2003), throughout this PhD research women's barriers and facilitators to PA have been subject to FA, using the COM-B model and the TDF as domains. During intervention evaluation, women's barriers and facilitators to participation in the 4-week pilot feasibility PA intervention were similarly subject to FA. When conducting FA, one option is to deductively code to the predetermined components, as this approach enables clear identification of the features that these frameworks encompass. However, gaps in frameworks cannot be identified easily using this approach. Thus, inductive free coding of barriers followed by deductive mapping provides a less biased, but similarly systematic means of gaining a holistic view of women's determinants of programme participation. Gale et al. (2013) explored how FA can be implemented within multi-disciplinary and mixed methods research, including applied health research and patient public involvement work, identifying strengths and limitations of the approach. FA was considered beneficial due to its practicality to implement for quantitatively and qualitatively minded researchers, its ability to both describe and explain phenomena, its applicability to a broad range of epistemological and theoretical approaches, its flexibility in respect of which theoretical frameworks it can be applied to and because of the clear audit trail it creates. Drawbacks included a tendency for quantitatively minded researchers to inappropriately quantify qualitative data when using this approach and the time and resource intensive nature of the analytical process. When facilitated by an experienced qualitative researcher however, FA was considered an excellent tool for analysing interview

data. FA is compatible with the TDF and the COM-B model, so was considered appropriate for use in the evidence-based evaluation of women's barriers and facilitators to PA.

2.6.2. Feasibility

It is generally considered good practice to assess the feasibility of implementing an intervention in a local community context, although historically there has been a dearth of guidelines and tools for achieving this. Gadke and colleagues (2021) describe intervention feasibility as consisting of ten possible components which may need to be assessed:

1. Recruitment capability
2. Data collection procedures
3. Design procedures
4. Social validity
5. Practicality
6. Integration into existing systems
7. Adaptability
8. Implementation
9. Effectiveness
10. Generalizability

Evidence suggests that feasibility studies result in better quality future RCTs and may help to identify potential refinements and uncertainties, whilst testing preliminary intervention effects (Eldridge et al., 2016). Aschbrenner et al. (2022) highlighted the importance of pilot feasibility studies that use mixed methodological approaches in the development of comprehensive and nuanced understanding around the feasibility of implementing full-scale interventions in local community contexts. In their overview of reviews, which included more than 250 publications, Klaic and colleagues (2022) identified feasibility as one factor that determined the scalability and sustainability of health interventions, alongside treatment fidelity and acceptability. The feasibility of running any intervention at full-scale is therefore an important consideration during piloting. Andreopoulou et al. (2024) reviewed intervention studies aiming to promote PA for people with

cerebral palsy and found that although studies that explicitly reported on feasibility were sparse, those that did highlighted important themes that were not well captured by other research in the area, (e.g. the importance of the social aspect of group exercise, the perceived benefits of fitness, adverse effects of intervention participation and ways to manage expectations). Despite the lack of any review that directly compares intervention effectiveness based on the inclusion and consideration of feasibility, pilot intervention feasibility remains an important consideration for the development of interventions that can sustainably run at full-scale. Without any more empirically grounded frameworks, Gadke et al.'s (2021) ten components are considered appropriate for assessing intervention feasibility and its component parts.

2.6.3. The Theoretical Framework of Acceptability

There is consensus that health-related interventions must be acceptable to service users during design, evaluation and implementation, yet defining acceptability in the context of health-related interventions has proven difficult. To overcome issues with variation in the definition, operationalisation, measurement and evaluation of acceptability within research, the Theoretical Framework of Acceptability (TFA) for Healthcare Interventions was developed based on an overview of 43 systematic reviews (Sekhon et al., 2017). Measures of acceptability included within the literature were highly variable and included monitoring behaviour, affect, cognition and/or some combination of these. The TFA aims to provide an evidence-based means of understanding how acceptable an intervention is, from the perspective of both participants and deliverers. Acceptability is defined as "a multi-faceted construct that reflects the extent to which people delivering or receiving a healthcare intervention consider it to be appropriate, based on anticipated or experienced cognitive and emotional responses to the intervention" (Sekhon et al., 2017, p. 1) and consists of seven components (see Figure 8). Each component can have relevance before (prospective acceptability), during (concurrent acceptability) or after (retrospective acceptability) the intervention.

Without an agreed definition of any construct, the development of valid measures can be difficult (Bollen, 1989), so the body of literature exploring acceptability prior to the development of the TFA lacked robustness. The TFA has been used to assess the acceptability of PA interventions across varying activity types and populations (e.g. Pavlova et al., 2020; Hoffman et al., 2019; Gerards et al., 2022). This body of research supports the applicability of this framework in the context of behaviour change interventions aiming to target PA. However, Paynter et al. (2023) proposed the inclusion of a new label ('perceived safety and risk') and the redefining of a previous label (changing 'opportunity costs' to 'opportunity costs and gains') to enhance the model. Thus, although the TFA may benefit from some refinement, it provides a well-used, empirically grounded starting point for assessing the acceptability of health-related interventions.

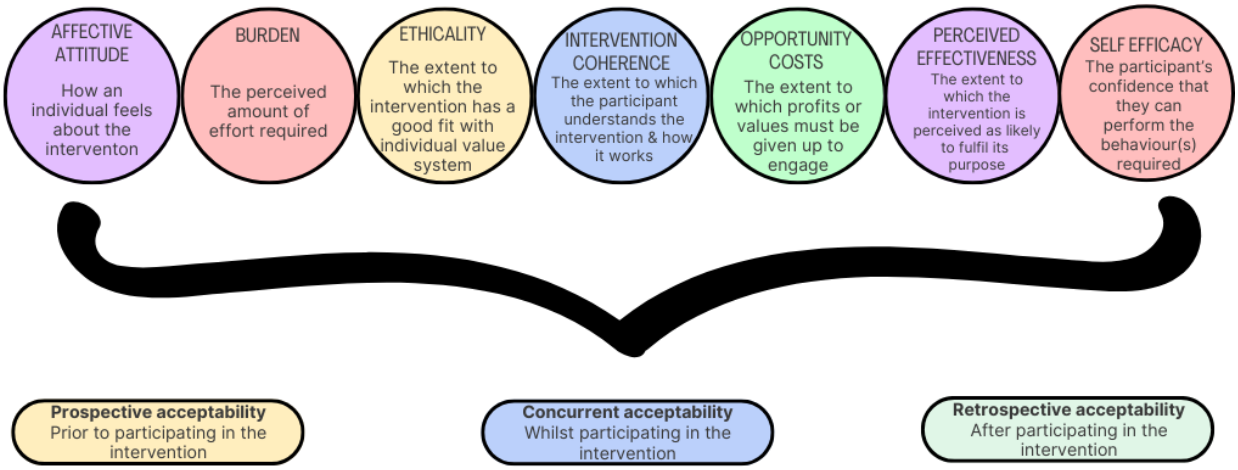


Figure 8: The Theoretical Framework of Acceptability

2.6.4. Descriptive and inferential statistics

Quantitative data was collected, described and tentatively analysed to indicate likely intervention efficacy and outcomes. Data was collected from participants during sign-up, periodically throughout the 4-week pilot intervention, at the end of the intervention and four-weeks post-intervention. Descriptive statistics were provided for three features of treatment fidelity: treatment receipt, behavioural enactment and behavioural adherence. Whilst Leon et al. (2011) state that pilot interventions cannot provide information about effect sizes due to the small sample size inherent in their design, De Winter (2013) found no principal issues with using

a t-test with participant groups of between two and five people, particularly where large effect sizes are observed. Thus, inferential analyses were implemented to support conclusions regarding the fitness and wellbeing outcomes from intervention participation. These should however be interpreted with caution.

2.6.5. Summary of intervention evaluation methodology

The 4-week pilot PA intervention for women was evaluated in various ways, based on several constructs and frameworks. Women's barriers and facilitators to pilot intervention participation were subject to FA using the TDF and the COM-B domains. Intervention treatment fidelity was evaluated using descriptive statistics, intervention efficacy was tentatively explored using inferential statistics, the feasibility of implementing the intervention in a local community context was evaluated using Gadke's ten components and intervention acceptability to the target demographic was assessed using the TFA.

2.7. Intervention reporting

2.7.1. Template for Intervention Description and Replication (TIDieR)

The Template for Intervention Description and Replication (TIDieR; Hoffman et al., 2014) checklist and guide was developed to improve the completeness of reporting and consequentially, to ensure that interventions can be replicated. This guide consists of 12-items, each of which is accompanied by an explanation, some elaboration and well-reported examples. The checklist requires researchers to be clear about a brief name for the intervention, why the intervention is being implemented, what materials are being used, what procedure(s) is/are being implemented, who is providing the intervention, how well the intervention was planned and how well the intervention was implemented in reality. In one review, placebo and sham-controlled trials reported only between five and eight of the 12 TIDieR checklist items on average, with no improvement observed in the quality of reporting following the checklist's publication (Palmer et al., 2021). These authors proposed that the seemingly sparse use of the checklist may be due to the relatively limited dissemination of the TIDieR checklist and guide, which was published in just one journal. To contextualise this, similar tools such as the Consolidated Standards of Reporting Trials (CONSORT) statement (e.g. Cuschieri, 2019) and the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA; 2020) were

both published in six medical journals simultaneously. Regardless, Madden et al. (2020) propose that intervention reporting quality might be improved if intervention providers formally adopt the TIDieR checklist and if journals made the TIDieR checklist a requirement for publication of lifestyle interventions. Since its publication there is some evidence of a significant improvement in reporting the number of sessions included in PA interventions and of negligible improvements in the reporting of the schedule, duration and intensity of PA interventions (McCambridge et al., 2021). Thus, despite its somewhat limited use by researchers, the TIDieR checklist – when utilised - appears to support the transparent and replicable reporting of interventions. The 4-week pilot feasibility intervention for women from the East Midlands has therefore been reported using the TIDieR checklist (See Appendix 1).

2.7.2. Summary of intervention reporting

The TIDieR checklist and guide is considered an appropriate evidence-based tool for reporting the 4-week pilot feasibility intervention for women from the East Midlands.

2.8. Intervention attrition

2.8.1. Identifying relevant demographic characteristics

Common characteristics of participants who dropped out of the pilot intervention or who did not engage past the point of sign-up were identified using descriptive statistics (See Section 2.6.4.).

2.8.2. Exit interviews

Exit interviewing has been found useful for "encouraging voice, enhancing alignment and examining process" (Pace & Kisamore, 2017, p. 59). In the context of interventions, follow-up interviews are widely used in intervention research and diverse evidence utilises semi-structured exit interviews to assess acceptability and/or feasibility of health-related interventions. Exit interviews have been used to assess interventions around diverse health-related behaviours in diverse populations (e.g. Musiimenta et al., 2018; Bottorff et al., 2017; Greene et al., 2021). Exit interviewing was therefore considered applicable for exploring experiences of pilot intervention participation, including reasons and remedies for attrition.

2.8. Summary of intervention attrition

A mixed methods approach to understanding intervention attrition was implemented, using descriptive statistics and exit interviewing.

2.9. Methodology summary and conclusion

This PhD thesis has taken a critical realist ontological and epistemological approach to the collaborative design, implementation and evaluation of a 4-week pilot PA intervention for women from the East Midlands. Mixed methods have been implemented across the research process and are considered to complement critical realism.

Throughout this PhD research, the aim has been to combine the most appropriate, well defined and best evidenced elements of the contributing methodologies and approaches, whilst mitigating their limitations. This blended, interdisciplinary and mixed methods approach, that considers complementary models, frameworks and epistemological approaches has enabled the design, implementation, evaluation and reporting of an efficacious, acceptable and feasible, empirically grounded 4-week pilot PA intervention for women from the East Midlands, which might have potential to be redeveloped into a full-scale, longer-term, targeted PA intervention for women.

Chapter 3: Study 1

Women's barriers and facilitators to physical activity in 2016-2020: A systematic qualitative evidence synthesis

3.1. Overview

This chapter describes a systematic evidence synthesis of the qualitative literature exploring healthy women's barriers and facilitators to PA in the English language. Articles published between January 2016 and March 2020 were included and findings were mapped onto the COM-B model and the TDF. The introduction of this chapter includes discussion of some previously identified barriers and facilitators to PA for women, to build on the information contained within Chapter 1 (Sections 1.3.2.-1.3.4.). The identified knowledge gaps that are relevant to this piece of work (see Section 1.5.) are recapped, the relevance of mapping findings onto the COM-B model and the TDF is explained and the determined timeframe for article retrieval is justified. The methods are described, the full range of women's determinants to PA are included in a table and the most salient, pertinent and/or nuanced findings are discussed in detail. Findings have been interpreted and their relationship with previous literature considered. The strengths and limitations, future direction for research and the real-world implications of findings are discussed, before the chapter is summarised and concluded.

This phase of research can be considered the first phase of 'understanding' according to the BCW (Michie et al., 2014) and the first phase of 'discovery' according to the Double Diamond (Design Council, 2005).

3.2. Introduction

As outlined in the introduction chapter (Section 1.3.2), women report experiencing more barriers to PA than men. Women's traditional gender roles and expectations provide a highly pervasive barrier to PA, particularly for women from certain cultures including Arab women (El Masri et al., 2020), African American women and Latina women (Bantham et al., 2021; See Section 1.3.2.). Women's PA appears to be

heavily motivated by a desire to change appearance to conform to Western beauty ideals, usually by losing weight and becoming thinner (Donnelly et al., 2018; Hoare, 2017; van Uffelen et al., 2017). Across the literature, women frequently describe how social influences facilitate PA (Peng et al., 2023; Shah et al., 2020; van Uffelen et al., 2017). Chapter 1 also highlighted the relative paucity of research exploring the PA behaviour of healthy women outside the context of pregnancy (Section 1.5.). This is problematic as PA interventions are likely to reduce the economic burden of inactivity most effectively when used to prevent, rather than treat, ill health (Section 1.4.2) and because women are generally less active than men across the planet and the lifespan (Section 1.3.1.).

In 2020, a narrative review aiming to summarise women's barriers and facilitators to regular PA (Alyafei & Albaker, 2020) identified three key themes: 1) Physical body related factors, which are not dissimilar to physical capability within the COM-B model, 2) Psychosocial factors, which align with physical and social opportunity and 3) Physical exercise environmental factors, which could be considered to further elaborate on physical opportunity. This review fails to consider women's motivations for PA engagement in detail, so COM-B consideration might have allowed for a more comprehensive view of women's PA determinants. Peng et al., (2023) completed a systematic review and thematic synthesis of the qualitative evidence published between 2000 and 2022, that summarised barriers and facilitators to PA for young women aged 18-40. This review highlighted an issue within the literature whereby existing reviews aiming to summarise the evidence on women's barriers and facilitators to PA almost exclusively included quantitative studies and implemented quantitative methods of analyses. A further issue was identified, as results in this field were frequently reported and interpreted without clarification of important contextual considerations. This produced limited understanding of the interrelationship between different determinants of PA, making the development of practical recommendations for PA promotion difficult. To address this limitation and better contextualise findings, Peng and colleagues mapped identified determinants of PA onto the Social Ecological Model (Sallis & Owen, 1998). The use of an empirically grounded theoretical framework that considers the social and cultural context surrounding health behaviour can be

considered a strength of this work, but their exclusion of women outside the ages of 18-40 years means that findings have limited generalisability and transferability. Currently therefore, a systematic analysis of the qualitative evidence on the barriers and facilitators to PA for women outside of this age range is absent from the literature and would be useful.

The qualitative research exploring women's barriers and facilitators to PA is yet to collectively undergo comprehensive COM-B and TDF analysis. Understanding PA and identifying PA determinants is the first step towards evidence-based PA intervention design, when following the BCW approach. Aligned with this process, the COM-B model and the TDF are appropriate and complementary theoretical frameworks upon which a holistic understanding of barriers and facilitators can be built, with maximum utility for intervention design. Qualitative research is considered to have advanced the field of health psychology, with implications for programme development, policy change and the illumination of health disparities and associated injustices (Lyons, 2011). Synthesising the qualitative literature exploring barriers and facilitators to PA for women aged 18-65, then mapping findings to the COM-B model and the TDF should therefore enable an in-depth, yet generalisable and transferable understanding of women's barriers and facilitators to PA throughout the lifespan. This approach aligns with the overall methodological approach of this thesis (See Chapter 2) and provides an empirical basis upon which PA interventions for women can be built, using the BCW.

In 2016, Sport England developed their 5-year Sport Nation 'Towards an Active Nation' strategy, which aimed to tackle inactivity, placing physical wellbeing, mental wellbeing, individual development, social/community development and economic development at its heart. In particular, the strategy highlighted a need to focus on increasing PA in the most inactive groups, including women. The strategy included a commitment to financially invest in tackling physical inactivity, with specific funding allocated to women's PA promotion in England. In 2020, the Covid-19 pandemic was declared a national and international emergency. Nationwide lockdowns were mandated in the UK periodically between March 2020 and July 2021, dramatically changing the social, economic and political climate. Many of

these changes were temporary, but evidence suggests that the impact of Covid-19 on some factors has endured. Interestingly, a longitudinal study exploring weight management behaviours found that in Italy, changes to diet behaviour that happened during the time of Covid restriction were still observable at follow-up but that the reduction in PA levels observed during this time were not (Bifolco et al., 2024). This suggests that the motivations for these health-related behaviours and the mechanisms that facilitate or inhibit each are different, so environmental context may be more impactful for PA than for other health-related behaviours such as dietary practices. One qualitative study mapped barriers and facilitators to PA during times of Covid-19 onto the COM-B model, (Roche et al., 2022), identifying key determinants of PA to include the direct impact of Covid-19 restrictions on PA, specific restrictions around exercise usually related to team sports and group exercise, government guidance to work from home, fear of contracting Covid-19 and level of engagement with home exercise that was necessitated by lockdown restrictions. Women's PA may have been disproportionately affected by Covid compared to men's. Ripley-Gonzales et al. (2023) found women's aerobic fitness to have declined almost twice as much as men's following Covid, with significant reductions in explosive fitness and upper body strength observed in women only. Covid-19 was therefore undoubtedly impactful for women's PA.

This chapter will consider qualitative evidence that explores women's barriers and facilitators to PA, which was published after the introduction of Sport England's 'Towards an Active Nation' strategy 2016-2021 and before the first Covid-19 lockdown. The subsequent chapter (Chapter 4) will assess research that has been published since the pandemic. Evidence has been systematically explored and synthesised, with findings mapped onto the COM-B model and the TDF.

3.3. Methods

This synthesis was prospectively registered on PROSPERO to promote transparency and reduce bias (Booth et al., 2012; See full registration in Appendix 2). The ENTREQ statement for enhancing transparency in reporting the synthesis of qualitative research (Tong et al., 2012) has been adhered to. The ENTREQ uses a 21 item checklist grouped into five domains 1) Introduction, 2) Methods and

methodology, 3) Literature search and selection, 4) Appraisal and 5) Synthesis of findings.

3.3.1. Eligibility criteria

Studies qualitatively exploring women's perceptions of barriers and facilitators to PA, were included for synthesis. Table 2 outlines eligibility criteria and justifications.

Table 2

A table showing inclusion and exclusion criteria with justifications for criteria

Inclusion criteria	Justification for criteria
Peer-reviewed	Peer-review improves article quality (Ware, 2008)
Qualitative research (including mixed methods studies with distinct, explicit and substantial inclusion of qualitative methodology)	To fill an area of relative unmet need in terms of understanding barriers and facilitators to PA for women from a qualitative perspective and to inform future research & intervention design
Published 2016-2020	Research published after the release of Sport Nation's Towards an Active Nation Strategy for 2016-2021 and before the first Covid-19 lockdown
English language	To minimise loss of meaning through translation (Van Nes et al., 2010) and to enable the English-speaking researcher to undertake this synthesis
High methodological quality (as assessed by CASP; Singh, 2013)	Minimises risk of researcher bias influencing synthesis results and an easy tool for early career researchers (Singh, 2013)
Female participants only	To directly answer research question without ambiguity around gender specifics of barriers and facilitators
All participants aged 18-65	Children and older adults likely to experience different and unique barriers to general population
Must explore barriers/facilitators to PA	To achieve research aims.
Exclusion criteria	**Justification for criteria**
Quantitative analyses conducted on qualitative data	To ensure that papers included a rich amount of data for analysis, with some context
Reviews &/or syntheses	To minimise researcher bias that might occur at each level of analysis and prevent any one paper from being represented multiple times if included in multiple reviews
Grey literature & conference abstracts	To ensure all papers are peer-reviewed
Participants recruited based on having a health condition	Different conditions will have different specific barriers and facilitators to PA and findings from this synthesis aim to have maximum transferability.
Participants recruited based on being an elite athlete	Elite athletes are not representative of the general population, particularly not in respect of PA
Participants recruited based on being >/<12 months pre/post-partum or pregnant	Barriers and facilitators to PA temporarily change when pre/post-partum or pregnant
Papers that do not fully or directly answer the research aims or which don't distinguish between PA and other behaviours	To ensure that research aims are directly and appropriately achieved

3.3.2. Search strategy

A comprehensive, pre-planned single line search strategy aiming to retrieve all relevant studies was devised in Medline, in line with Bramer et al.'s (2018) systematic approach. A detailed, step-by-step documentation of this development process can be found in Appendix 3.

Seven databases were searched: Medline, CINAHL, SPORTDiscus, Sociological abstracts, Applied Social Sciences Index and Abstracts, PsycARTICLES and PsycINFO.

The original search strategy was appropriate for use in Medline, CINAHL and SPORTDiscus, which are hosted by EBSCO. This was then translated into syntax appropriate for databases hosted by Proquest. The complete single line search strategy with syntax appropriate for databases hosted by EBSCO and Proquest can be seen in Appendices 4 and 5 respectively.

3.3.4. Study selection and screening

Following removal of 1,258 duplicates, the Lead Author reviewed titles and abstracts of 33, 831 unique articles retrieved through searching. If the Lead Author was unsure whether to include an article at this stage, it remained in the pool for full text screening (See Prisma flow chart in Figure 9 for more details).

During full text screening, studies that failed to meet eligibility criteria were excluded. To ensure methodological rigour in study selection, full text screening was conducted on 20% of texts by an 'Educated Friend' (JKL). Discrepancies were discussed with the Lead Author's Supervisory Team (MA & LK) and were included/excluded by consensus. Reasons for exclusion can be seen briefly in Figure 9 and in greater detail in Table 3.

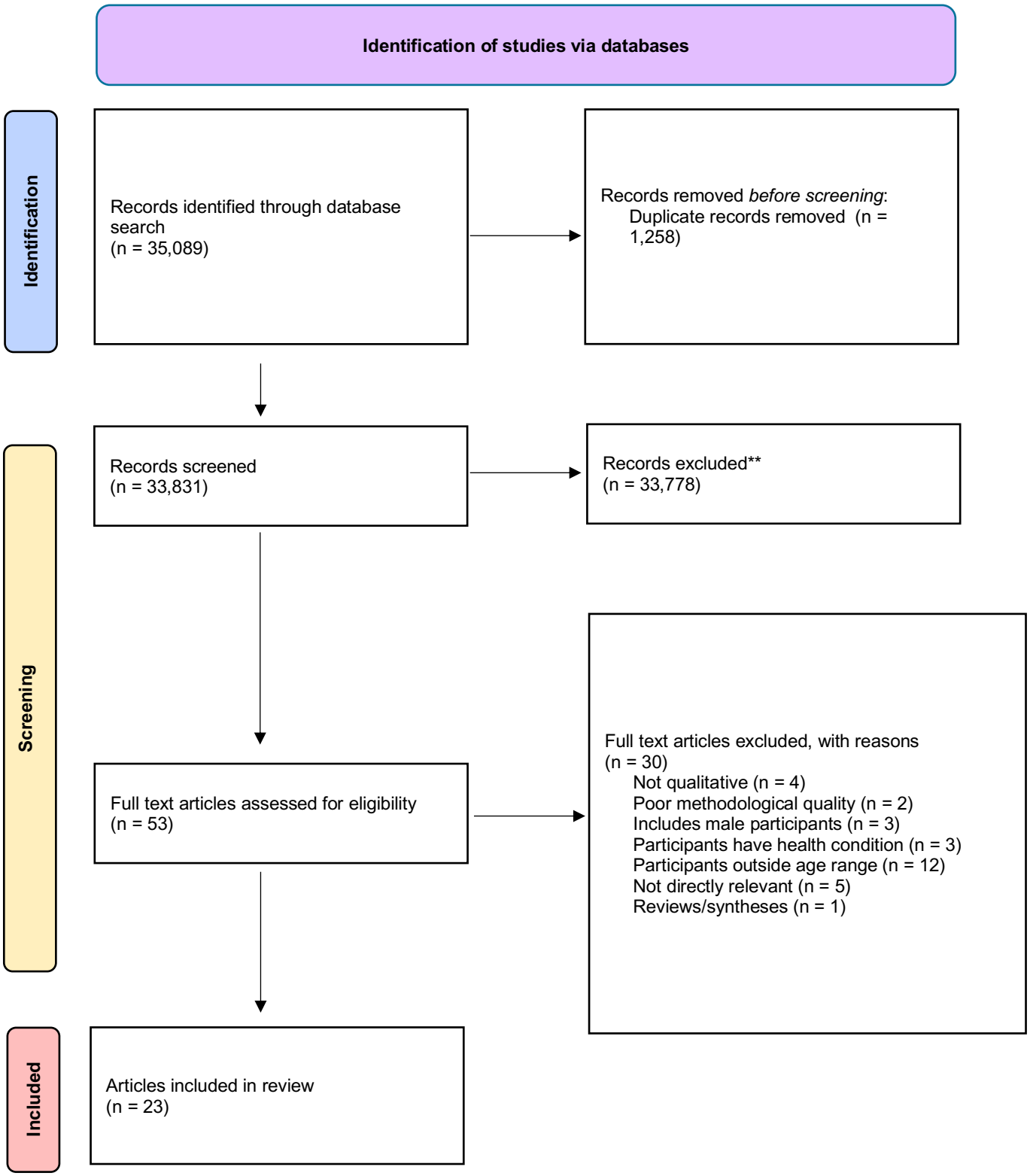


Figure 9: A Prisma flow chart showing the number of articles identified, screened and included for analysis

Table 3: *A table showing reasons for exclusion during full-text screening*

Inclusion/Exclusion criteria	No. full texts excluded on this basis
Quantitative analyses (including quantitative analysis of qualitative data)	4 (1 quantitative, 2 conducted quantitative analysis on qualitative data, 1 did not provide sufficient information on the qualitative aspect of their mixed methods study)
Includes male participants	3 (Gender of participants unclear in the qualitative aspect of one. An additional paper that was included for synthesis recruited male and female participants but excluded males from analysis due to small N)
Poor methodological quality (assessed using CASP; Singh, 2013)	2
Recruited on basis of having a health condition	3 (2 papers exploring obesity, 1 was unclear about whether or not participants were recruited on the basis of having a health condition)
Outside ages 18-65	12 (9 included older adults, 1 study only included under 18's, 1 unclear about age of participants for qualitative aspect)
Does not directly and appropriately address research aims	5
Reviews and/or syntheses	1

3.3.5. Quality assessment

The methodological quality of research papers was assessed by the Lead Author, using the Critical Appraisal Skills Programme (2013) checklist for qualitative research (CASP; Singh, 2013). CASP enables assessment of the validity, rigour and transferability of qualitative research. CASP is designed to act as a broad guide that facilitates judgement of the methodological quality of a body of research in a particular area, rather than to assess the quality of individual studies. However, to

enhance replicability and transparency of this synthesis, a table displaying how each paper was assessed against each CASP criteria is available to view in Appendix 6. Studies were scored against each CASP criteria as follows: No = 0, Not Clear = 1, Yes = 2. Item CASP 10 (*How valuable is the study?*) was scored out of five, with one point available for each of the following: Contribution to existing knowledge, identification of future direction for research, discussion of transferability of findings to other populations, synthesis and clarity of communication. Articles that scored less than 19/23 (i.e. those that dropped the equivalent of one mark on at least half of the items within the checklist) were excluded (N=2), as these papers were not considered representative of the methodological quality of studies in this area generally or to adequately convey the views of women, without bias.

3.3.6. Data extraction

Following removal of duplicates, preliminary screening, full text screening and methodological quality assessment, 23 papers were included for analysis.

Each reference and its identifying number can be seen in Table 4. Extracted data can be seen in Appendix 7, including country of publication, participant N, participant age (range where this data was reported, mean where not and in one instance a “ballpark” figure, as reported by the Authors), specific population under study, PA type explored, data collection method, context, recruitment strategy, theoretical basis and method of analysis.

Table 4 - *A table showing each article's identifying number, lead author(s) and date of publication*

Identifying number	Author(s) and date
1	Alsarve & Tjønndal (2020)
2	Blackstone et al. (2017)
3	Clark (2019)
4	Daniel, Abendroth & Erlen (2017)
5	Dawes, Sanders & Allen (2018)
6	Dlugonski & Motl (2016)
7	Dorwart, Smith Cornelous & Patterson (2019)
8	Kalani et al. (2017)
9	Lambert et al. (2020)
10	Lenneis & Pfister (2016)
11	Lenneis & Pfister (2016a)
12	Lenneis & Pfister (2017)
13	Mathews et al. (2016)
14	Miles & Benn (2016)
15	Morton (2017)
16	Öztürk & Koca (2017)
17	Rathanaswami et al. (2016)
18	Ruissen et al. (2019)
19	Sanz-Remacha et al. (2019)
20	Segar et al. (2016)
21	Tabatabaei et al. (2017)
22	Walsh & Simpson (2020)
23	Ware et al. (2019)

3.3.6. Coding, synthesis and analysis

All data headed 'Results' or 'Findings' was included for analysis in NVivo. If results and discussion were presented under one heading, only descriptive comments from the Author (i.e. summaries of data) and data that was directly from participants (i.e. quotes) were coded and analysed. Author's interpretations of participants' comments were excluded, to reduce bias associated with additional layers of interpretation. Twenty percent of data was subject to scrutiny by the 'Educated Friend' JKL at all analytical stages. Major discrepancies were

discussed and if consensus could not be reached, allocated with the help of the Supervisory Team (MA & LK).

Data were first inductively free-coded to identify barriers and facilitators to PA, without the confines of a pre-determined framework. Next, data were coded again using a deductive framework analysis with the COM-B and the TDF as domains. Where a quote was relevant to more than one domain, data was cross-coded, such that overlapping constructs could be identified and to enable more complete identification of evidence-based behaviour change techniques for potential intervention design. Finally, inductively coded barriers and facilitators were deductively mapped onto the COM-B model and the TDF, to enable identification of barriers and facilitators that the COM-B model and/or the TDF might not capture and to ensure findings have maximum utility for PA intervention design.

Where a determinant of PA could have variable effects for different women/in different contexts, this was considered divergent and categorised as 'both' a barrier and a facilitator. For example, heightened awareness of available activity opportunities consistently facilitated women's PA and so was categorised as a facilitator. However, the impact of weather was more dependent on women's preferences and the extremity of the weather, so this was categorised as 'both' a barrier and a facilitator to PA. A coding framework can be seen in Appendix 8.

3.4. Results

Analysis was conducted on 23 research articles from 13 countries. Participant numbers ranged from 2-295 and the full spectrum of age ranges (18-65 years) were represented. There were diverse women recruited across various PA types and contexts. Data collection methods included observations, mixed methods surveys/questionnaires, interviews and focus groups. Most (20/23) studies were grounded in theory, just one used the COM-B model (Article 23). The most implemented analysis was thematic (e.g. Braun & Clarke, 2006).

Inductive analysis of women's barriers and facilitators to PA revealed 59 subcategories. Table 5 includes a full list of the identified determinants, as mapped onto the COM-B model and the TDF (with the number of articles that contributed to the determinant, definitions of each and example quotes from the data). Barriers and facilitators were also mapped directly onto the COM-B model (see Figure 10). Findings that are complex, nuanced or which have particular salience are elaborated upon below (Sections 3.4.1-3.4.6).

Articles are referenced within the results section of this report using the numbers allocated in the data extraction table (Table 4). 'A' denotes Authors' comments and 'P' denotes participants' quotes.

Table 5

A results table showing (from left to right), the COM-B category, the domain within the TDF, the inductively coded category, the number of studies in which that category was identified, the category definition and an example quote from the data set. Each category is grouped into barriers, facilitators and those which act as both

COM-B	TDF	Category	No. of studies in which this is identified	Definition	Example quote[3]
Physical capability	**Biomechanical capability**	**Barriers**			
		Physical exhaustion	5	A state of extreme physical tiredness.	*"'When you come home, your body's dead. […] I can't get up. I sit on the couch and can't even talk because I'm so tired.'*
		Both			
		Injuries/health problems & concerns	10	Injuries, health problems and family history of health problems and associated concerns.	*"There're things I can't do because I've had a foot ≪operation≫" [B]*
					"I have a family history of osteoporosis so I was worried about getting it and thought I could do whatever [activity] was available to me to try and prevent it" [F]
Psychological capability	**Knowledge**	**Barriers**			
		Lack of knowledge re. PA guidelines	6	Lacking knowledge about PA guidelines and the intensity of activity required in relation to these.	*"Just walking up and down the stairs at home with carrying some weights such as laundry basket itself is a good exercise."*
		Facilitators			

[3] *Under subheading 'Both', quotes marked with a [B] illustrate that category acting as a barrier, whilst [F] denotes a facilitator*

		Awareness of appropriate activity opportunities	3	Knowledge and awareness of places and groups that suit the individual's needs, preferences, lifestyle and income	*"There are a lot of women sports/classes/gyms around. At least in this city"*
		Knowledge of benefits of PA	19	Knowledge and awareness of the (physical, psychological, economic and/or environmental) benefits of engaging in the given behaviour	*It helps to protect your body from all contemporary diseases, like if you have BP [high blood pressure], walking will reduce it, even diabetes is said to get controlled with walking.*
	Behavioural regulation	**Facilitators**			
		Planning/ Scheduling	5	Deliberate planning, organising and scheduling by the individual, to make time for PA	*"I have it all planned. I cook the meal for the next day every night, so I am free in the morning. My husband wakes me up early and we go together to the park to do exercise."*
		Both			
		Fixed routines	13	Having routines that are/are not conducive to partaking in PA	*"Single mothers in the low activity group […] had a routine that got in the way of being active." [B]*
					"I go for walking at 8 o'clock every morning" [F]
Social opportunity	**Social influences**	**Barriers**			
		Male presence	8	The (immediate or peripheral) presence of men at the time and place of a given behaviour.	*"just to have an environment that is male free is really the key"*
		Facilitators			
		Instructional support, supervision, expertise and encouragement	9	Instructional support, supervision, expertise and/or encouragement from a person (or people) who is (or are) knowledgeable about/educated regarding PA	*"I liked being watched over and being corrected if I had done something wrong."*

		Activity with others	19	Engaging in activity at the same time as others, regardless of supportiveness or relationship.	*"Many participants throughout a variety of classes discussed how they are more motivated to exercise in a group fitness setting. This was for several reasons including [...], having other people around doing the same"*
		Exposure to active people	8	Being around active people and/or having relationships with active people.	*"Seeing another person walking is a motivation."*
		Doctor's orders	5	Advice from health professionals to be active	*"I have to exercise. That's what my doctor told me."*
		Activity-related social support	21	Social support that is specifically and directly relevant to supporting the active behaviour.	*"In some cases, participants were motivated by a friend bringing them to classes"*
		Both			
		Cultural and religious expectations and requirements	12	Expectations and requirements that are placed on an individual (or which an individual places on themselves) based on (or governed by) the culture/religion they identify with or come from.	*"in my culture if I do Zumba, it's as if I want to have fun, you know? (...); well what happened to my husband [deceased] does not allow me to go to Zumba" [B]*
					"...when someone comments [to] you that you are looking gorgeous. It gives you a feeling of acceptance among other Indian women. You feel good about yourself and want to continue to work out regularly" [F]
		Social comparison	5	Comparing oneself favourably or unfavourably to others.	*"I find it discouraging when my friends who are very into exercise or whatever, they just have a higher level of activity and um I find, I feel like I can't keep up and so that discourages me." [B]*
					"Oh, look she's got a six pack. I haven't; I better [exercise].... I want that." [F]
Physical opportunity	**Environmental context and resources**	**Barriers**			
		Roles and responsibilities that restrict	16	Including: 'dual roles/second shifts', being a Mother, being a wife, being a student and having a familial ethic of care.	*"After work I pick up my two children, take them home and cook for them. Then they need to take a bath. It's already 7pm by then. My husband only comes home at*

		available time for PA			*10 pm. So who should take care of my children while I exercise?"*
		Adverse or challenging personal circumstances	6	Adverse personal life circumstances (e.g. homelessness, poverty, bereavement, forced migration).	*"The unpredictability of being homeless[…]impacted on her attendance"*
		High cost of engaging in PA	5	The high financial cost of engaging in PA, including the price of travel to and from PA spaces/opportunities and the equipment/attire needed to engage	*"The gym is really expensive even I think I can squeeze time but I can't . . . produce more money . . . so I said I cannot afford gym, it's very expensive."*
		Facilitators			
		Low cost (or free) PA opportunities	5	Having low cost or free PA opportunities available	*"It seemed like a good opportunity to get fit with some free exercise"*
		Appropriate equipment/ Clothing	4	Having the right equipment and/or clothing to fulfil the activity and to feel dignified whilst doing so.	*"Wearing the clothes makes me feel like I can be sporty and can do anything"*
		Both			
		Weather	4	Aspects of the weather that facilitate or inhibit PA or access to facilities (e.g. snow, extreme hot temperatures etc.).	*"Exposure to poor Irish weather is a major disadvantage and barrier, with the inverse for good weather" [B] & [F]*
		Aspects of available activity types	10	Aspects of available activity types, which appeal (or not) to the individual	*"with hiking once you start you pretty much have to finish it out. There's no quick [turnaround…] but,[I dislike] that not being able to just snap your fingers and be done with it" [B]*
					"I like that [group fitness has] an aspect that's all strength, that's all cardio, they have an aspect that's all agility"[F]

		Timing and scheduling of activity/activity spaces	8	Activity-based scheduling (or scheduling/opening times of places where activity occurs) which may help or hinder attendance/engagement in PA.	*"[the gym is] open at 6 in the morning and I leave for work at six thirty, so it doesn't suit me". [B]*
					"My main reason to come here is the 30min length of the exercise because I have no time"[F]
		Facility convenience and appropriateness	19	Convenience of the location and convenience for the needs of the individual and the specifics of the activity - can refer to cultural appropriateness.	*"Sometimes I'm just too far away [from the running group to take part]" [B]*
					"Lake Johnson is near the university so it's a drive on the way home and you can take a walk" [F]
		Not owning a vehicle	8	Not owning a car or other motorised vehicle.	*"gym is not near my home [and] I don't have a car of my own." [B]*
					"[people walk] 'Because they ain't got no car.'" [F]
		Environment safety	5	Aspects of the environment that are perceived or experienced as safe or unsafe.	*"it's not safe for us to walk in the streets" [B]*
					"Safety is not an issue on these roads as there are houses here. We don't go to main roads." [F]
Reflective motivation	**Goals**	**Barriers**			
		Competing goals and priorities	8	Goals (or priorities) of the individual that get in the way of PA (e.g. education, socialising), often by leaving little available time	*"My problem now is that I would rather take that time to socialize with my adult friends ..[than be active]"*
		Facilitators			
		Desire for weight loss/ management	13	The drive to lose or maintain a certain weight.	*"I walk every night at 6 p.m., because I want to reduce weight. Nobody told me to do so."*
		Prioritising PA	10	The cognitive process of prioritising PA over other tasks that are demanding attention and/or resources	*"Despite a full-time job and family obligations they found the time and energy for exercising because they made exercise a priority"*
		Competition goals & winning	4	A drive to win or be the best, particularly in the context of organised tournaments/competitions.	*"One informant expressed that she wanted to win and be the best"*

		Defiance/ Resisting gender stereotypes	2	A drive to challenge the conventional expectations of men and women.	*"I really wanted to box, and there was a lad that boxed, […]I said, 'Oh, where do you go? I wanna box.' And, he said, 'Girls don't box,' and I said, 'Why not?', and he said, 'Coz they don't; girls do not box.' So, I went along to the gym"*
	Intentions	**Facilitators**			
		Willingness to try/conscious effort	9	A willingness to engage in a given behaviour and the conscious choice or effort to participate.	*"I try to do walking as much as I can"*
	Beliefs about consequences	**Facilitators**			
		Belief that PA Improves physique	10	A belief that being active will result in a better physique (often related to desire for weight loss)	*"This participant in particular frequented dance fitness classes because they would help achieve her weight [loss] goal"*
		Belief that PA Increases self-esteem	8	Belief that PA will support development of self-esteem.	*"MMA was perceived as […] increasing self-esteem."*
		Belief that PA promotes Holistic health & wellbeing	15	A view that health behaviours and physical/psychological wellbeing are interrelated constructs and that improving PA behaviour improves other related health behaviours and wellbeing more generally.	*"Participants indicated that a positive outcome associated with being more physically active was that it would encourage other healthy habits. These healthy habits included eating healthier, and/or improving their sleep quality/quantity".*
		Anticipating positive social outcomes	8	The expectation that engaging in PA will be positive for one's social life or feeling of social connectedness.	*"[because of PA participation] … our behavior with our kids and husband also becomes better"*
		Belief that PA helps recovery	8	Use of activity and exercise to promote recovery and rehabilitation following injury or ill health.	*"I basically do the water aerobics more as water therapy"*
		Belief that PA is energising &	8	A belief that one will feel energised and be more productive because of PA	*"being physically active 'influences my day to day tasks and improves concentration. As a result I would be more efficient in everything I engage in'."*

		productivity inducing			
		Belief that PA is Mood enhancing	13	A belief that being active will result in a better mood (on an acute or chronic basis)	*"since exercise makes me happy I shall come here [to the gym]"*
		Both			
		Belief that It hurts/it's difficult/it's vigorous	10	A belief that PA will be difficult and/or will cause pain or discomfort (from being out of breath, for example).	*"She cannot walk because of the pain. She has time to walk and all, but cannot walk because of pain" [B]*
					"I really like that it pushes to the limit, so for example with the peak tracks, I feel like I definitely peak."[F]
	Beliefs about capabilities	**Barriers**			
		Perceived lack of time	6	A belief that one does not have enough time available to engage in a given behaviour.	*"there is no time for exercise"*
		Perceived lack of physical fitness	6	A belief that one is not physically fit (enough to participate in PA)	*"she did not feel 'fit' enough to complete this type of [...] activity"*
		Mental exhaustion	4	A state of extreme mental tiredness leading to a belief that one could not take part in PA.	*"I get mentally exhausted and that somehow converts into physical exhaustion."*
		Facilitators			
		Self-efficacy	11	Belief in one's ability to enact a given behaviour (correctly).	*"...because my dancing and cheerlead- ing background allow me to pick up choreography quickly. So when I'm in a group fitness class I pick it up quickly, I feel confident, I feel like I'm working out better. Whereas, um, like if I walk into a weight room and I'm not sure how to use a certain weight machine, I'm not gonna use it."*
		Taking accountability	5	Accepting responsibility for health and engagement in the programme of PA	*"I have to bring change in myself"*
		Barriers			

	Social role and identity	Lack of identification with participants	9	A belief that those who participate in physical activity are "not like me" (can be related to a specific activity or to being an active person generally).	*"Obviously, when I think of outdoor recreation, I see White females, White males. I don't see a lot of people like me."*
		Facilitators			
		Shared sisterhood and sense of belonging within active spaces	15	A sense that people who participate in PA are "like me" and that I fit in with participants (can be related to a specific activity or to being an active person generally).	*"A participant described that she 'prefers group exercises because I feel like I fit in.'"*
		Both			
		Religious beliefs	4	Religious identity and expectations/rules related to that identity	*"Most of the women shared the opinion that they could not exercise while fasting during Ramadan because the lack of food and fluids during the day would make them too weak to exercise." [B]*
					"I think within Islam physical activity is important … your body is a trust from God and you have to look after it" [F]
		Body image	10	One's perception and feelings about one's own physical appearance (and how others might respond to it)	*"I thought people were looking at me […] thinking 'she's too big to run'. So that stopped me to start with…" [B]*
					"Everyone has problem areas that they think about, and um working out, specifically the group fitness classes that I do help me target that and make me feel better about that."[F]
Automatic motivation	**Reinforcement**	**Barriers**			
		Slow/little/no progress	4	Delayed (or non-existent) positive outcomes associated with engagement.	*"[I have trouble] getting over that "short term pain, long term gain" mindset"*
		Facilitators			
		Sense of accomplishment	7	Feeling that one has achieved something good (or beyond expectations).	*"I suppose it's a sense of achievement, that you've actually got up and you've done [exercise]"*

		Physical improvements	11	Development of physical outcomes and skills associated with engaging in the given behaviour	*"being able to notice physical improvements in classes, particularly those they were not confident with initially, were particularly important for bolstering self-efficacy, and ultimately one's decision to continue with a particular [exercise] class"*
		Immediate rewards	5	Rewards that occur during or immediately following engagement.	*"Participants also identified experiential reasons to walk, benefits they immediately experienced such as feeling better, feeling more energetic, and helping with "clear(ing) out their heads."*
		Fun & enjoyment	12	Intrinsic enjoyment of the activity itself or the context in which it is occurring.	*"Not only for my health issues, but I enjoy doing it as well"*
		Both			
		Low effort levels required	3	A sense that low effort levels are required to participate (can be viewed positively or negatively)	*"I think it was too easy for me" [B]*
					"Well I was expecting it to be more intense but … I liked it, that it was light and I didn't feel tired after doing it" [F]
		Past experience of PA	15	(Positive, negative or lack of) past experience of engagement in PA	*"[I don't do physical activity because it] is something I have never done" [B]*
					"I do like participating as I was very active in school—a very, very long time ago i.e. judo, basketball, swimming" [F]
		Social sanctions	11	Social responses to individuals engaging in PA (often in the form of social disapproval)	*"[I] tell myself […] I'm going to jog today […] The minute you walk out… people […] literally laugh at you. […]she is jogging, what is she doing?" [B]*
					"It became clear that the approval of the cleaning companies' (senior) management could be a decisive factor for the success of a worksite PA initiative"[F]
	Emotion	**Barriers**			

		Apathy	12	No personal interest, enthusiasm or concern regarding the given behaviour itself.	*"I wasn't ever able to really find something that interested me. I thought it looked kind of boring"*
		Fear	12	Fear of injuries, of being embarrassed, of getting left behind, of lack of safety etc.	*"I do not do exercise because I am alone. I am scared of walking alone."*
		Both			
		Guilt	5	A sense (accurate or not) that one has compromised a moral standard (often for personal gain).	*"participants described Guilt as an affective obstacle to being more physically active". [B]*
					"[participants were driven to be active by] a sense of guilt, or a feeling of obligation primarily centered on physical health" [F]

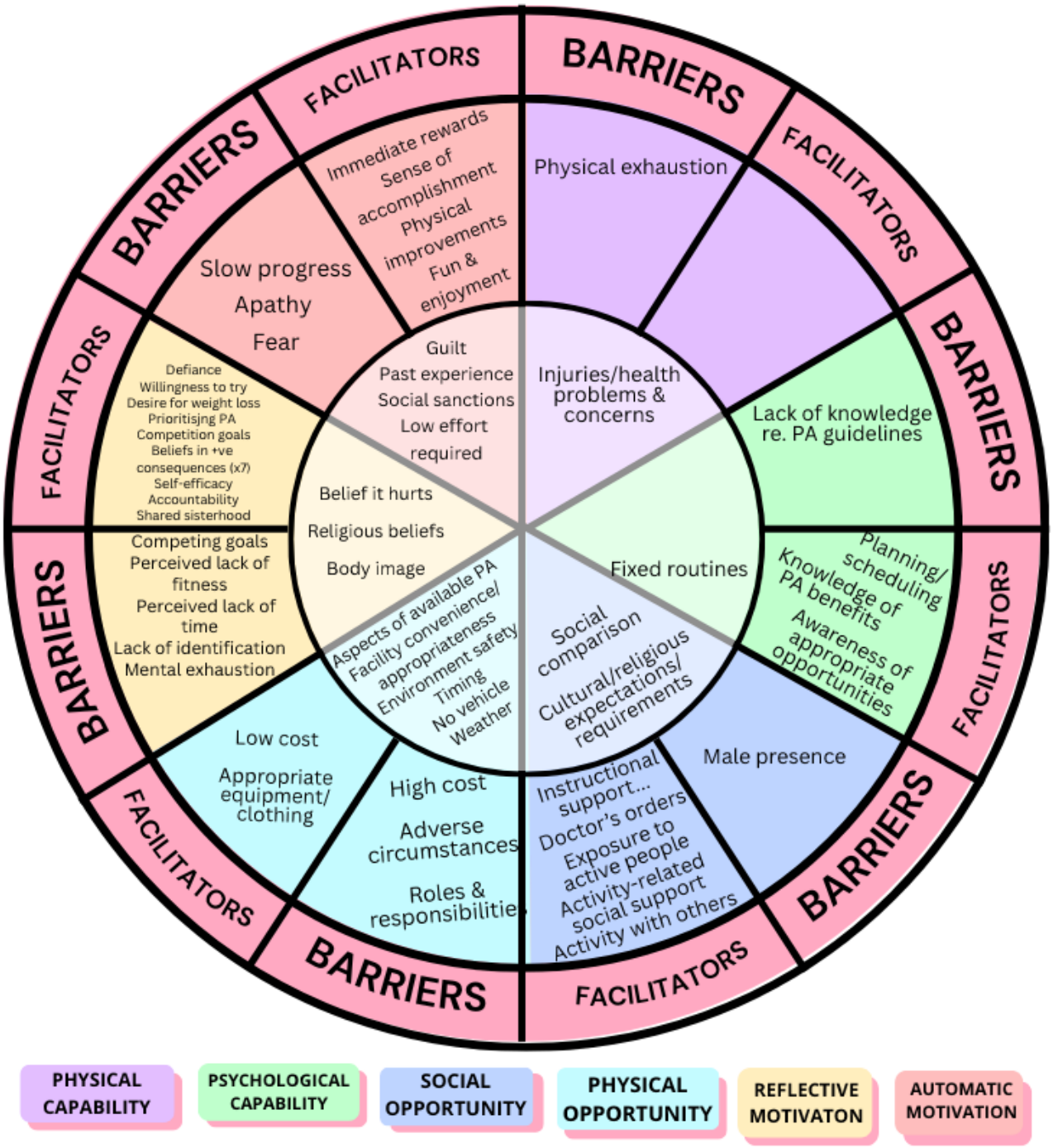


FIGURE 10: A diagram showing women's barriers & facilitators to PA mapped onto the COM-B model

3.4.1. Physical capability

Physical exhaustion reduced women's physical capability to engage in leisure-time PA. Women explained that *"their physically exhausting job and their family responsibilities made it impossible for them to exercise"* [11A]. This was most relevant for women who had manual occupations:

"Cleaning is really tough. When you come home, your body's dead". [12P].

Injuries and health problems/concerns variably impacted PA, depending on the severity of the health issue and beliefs about the outcome of participation. One woman described how PA was impossible for her Mother, due to ill health:

"the doctor in the medical college told my mother to walk for her arthritis, but she cannot walk because of the pain." [13P]

However, for another woman, having a health condition made being active a priority*:*

"Because of diabetes [...]. I have to exercise." [11P.]

Whilst these determinants are clearly related to the COM-B domain of physical capability, the TDF domain of 'physical skills' is not an appropriate categorisation of these factors. This is because ill health and pain impact women's physical ability to undertake PA, regardless of skill level. For example, an Olympic athlete may sustain an injury that renders them physically incapable of PA participation, despite highly developed physical skills.

3.4.2. Psychological Capability

Women who lacked knowledge regarding PA guidelines and who considered that their day-to-day tasks/routines rendered them sufficiently active to stay healthy, did not believe increasing PA to be necessary. One woman stated:

"the household work is sufficient for us" [13P].

However, "*Most women reported carrying water, washing clothes, shopping and carrying groceries, walking for shopping, and cleaning the home with a mop as 'vigorous,'"* [13A]. Notably, domestic PA is not associated with a reduction in cardiovascular disease (Stamatakis et al., 2007) and research shows that whilst domestic PA accounted for a significant proportion of self-reported moderate to vigorous PA for women, the amount of time spent doing this was negatively associated with leanness (Murphy et al., 2013), implying that the health benefits of this type of activity are not in line with women's beliefs/expectations.

Planning and scheduling, categorised under the 'behavioural regulation' domain of the TDF was a tool used by women to 'make' time for PA alongside other responsibilities:

"I finish the housework, such as cooking and cleaning, a day before the exercise or in the morning right before the exercise. I also plan my exercise time according to the schedules of my children"[16P].

Some women had daily routines that necessitated PA:

"they "constantly" walked as an inherent part of meeting their daily needs, such as going up and down stairs, doing laundry, cooking, cleaning the house, and taking their kids to school" [20A].

Others described routines that inhibited PA, particularly with regards to leisure-time PA and exercise:

"[the gym] is open at 6 in the morning and I leave for work at six thirty, so it doesn't suit me. [17P].

Generally, women had daily routines that facilitated domestic PA and inhibited leisure-time PA and exercise, which is problematic because domestic PA does not elicit the same health benefits as leisure time PA/exercise.

3.4.3. Social Opportunity

The only discrete barrier to PA for women in relation to social opportunity was male presence. However, this barrier was only prevalent amongst Muslim women, who required single-sex spaces to address their religious and cultural requirements. One participant told researchers:

"I suppose in Western society it restricts [Muslim] women [from being active] because, like I said, there's not enough women-only provision" [14P].

Participants *"emphasized that a women-only environment was not essential"*[12A] but that *"the majority of the interviewees preferred to train without men being present because then they could take off their*

headscarves and act more freely"[12A]. However, another participant stated:

"If facilities were mixed male and female, no Muslim would take part whether wearing the hijab or not"[14P].

The social opportunity to be active in mixed sex environments therefore appears directly limited by male presence, indirectly limited by social disapproval from the cultural in-group and/or Muslim women may simply feel uncomfortable exercising with men present.

Professionals could positively influence women's PA behaviour. Instructional support helped to counteract low activity-related self-efficacy. This support enabled women to feel:

More confident in the activity itself:

"instruction and support [...] helped participants improve their confidence related to specific exercises."[2A]

More confident that they were performing the activity correctly:

"I liked being watched over and being corrected if I had done something wrong" [16P]

Less scared about the potential for injury:

"it's more of the safety aspect."[7P]

And more able to push themselves to work for longer and/or at a higher intensity:

> *"[the] instructor pushed them to new limits and helped them obtain more from the workout than they would otherwise receive on their own."* [2A]

One participant told researchers

> *"the instructional videos were awesome, as well as like the print outs that I was given, like it was quite easy for me to replicate the things that I had to do and I thought it was good."* [9P]

This shows how distal, somewhat impersonal support can still facilitate PA. Some women's PA was facilitated by their 'Doctor's orders' but this was sometimes ineffective:

> *"Doctor told me to walk, but I am not walking[…] I have not taken the advice seriously."* [13P]

Others in women's social world could help to promote women's PA in different ways. *"In general, the physical presence of others in a [group exercise] class provided motivation for exercise that the participant was not able to achieve on her own"* [2A] and promoted accountability:

> *"My running group feels like it is extremely important. They tend to have people they can be accountable to [because of it]."*

and enjoyment:

"It, umm, just makes it more fun[7A]

One woman explained:

"If you live with people who like to exercise, you'll be inspired that, you know what, let me also do this" [23P]

But even just "*The sight of other walkers [was] reported to be motivating"* [13A], showing that exposure to active people facilitated PA even in the absence of any meaningful relationship with those individuals. Activity-related social support could be direct:

"in some cases, participants were motivated by a friend bringing them to classes" [2A]

or indirect:

"My husband takes care of the baby while I am doing exercise." [8P]

Women repeatedly described having high levels of direct activity-related social support, usually from female friends. They also frequently mentioned having low levels of indirect activity-related social support from spouses, in the form of assistance with housework or childcare.

The variable impact of the cultural and religious expectations and requirements that are placed on women was primarily discussed in relation to being Muslim, being from a conservative/gender conservative

(typically Asian) cultural background and most frequently *"the traditional role of women at home, especially responsibility for their children and spouse"* [21P]. To a lesser extent, for *"black women, their community viewed certain types of activities as not relevant to them"* [23A]. One Muslim participant differentiated between religion and culture, stating:

"Cultures can be contradictory and hypocritical, it can be nonsensical and unjustified, Islam is never any of these things" [14P].

Another explained how culture and religion were distinct, but frequently referred to as if indelibly entwined:

"sometimes people may say 'Oh-no Muslim girls shouldn't do that', but really it's the cultural perception that they have and it has no basis in faith" [14P].

Most women described conflicting cultural and/or religious expectations and requirements in relation to PA. For example:

"when someone comments [to] you that you are looking gorgeous. It gives you a feeling of acceptance among other Indian women. You feel good about yourself and want to continue to work out regularly so that you stay slim and beautiful." [4P]

However, simultaneously:

"in South Asian standards if you're too thin you're too poor" [17P].

This highlights the interwoven nature of culture, beauty ideology and body image, which must be considered conjunctively. Twelve of 23 articles contributed to the theme of cultural and religious expectations and requirements, ten recruited participants based on being South Asian, Muslim and/or having migrated.

Women described engaging in social comparison between themselves and others in terms of body image:

"Oh, look she's got a six pack. I haven't" [3P]

and fitness:

"I think I find it discouraging when my friends who are very into exercise or whatever, they just have a higher level of activity and um I find, I feel like I can't keep up" [2P]

Generally, unfavourable comparison of oneself in terms of body image facilitated PA for women, who had a desire to change their bodies to match Western beauty ideals/norms. However, women who compared themselves unfavourably to others in terms of fitness were particularly discouraged from partaking in group activity with those individuals. PA was facilitated by the opportunity to engage in group activity with others whose fitness women considered roughly equal to theirs. There were no instances of women comparing themselves favourably to others.

3.4.4. Physical opportunity

The most cited roles and responsibilities that restricted women's available time for PA were being a wife, being employed, being a student and being a Mother or other female caregiver within the family system. Many women *"worked full time, picked up their child(ren) at daycare or school, attended their child(ren)'s extracurricular activities, and went home to complete an evening routine of family responsibilities."* [6A]. This left little time available for PA, which was rarely prioritised.

Adverse personal circumstances including homelessness, poverty, recent immigration status (particularly forced migration) and bereavement made being active more challenging for women. One *"stated that in addition to a lack of money, the unpredictability of being homeless and being tired impacted on her attendance [at a running group]"* [5A].

"Many participants mentioned how much they enjoyed walking in fresh air, especially in parks that were safe" [20A], showing how environmental safety was paramount for facilitating women's engagement in outdoor PA. Features of the environment that were perceived as unsafe (e.g. no pavements for pedestrians, stray dogs on road, areas high in antisocial/criminal behaviour) presented a barrier. *"Participants reported that crime directly affected their ability to exercise or even walk outside because local facilities were vandalized and because they were particularly vulnerable as women"* [23A]. Women who perceived their local area as safe were however comfortable engaging in outdoor PA:

"Safety is not an issue [for pedestrians] on these roads as there are houses here. We don't go to main roads" [13P]

Not owning a vehicle facilitated PA by promoting active travel *"out of necessity"* [20A], but also denied some participants the opportunity to access suitable spaces for PA:

"gym is not near my home [and] I don't have a car of my own." [17P]

3.4.5. Reflective motivation

The goals and priorities that presented a barrier to women's PA were related to their education, work, social life or family/home life:

"[my] job [is] time consuming [so I] often feel need to complete other errands or spend time [with] friends rather than work[out] when I have time off" [18P]

Competing goals and priorities were closely linked with a perceived lack of time to be active, which having children exacerbated:

"...Before kids, it was a priority to exercise. Now you've got the kids and house and yard and life ... it just kind of like falls further down the totem pole." [20P]

Women described feeling mentally exhausted from balancing these priorities and perceived PA as requiring headspace they did not have:

"Our daily routine and responsibilities at home could drain us out easily. I get mentally exhausted" [4P]

Lack of identification with PA participants in a specific setting or generally, made women feel uncomfortable about joining in:

"You need to feel some immediate connection to the group or you're not going to stay." [2P].

Some black women *"specifically reported that they personally, or heard friends, refer to certain outdoor activities as "White people" activities"* [7A]. Other characteristics that appeared to impact sense of belonging/shared sisterhood in active spaces included age, gender, social group, SES, body type and health status.

Women recurrently described being more active as *"a decision that was mainly motivated by their wish to lose weight"* [12A] . Feelings of self-loathing/self-disgust in relation to this were driving factors in women's PA:

"I get really down, and I feel really fat and really disgusting, but then the next day I think, 'Right, I'll go to the gym.'" [3P]

This was closely related to a sense that for women *"it was necessary to exercise and stay physically fit so they could look beautiful and attractive. Some mentioned that by working out, they can get well-toned bodies to promote a sense of self-esteem"* [4A].

Holding religious beliefs and values could both facilitate and inhibit PA. For some women, their religious beliefs encouraged them to take care of their body which was considered a trust from God:

"I think my religion really encourages PA because there are lots of sayings and teachings of the Prophet Muhammad about taking part in sport"[14P]

However, these beliefs could also create a barrier by removing women's sense of agency over their health status because:

"[it is] Allah who eventually [has] the power to decide' about good health and a long life." [11P]

Women's body image impacted their engagement in, and choice of, PA. It was generally accepted that women would be experiencing body dissatisfaction and would be driven to engage in PA to address this:

"Everyone has problem areas that they think about, and um working out, specifically the group fitness classes that I do help me target that and make me feel better about that." [2P]

Living in a Western culture where beauty ideals pertain to the notion that slimness is beautiful appeared to drive women's PA behaviour based on their body dissatisfaction, regardless of their origin culture. There was a sense that:

"If I was thin, I would be really happy" [11P]

For women living in cultures where 'big is beautiful', desire for weight loss or to change physique did not have relevance for PA promotion. Regardless of culture, poor body image coupled with low self-esteem and anxiety about what others might think or say presented a barrier to PA:

"I thought people were looking at me [...] thinking 'she's too big to run'. So that stopped me" [5P]

There were almost no instances of women speaking positively about their own bodies, unless referring to a past version of themselves.

3.4.6. Automatic motivation

Guilt's impact on PA was context dependent. When focussed around not being active/healthy enough, PA was facilitated because *"a sense of guilt, or a feeling of obligation primarily centred on physical health was observed"* [2A]

Where guilt was concerned with not being available to fulfil caregiving responsibilities, PA was inhibited:

"when it comes to guilt, I know I have many things to do for my family [who] need help with something, so it feels like I should spend my time more [...] than wanting to exercise" [18A]

As sense of responsibility for others increased, it seemed the likelihood that guilt would act as a barrier to PA also increased.

A perception that PA required little effort facilitated PA for some women who experienced this as positively reinforcing but was a barrier for others who felt little satisfaction as a result. One participant stated:

"I liked that it was light and I didn't feel tired after doing it" [9P]

Whilst another from the same condition in the same study said:

"I think it was too easy for me" [9P]

This may depend on physical fitness and/or self-efficacy, whereby individuals who are less fit and/or who have lower PA-related self-efficacy may experience this as positively reinforcing whilst those with higher levels of fitness and PA-related self-efficacy may not.

3.5. Discussion

The qualitative evidence exploring healthy women's barriers and facilitators to PA outside the context of pregnancy have been summarised and mapped onto the COM-B model and the TDF. There were 60 unique determinants of PA for women, identified across 23 eligible research articles. Women's PA was especially influenced by factors relating to socioeconomic status, gender typical roles and responsibilities, culturally specific expectations/requirements and body image. This echoes findings from Peng et al.'s (2023) qualitative evidence synthesis covering 2000-2022, which identified family duty, religious and cultural norms, body image and societal beauty standards as key determinants of women's PA. Many divergent determinants of women's PA might be closely related to SES, facilitating PA for women of

high SES and inhibiting PA for women of low SES (e.g. environment safety; Mouratidis, 2020). When the PA behaviour of low SES women was facilitated, this most frequently pertained to domestic, household and occupational PA, rather than leisure-time PA and exercise.

3.5.1. Socioeconomic status

There is a well-documented association between poverty and ill health (e.g. Chokshi, 2018; Mukherjee, 2015; Pond, 1961), so people of low SES typically experience poorer health, worse quality of life and earlier mortality than their more affluent counterparts. Increasing PA for people of low SES could therefore be an especially impactful, cost-effective and consequentially, accessible means of health promotion for this population. Women of low SES are more susceptible to barriers to PA including physical exhaustion from physically demanding, 'typically female' jobs (Charles, 2011), being overweight (Mayor, 2017), injuries/health problems or concerns (Wang & Geng, 2019), poor environment safety (Mouratidis, 2020) and negative social comparison/social disapproval (Krause et al., 2017). In this systematic qualitative evidence synthesis, there were some factors (e.g. daily routines, roles and responsibilities) that typically facilitated domestic, household and occupational PA for women of low SES, but not leisure-time PA or exercise. Research shows that recreational and purposeful PA generally elicit more physical and psychological health benefits than occupational or domestic PA (e.g. Peeters et al., 2014; Kazemi et al., 2024) and some evidence suggests that occupational and domestic PA are negatively impactful for mental health (Wang et al., 2011), cognitive functioning (Choi et al., 2022) and risk of injury/hospitalisation (Hollander & Bell, 2010). Women of low SES are therefore likely

experiencing more barriers to PA, whilst benefiting less from the PA they undertake.

3.5.2. Gender Typical Roles and Responsibilities

Aligned with previous literature on female PA participation (e.g. Bantham et al., 2021; El Masri et al., 2020; Slater & Tiggemann, 2010; Spencer et al., 2015), data in this analysis showed women's PA to be heavily impacted by gender typical roles and responsibilities. In keeping with the evidence base (e.g. Bantham et al., 2020; Donnelly et al., 2018; El Masri et al., 2020; Sørensen & Gill, 2008), this primarily related to women managing their duties in respect of household chores/responsibilities alongside meeting the needs of loved ones in their roles as caregivers, wives and mothers. Gender typical roles and responsibilities generally operate to the detriment of women (Neculaesei, 2015) and despite the large expectations placed on women in this regard, there were no instances of women describing being relieved of any of their gender typical duties because of paid work. With frequent mention across the literature of women undertaking 'dual roles' and 'second shifts' comprising paid work during the day and childcare/household chores in the evenings, women were left with little available time, energy and resources for PA. Gender typical roles and responsibilities again appeared to facilitate women's domestic and household PA, but not leisure-time PA or exercise. Women whose data were included in the present synthesis sometimes described household chores and domestic responsibilities as facilitating PA and being sufficient for healthy outcomes. However, one study found domestic PA accounted for over 35% of self-reported moderate-vigorous PA for women but did not reduce risk of cardiovascular disease (Stamatakis et al., 2007). Women's knowledge base about what constitutes sufficient PA for

health may therefore be somewhat distorted and some women are unknowingly missing out on the health benefits of recreational PA/exercise. This reduces women's motivation to engage in recreational PA/exercise based on a misguided belief that they are already satisfying their health-related needs whilst fulfilling gender typical roles and responsibilities.

3.5.3. Culturally Specific Expectations and Requirements

Cultures that are described as gender-conservative have heavily ingrained gender roles and rules, that are sometimes government mandated (Friberg & Jahanlu, 2024; Inglehart & Norris, 2012; Ponce, 2017). Some women described cultures that were supportive of and facilitated PA. However, this most often related to domestic responsibilities, not leisure-time PA/exercise. Although distinct and separate constructs, women described the terms culture and religion as frequently being used interchangeably by community members, to justify the enforcement of gendered rules and expectations. Aligned with findings on women from traditionally Muslim, Arab cultures (El Masri et al., 2021; Donnelly et al., 2018), many Muslim women described difficulty with the lack of culturally appropriate spaces to be active within Western society (single sex spaces with modest dress codes), social disapproval from the cultural in-group about violating culturally governed social norms and their lack of identification with active people. However, Krause et al. (2017) found strongly held religious beliefs to be associated with healthy behaviours, including engagement in moderate and strenuous exercise. Sometimes, religion drove women's PA based on a belief that the body is a trust from God that should be cared for. Religious women also highlighted that religious leaders and other women from within the religious community could support PA and that

PA opportunities within places of worship were socially and culturally acceptable. Ideal body size is culturally governed. Some cultures, such as African and Arab cultures, show preference for larger bodies (Naigaga et al., 2018), opposing the Western ideology that beauty pertains to thinness (e.g. Mckay et al., 2018). The impact of culture on beauty ideals may be diminishing, with a global shift towards the traditionally Western ideology that thin is beautiful (Swami et al., 2015), partly due to high levels of global exposure to Western media/imagery and partly due to global economic development, as affluent cultures have traditionally valued thinness, whilst economically deprived cultures have historically considered fatness to signify wealth and beauty (Swami et al., 2015). In this systematic evidence synthesis, South Asian women described overweight bodies as desirable in their home countries, which discouraged PA, to avoid weight loss. However, following migration to Western society the same women were driven to be more active, to conform to Western beauty ideals by reducing bodyweight. This was true despite social disapproval about their apparently 'too slim' physiques from people from their culture of origin. This provides a brief snapshot into the magnitude and speed with which environmental context and cultural/social norms impact women, their sense of self and their health-related behaviour. This push-and-pull between cultures undoubtedly has prominence for migrant women, who must circumnavigate a world in which their cultural foundations and horizons are frequently misaligned.

3.5.4. Body Image

Females consistently have lower self-esteem than men throughout the lifespan and cross-culturally (Bleidorn et al., 2016), consistently experiencing more body dissatisfaction and having poorer body image

(e.g. Demarest & Allen, 2000; Brennan et al., 2010; Wong & Say, 2013). Women engage in more social comparison (Buunk et al., 2020), particularly in Western cultures where social comparison happens more frequently and is more impactful (Guimond et al., 2007). In this synthesis, women's PA was both enabled and inhibited by various factors relating to their almost exclusively negative body image and again, this was culturally ingrained. Women's body image drove PA behaviour based on expectations that being more active would enable weight loss and positively alter the physique and that this would improve self-esteem and elevate life satisfaction. Interestingly, despite women wishing to increase PA to manage their physique in connection with their poor body image, this poor body image also created a barrier to PA for women, who were dissuaded from partaking in group activity with others whose bodies they compared favourably to their own. This appeared primarily related to women's negative self-assessments and fear of social disapproval from others regarding their 'undesirable' body. This is a type of anticipated stigma, which Stevens (2018) discusses in relation to overweightness, identifying this phenomenon as more prominent for women than men and most pronounced in contexts associated with weight loss or gain such as cafeterias and recreation spaces. Thus, whilst poor body image might motivate women to be active to manage their physique, it might also prevent women from engaging in PA in public (particularly purpose built) spaces. This might limit the availability of facilitating factors such as social support, instructional support and fun/enjoyment of PA.

3.5.5. COM-B and the TDF

There were determinants of PA identified under all COM-B domains and all but two TDF domains ('optimism' and 'memory, attention and

decision processes'). From the COM-B mapping, it might - based on the high number of determinants under this domain - appear that reflective motivation is the most impactful COM-B component for women's PA. However, many of these facilitators fell under the TDF domain of 'beliefs in positive consequences' of being active, which participants are often explicitly asked about during interview. Further, the conscious and deliberate nature of reflective motivation means that it involves cognitive processes that people are often aware of, making articulation during interview relatively easy. The ease with which a phenomenon can be discussed does not necessarily indicate importance, relevance or pervasiveness, as construct accessibility and salience can easily be primed and altered (e.g. Higgins, 1996). Furthermore, evidence shows that conscious and reflective motivational processes alone, such as intentions (Fishbein et al., 2003), positive outcome expectations (Larson et al., 2017) and beliefs about capabilities (Povey et al., 2005) are often insufficient motivation for positive health-related behaviour. This aligns with a critical realist perspective, as despite ample empirical evidence of women being highly motivated to be active, 'real' structural barriers (such as limited financial resources) retain greater causal power in terms of predicting behaviour. In COM-B terms, opportunity and capability can therefore be considered 'gateways' that allow for healthy behaviour, if there is sufficient motivation to support this. However, if the opportunity and capability 'gateways' are closed, motivation alone will not sufficiently drive the behaviour. The facilitating role of reflective motivational processes should therefore not be overstated based on the relative ease with which it can be discussed. Regarding automatic motivation, women experienced mainly positive 'reinforcement,' but negative 'emotion' under the TDF in respect of PA. These negative

emotions were usually a barrier to PA, except for guilt, which variably impacted PA and was most prevalent for mothers. Mothers in this systematic qualitative evidence synthesis described experiences that mirror findings from a systematic review exploring the phenomenon of 'maternal guilt' more generally (Constantinou et al., 2021). Mothers in both datasets described a great sense of responsibility to their children and feeling divided in wanting to take time for themselves. Here, women primarily experienced guilt as a barrier to PA, as it was usually focussed on spending time away from dependents, to be active. However, when women described guilt for not being fit or healthy enough to remain active enough to care for and live a long life for dependents, PA was facilitated. Work that refocuses guilt may therefore have potential for PA promotion in mothers, but leveraging guilt could be considered morally and ethically dubious.

Women's psychological capability to be active was facilitated mainly by knowledge of the benefits of PA. The only barrier identified under this domain was lack of awareness of available PA opportunities. Both these determinants mapped onto the knowledge domain of the TDF. Previous research shows that people with physical disabilities are more likely to report being disabled as an intrinsic barrier to PA than people with intellectual or visual disabilities (Ascondo et al., 2023). Despite the physical nature of PA, women in the present synthesis rarely discussed their physical capability to be active. When this did occur, women only described physical exhaustion as a barrier and injuries/health problems or concerns, which had divergent effects. However, despite research that recruited participants based on having a health diagnosis being excluded for analysis, there were no instances of women describing how

their good health or physical fitness/ability enabled their PA. It therefore seems that healthy women rarely consider their own physical capability to be active, despite the obvious relevance of physical capability for enabling PA. The TDF category of 'physical skills' is not considered entirely appropriate for the categorisation of many features of physical capability regarding PA. An Olympic athlete might sustain an injury that renders them (temporarily or permanently) physically incapable of PA, despite exceptional physical skill. A new TDF domain, 'biomechanical capability' is therefore proposed, to sit beneath the physical capability COM-B domain and beside the 'physical skills' TDF domain. This addition would enable communication of this important distinction, which is highly applicable for PA, particularly for those whose biomechanical capability is most limited, such as people living with chronic illness/injury or physical disability.

Women frequently described having the social opportunity to be active. Factors that motivated women echoed previous work highlighting the importance of the social element of PA and of social influences on PA (van Uffelen et al., 2017; Shah et al., 2020; Peng et al., 2023). However, women appeared to have better direct social support for PA from health/fitness professionals and other women who wanted to be active together, than indirect social support from spouses/family or friends in the form of relief from childcare and household duties/responsibilities. Thus, whilst many women had the social opportunity to be active, physical opportunity remained limited. Further, many divergent factors under the physical opportunity domain have been identified as pronounced for women of low SES, whose physical opportunity to be

active is already disproportionately limited compared to other demographic groups, based on their limited resources.

3.5.6. Strengths, limitations and future direction for research

By mapping findings to the COM-B model, this systematic qualitative evidence synthesis provides a sensible starting point for anybody considering PA intervention design for women, in line with the BCW approach. The TDF and the COM-B model have enabled findings with practical utility for following the BCW approach to intervention design. Furthermore, demographic groups of women for whom PA interventions would be most beneficial have been identified alongside key considerations that should be made when designing targeted interventions for these cohorts. Healthy women's barriers and facilitators to PA in the five years before Covid-19 have been summarised. This synthesis provides a broad overview of women's barriers and facilitators during this time and has included evidence from diverse women across five continents. The full spectrum of eligible ages (18-65 years) were represented and papers were varied in respect of PA type, context, data collection methods, types of analyses and theoretical bases. The methodological quality of evidence was largely good, with just two studies excluded from analysis based on quality assessment. Certain characteristics (cultural heritage, country of residence and SES) heavily impact women's PA and future work should synthesise the available evidence exploring the barriers and facilitators to PA for these demographic subgroups of women, such that these more complex collections of PA determinants can be better understood. Future syntheses that identify women's barriers and facilitators to PA whilst differentiating between different PA domains

(domestic/household, occupational, recreational/leisure-time and exercise) would add value and promote health equity.

Certain subgroups of women could be considered somewhat overrepresented within this synthesis. For example, migrant cleaners' views may appear somewhat overstated, as one author contributed three papers (that originally formed three parts of a PhD thesis) to this review (Articles 10, 11 & 12). There was repetition of identical quotes across these papers, revealing that the same participants and dataset had been analysed, reported and interpreted multiple times. This overrepresentation of women who are migrant cleaners is considered less problematic within a qualitative evidence synthesis than in a quantitative review, as construct importance is not determined by quantifiable features, such as the frequency of discussion. Women who do not speak English were underrepresented within this synthesis, due to limitations in the author's capabilities. One critique of qualitative syntheses is that data collection and analysis are conducted by different researchers. This can create problems by adding an extra layer of interpretation, which increases the likelihood of participants' views being misrepresented (van Nes et al., 2010). The combined use of inductive and deductive coding seeks to remedy this somewhat but cannot account for the initial authors' decision-making regarding which data and themes should be included. Further, whilst the topics that participants discuss are undoubtedly impacted by the questions that researchers ask, without access to the original interview/focus group schedules and other relevant data collection tools, assessing the implications of researcher bias during the design of data collection guides/tools was not possible. Future authors aiming to enhance the

academic rigour of qualitative evidence syntheses might achieve this by gaining permission to access the data collection guides and tools used by the original authors.

3.5.7. Real world implications

In Western society women of low SES, mothers, Muslim women and migrant women (particularly those from gender conservative cultures) face particular challenges in respect of PA participation. Health professionals, fitness professionals and other women within the social world appear to allow women the social opportunity to be active. However, traditional gender roles, responsibilities, expectations and pressures leave little time to engage in healthy PA, particularly for the modern woman, who also undertakes paid work. To provide real opportunities for PA that allow for women's capability and motivation, it will be important to provide:

1. Affordable – preferably free - activity opportunities for women of low SES that consider the cost of travel and childcare as well as attendance/membership
2. Culturally appropriate activity opportunities and spaces for Muslim women and migrant women from gender conservative cultures
3. Flexible activity opportunities that can work around women's busy schedules and highly demanding roles and responsibilities
4. Programmes of PA targeted towards mothers, which focus on alleviating the maternal guilt associated with taking time for oneself, to be active.

3.6. Summary and conclusion

Women are generally capable of PA and are motivated by their desire to be healthy, enhance their social world, be there for loved ones and

manage physical appearance in line with societal beauty standards. Despite being motivated and capable, women frequently lack the physical opportunity to be active. Socioeconomic status, culture, motherhood and body image heavily impact women's PA, exacerbating pre-existing health disparities. In line with the in-group diversity of this demographic group, women's PA determinants are varied and complex but women of low SES, Muslim women, migrant women from gender conservative cultures and mothers would benefit from special attention/targeted work. Women who experience intersectionality in respect of these characteristics are likely to face disproportionate barriers to the types of PA that best promote health and wellbeing, which will undoubtedly contribute to increased and avoidable health inequalities.

Chapter 4: Study 2

Women's barriers and facilitators to physical activity in 2020-2025: A qualitative evidence synthesis using a forward citation search strategy

4.1. Overview

In this chapter, the qualitative evidence exploring women's barriers and facilitators to PA between March 2020 and February 2025 is summarised. The reasoning for synthesising papers from this timeframe is explained and the potential impact of the changing environmental and political context on women's barriers and facilitators to PA is considered. The use of a forward citation approach to evidence searching is justified and the refinements made to the methods used in Chapter 3 are explained. Data was analysed, findings were mapped onto the COM-B model and the TDF with results comprehensively detailed in a table. Key findings and important nuances are highlighted and additional determinants identified within this synthesis are discussed.

This chapter can be considered a further phase of 'understanding' according to the BCW (Michie et al., 2014) and a further phase of 'discovery' according to the Double Diamond (Design Council, 2005).

4.2. Introduction

This chapter aims to add to the knowledge gained from Chapter 3, to identify additional barriers or pertinent changes that might have

occurred in respect of women's barriers and facilitators to PA since 2020.

There is a documented bidirectional relationship between mental health and PA (Azevedo Da Silva et al., 2012), whereby people with poorer mental health appear more likely to be sedentary and less likely to be physically active longitudinally (e.g. Roshanaei-Moghaddam et al., 2009). Since Covid-19, enduring change has been documented in respect of global mental health decline (Leung et al., 2022; Robinson et al., 2020; Wu et al., 2021) and altered travel practices, alongside increased working from home (Greaves et al., 2024). These three factors have likely impacted women's barriers and facilitators to PA.

The year ending June 2024 saw record migration (Sumption et al., 2024). Increasing numbers of women, from increasingly multicultural backgrounds will thus be trying to manage the expectations and requirements of their cultural in-group within a new country of residence that may not appropriately accommodate these, based on differing cultural and social norms. In the UK, 'Brexit', whereby the United Kingdom opted to leave the European Union (EU), has prompted citizens from the EU to leave the UK, whilst migration from non-EU countries particularly within Asia and Africa has increased (Sumption et al., 2024). Afghan women faced more barriers to PA in the UK, than in Afghanistan (Safi & Myers, 2021), so migrant women appear to face additional challenges in their pursuit of PA, which has implications for public health. Further, women's body image cannot be untangled from societal beauty standards, which are culturally governed (Abdoli et al., 2024) so

the determinants of PA that relate to women's culture and body image may have been complexified in recent years, due to mass migration.

Between 2019 and 2020 an additional 70 million people began to live in extreme poverty, bringing the global extreme poverty rate up to 9.7% and reversing decades of poverty reduction progress (Hasell et al., 2022). Aligned with findings from Chapter 3 relating to the impact of SES on engagement in different PA domains, people on higher income report more leisure-time PA and less house/care work than those on lower income whilst people with a lower level of formal education report more time in house/care work and paid work compared to their more educated counterparts (Cusatis & Garbarski, 2019). The types of PA typically undertaken by those of the lowest SES are therefore the least beneficial for health and wellbeing promotion (e.g. Scarabottolo et al., 2022) so do not address health-related inequality between different socioeconomic groups. Considering the implications of SES for women's barriers and facilitators to PA alongside the global increase in poverty, more women are likely experiencing increased barriers to exercise and leisure-time PA, but increased facilitators to domestic/household and occupational PA. It is therefore important to understand whether there have been changes to women's barriers and facilitators to PA in recent years, because of factors relating to global poverty.

4.2.1. Forward citation searching

In Chapter 3, the single line search strategy yielded many articles (>35,000 articles), that were time consuming to screen. A more pragmatic search strategy was therefore required for the completion of Chapter 4, in line with the timescales of this PhD. Haddaway et al. (2022)

describe limited application of forward citation searching within otherwise rigorous systematic reviews. Iterative forward and backwards citation searching outperformed the traditional method of applying keyword search queries to bibliographic databases using Boolean logic (Hinde & Spackman, 2015) and retrieved 76 papers of relevance, including all 15 identified by keyword searching. A cross-sectional study found that 172 of 215 Cochrane reviews had implemented backward citation searching, compared to just 18 that reported forward citation searching. Forward citation searching can therefore be considered an underutilised, but potentially effective means of identifying research papers that fulfil given criteria.

Articles published between 2020 and 2025, which qualitatively explored women's barriers and facilitators to PA were analysed. Aligned with the previous synthesis (Chapter 3), findings were mapped onto the COM-B model and the TDF. Additional identified determinants are discussed below.

4.3. Methods

This systematic qualitative evidence synthesis implemented a refined version of the methodology from Chapter 3. The ENTREQ statement for enhancing transparency in reporting the synthesis of qualitative research has again been adhered to, but to avoid repetition the methodological detail that has remained consistent between the two chapters has not been repeated here (See Section 3.3.).

4.3.1. Eligibility criteria

Eligibility criteria for inclusion and exclusion remained the same as in Chapter 3, with an altered time-period (March 2020-February 2025) and

an additional exclusion criteria eliminating research exploring women's barriers and facilitators to PA in the context of Covid-19. This is because the contextual specificity surrounding national government mandated lockdowns would limit transferability of findings. Reasons for article exclusion can be seen in Table 6, alongside the number of articles excluded on that basis during full text screening. Exclusion criteria were applied hierarchically, whereby if an article could have been excluded for more than one reason, the documented reason was the first in the hierarchical list of exclusion criteria outlined in Table 6.

Table 6: A table showing eligibility criteria and reasons for exclusion during full-text screening

Exclusion criteria	**No. full texts excluded on this basis**
1. Not peer-reviewed	13 (11 theses, 1 book chapter, 1 conference presentation)
2. Not published between 1st March 2020 and 28th February 2025	2
3. Does not fully or directly answer the research aims (including not distinguishing between PA and other behaviours)	2
4. Quantitative	6 (2 of which reported insufficient qualitative data for analysis)
5. Reviews/syntheses	0
6. Includes male participants	7
7. Includes participants outside ages 18-65	3 (2 included participants over 65, 1 did not specify age range of participants)
8. Includes elite athletes	1
9. Participants recruited based on being >/<12 months pre/post-partum or pregnant	0
10. Participants recruited based on having a health condition	0
11. Data collected during Covid-19	4

4.3.2. Search strategy

To identify relevant research, forward citation searching was implemented. Any article that had cited one of the 23 articles analysed in Chapter 3 in the five years following its completion, was included for screening.

Google Scholar was used for article searching because comprehensive evaluation of the forward citation searching capabilities of 59 different databases found that Google Scholar outperformed all others and retrieved all relevant forward citations (Gusenbauer, 2024).

4.3.3. Study selection and screening

Following removal of 17 duplicates, the titles and abstracts of 421 unique articles were screened. There were 51 full text articles screened for eligibility, 13 of which were eligible and included for analysis (See Prisma Flow Chart in Figure 11).

4.3.4. Quality assessment

The 10-item CASP checklist was implemented to assess the methodological quality of the research, using the same approach as in Chapter 3 (See Section 3.3.5.). Full assessments can be seen in Appendix 9.

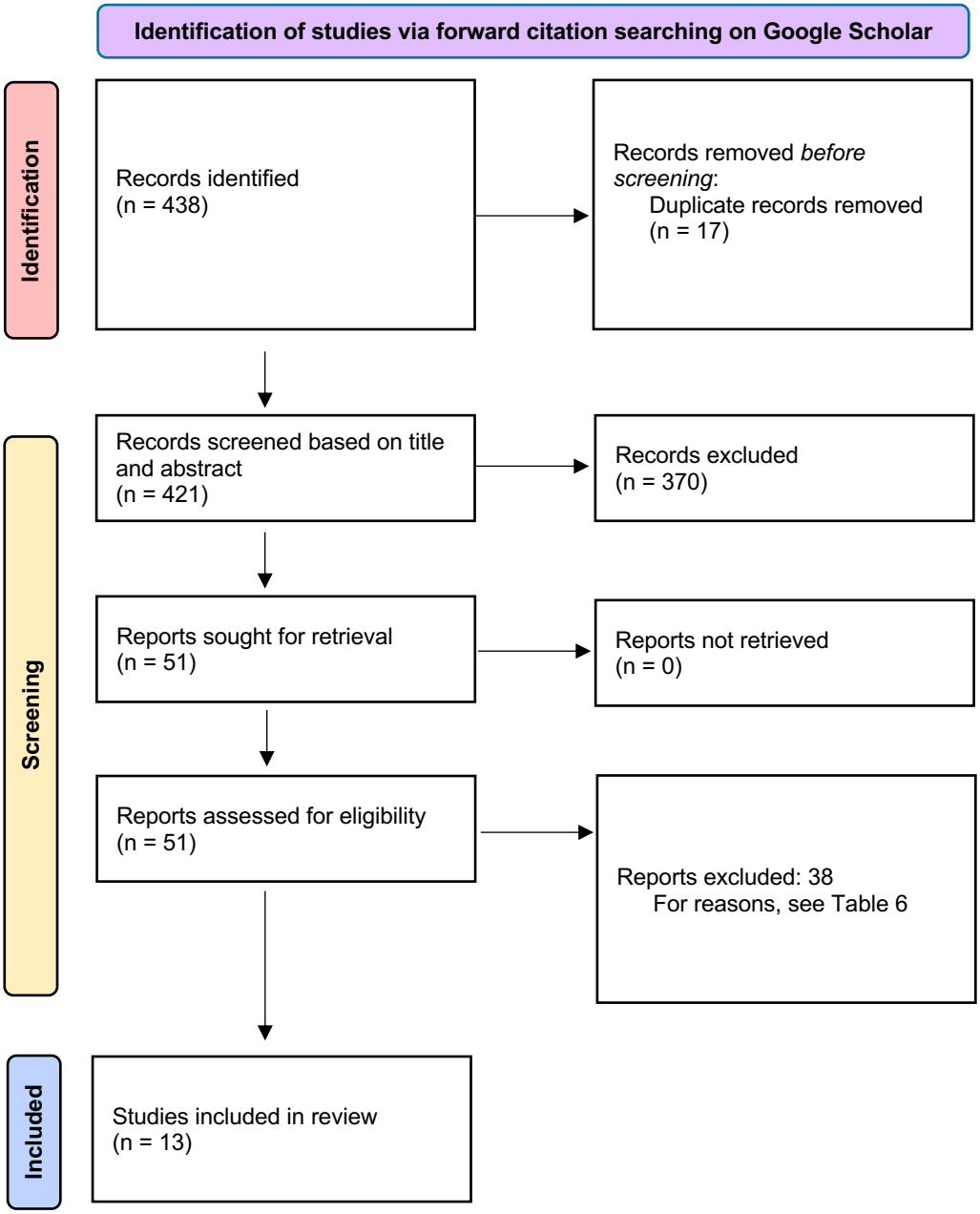


Figure 11: Prisma Flowchart showing the number of records identified, screened and excluded at each stage of synthesis

4.3.5. Data extraction

Each of the 13 included articles' authors and date of publication can be seen in Table 7 alongside its identifying number. Extracted data included country of publication, participant N, participant age, specific population under study, PA type explored, data collection method, context, recruitment strategy, theoretical basis and method of analysis (See Appendix 10). Articles were relatively diverse, exploring the PA behaviour of diverse women from 11 countries across various contexts and exercise types. Domestic/household, caregiving and/or occupational PA were not however explored. Recruitment strategies, methods of analyses and theoretical bases were relevant and varied. No paper included in this review used the COM-B model as its theoretical foundation.

Table 7 - *A table showing each article's identifying number, lead author and year of publication*

Identifying No.	Author(s) and date
1	Davis et al. (2024)
2	Enderle (2024)
3	Kim & Kwon (2025)
4	Laar et al. (2022)
5	Lenneis et al. (2022)
6	Lenneis et al. (2022a)
7	Leslie-Walker et al. (2023)
8	Rahbari & Mahmudabadi (2022)
9	Ryan et al. (2021)
10	Sanz-Remacha et al. (2021)
11	Soltani (2021)
12	Spotswood et al. (2021)
13	Streetman et al. (2023)

4.3.6. Coding, synthesis and analysis

Data was selected for analysis using the same criteria as in Chapter 3. The same bias reduction approaches were implemented, using the same Educated Friend and Supervisory Team (See Section 3.3.6).

A refined version of the analytical process was undertaken, based on previous learning. This time, the first stage of coding (inductive free-coding) followed the same analytic process, including cross-coding of data that could sit within more than one category (see coding framework in Appendix 11). The deductive coding stage was not undertaken, rather inductively coded determinants of PA were instead deductively mapped onto the COM-B model and the TDF. This is because no additional knowledge was gleaned from the deductive coding process when undertaking the previous systematic qualitative evidence synthesis and was pragmatic, due to time constraints.

4.4. Results

Across 13 articles, 71 unique determinants of women's PA were identified (See Table 8). Determinants related to all of the COM-B domains, all 14 TDF domains and the additional proposed TDF domain of 'biomechanical capability' that was considered to enhance the model (See Section 3.5.5.). All identified determinants within this synthesis are mapped onto the COM-B wheel (see Figure 12).

There was significant overlap between the determinants identified in Chapter 3 and this chapter. There continued to be relatively little discussion of capability, particularly physical capability. Physical and social opportunity remained highly impactful and topical, although

many more social opportunity-related barriers were identified within this synthesis than the previous. Reflective motivation remained the most well populated COM-B component, but automatic motivation was again discussed relatively little. PA continued to be automatically motivated by positive reinforcement and prevented by negative emotional responses. Women's gendered experience appeared to have increased salience in relation to PA in this more recent synthesis, which was primarily evident when exploring social opportunity. Specific barriers that were identified within this chapter, that had not been identified in the previous chapter included, but were not limited to, misinformation (psychological capability), weakness (physical capability), lack of social support (social opportunity), unsupportive infrastructure (physical opportunity) and anticipated stigma (reflective motivation). Guilt was no longer described as divergent, instead consistently acting as an automatically motivated barrier to PA for women in this synthesis. Facilitators that were identified here but not previously included (but were again not limited to) having and developing physical skills (physical capability) and some factors relating to body image/weight management (e.g. physique goals, perceiving PA as a healthy weight management tool). The impact of male oppression appeared to have greater relevance in this synthesis, with the patriarchy highlighted as a barrier and single sex spaces cited as a facilitator. It is not clear whether these differences are explained by the questions researchers asked, or by a change in/heightened awareness of, the female experience.

Findings with greatest complexity, nuance or salience are discussed in detail (Sections 4.4.1.-4.4.6.), alongside findings that build on those from Chapter 3. The same notation approach was utilised.

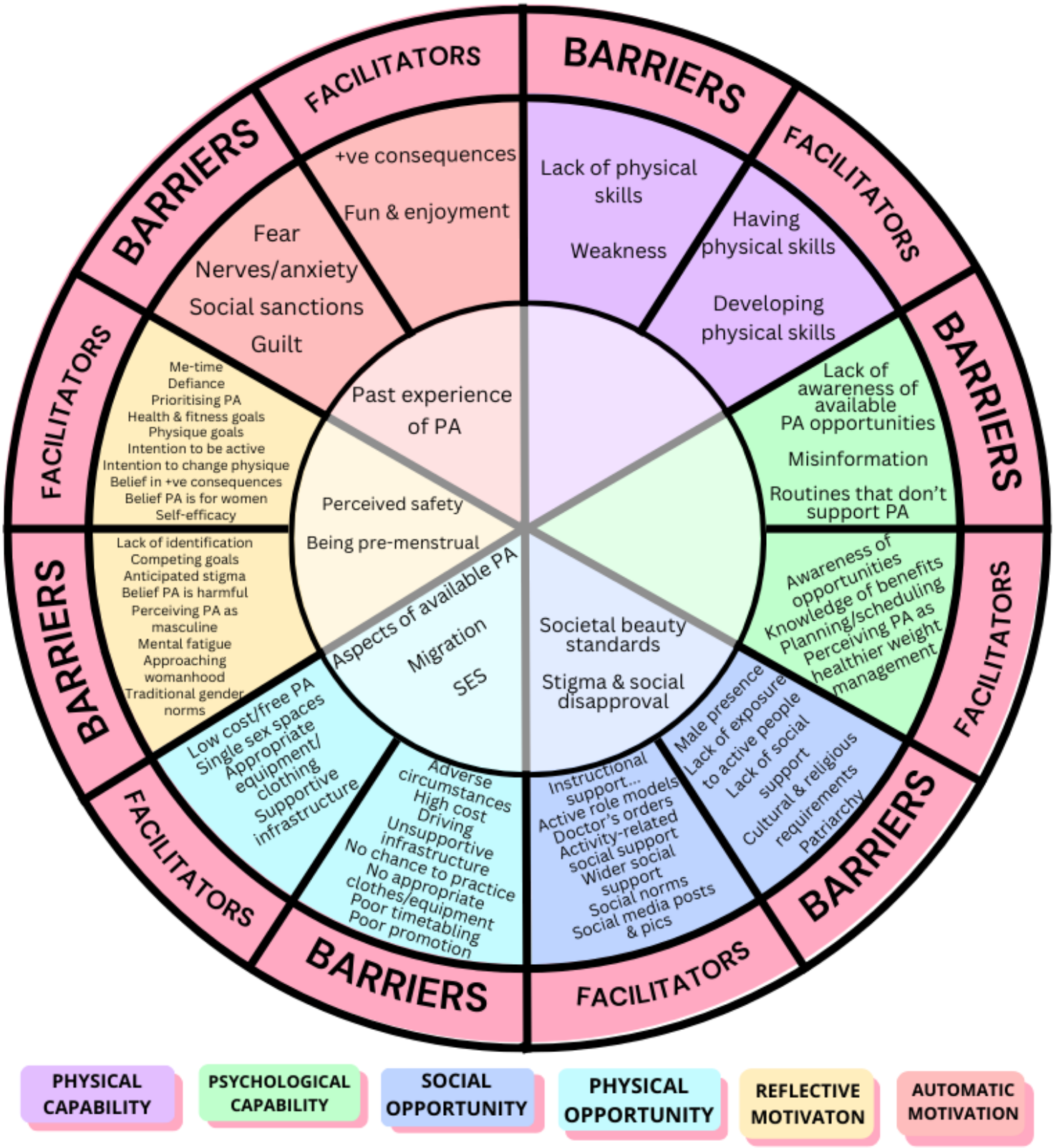


Figure 12: Identified PA determinants mapped onto the COM-B model, as it sits within the centre of the Behaviour Change Wheel

Table 8: A results table showing women's determinants of PA between 2020 and 2025, with findings mapped onto the COM-B model and the TDF

(Page 1 of 10)

COM-B	TDF	Category	No. of studies in which this is identified	Definition	Example quote[4]
Physical capability	**Physical skills**	**Barriers**			
		Lack of physical skills	4	Not having the necessary physical skills to undertake (general or specific types of) PA safely without injury.	*"I tried to learn cycling [...] I couldn't manage it, and honestly, after many attempts, it seemed impossible for me to learn it"*
		Facilitators			
		Having the physical skills	1	Having the necessary physical skills to undertake PA safely without injury.	*"Participants' swimming skills influenced the extent to which they could use the swimming space"*
		Developing physical skills	3	Developing the physical skills necessary to undertake PA safely without injury.	*"Through their participation in Bike Bridge, the women acquired cycling skills [and] developed essential physical capital (e.g., coordination and balance)"*
	Biomechanical capability	***Barriers***			
		Weakness	1	Not having the strength required to undertake PA safely and without injury.	*"My body felt too weak [to cycle]"*
Psychological capability	**Knowledge**	***Barriers***			
		Lack of awareness of available PA opportunities	2	Not having knowledge and awareness of places and groups that suit the individual's needs, preferences, lifestyle and income.	*"Poor visibility of facilities meant uncertainty of where to access which was a critical factor in individuals not participating in sport and physical activity"*

[4] *Under subheading 'Both', quotes marked with a [B] illustrate that category acting as a barrier, whilst [F] denotes a facilitator*

		Misinformation	1	Having inaccurate or incorrect knowledge or information around the implications of engaging in PA.	*"They say sports can harm women or harm their virginity, but these are baseless and unscientific claims"*
		Facilitators			
		Awareness of appropriate PA opportunities	1	Knowledge and awareness of places and groups that suit the individual's needs, preferences, lifestyle and income.	*"I am aware of the sessions available because I volunteer at the University"*
		Knowledge of benefits of PA	3	Knowledge and awareness of the (physical, psychological, economical and/or environmental) benefits of engaging in the given behaviour.	*"Sport is not really my thing but as I am training to be a nurse, I understand why it is important for your health"*
	Behavioural regulation	**Barriers**			
		Routines that are unsupportive of PA	1	Daily routines that are not conducive to taking part in PA (usually by limiting available time and/or being inherently sedentary).	*"I have to do the school run twice a day, so Emma's school run defines the day on those two days, because we have to be back for the school run"*
		Facilitators			
		Planning/ Scheduling	5	Planning, organising and scheduling by the individual, to make time for PA	*"I was able to manage my time more and just switch up the schedule so I can have an equal amount of social life and also do the exercise"*
	Memory, attention and decision processes	**Facilitators**			
		Perceiving PA as the healthy way to manage weight/physique	1	Having the belief that PA is a healthier form of weight/physique management compared to other alternatives (e.g. restrictive dieting or cosmetic surgery).	*"Exercising is a healthier way to lose weight, than going under the knife"*
	Mental skills	**Facilitators**			
		Mental skill development	2	Developing the mental skills that are supportive of (general or specific) PA.	*"Additionally, they learned the basics of bike repair. These newfound competencies significantly enhanced the women's everyday spatial mobility"*.

Social opportunity	**Social influences**	**Barriers**			
		Male presence	7	The (immediate or peripheral) presence of men during PA.	*"super embarrassing with a man around. I don't want to exercise with them around, it's just not comfortable."*
		Lack of exposure to active people	1	Not seeing or having relationships with active people (especially active women).	*"I never even considered the idea of learning to ride a bicycle. In Syria, I witnessed women riding bikes only a handful of times"*
		Lack of social support	4	Not having the social support required to support PA engagement (may relate to family acceptance or to practical support such as childcare and transport).	*"I used to do horse riding and jogging [...] But now, being a mum of two very young children and having the husband not be home during the days [...], I'm very restricted."*
		Cultural and religious expectations and requirements	7	Expectations and requirements that are placed on an individual (or that an individual places on themselves) based on (or governed by) the culture/religion they identify with or come from.	*"'There's some principles in our religion [. . .]. When you say, you're Muslim you also have to abide to some rules."*
		The patriarchy	4	A societal or governmental system in which men hold power over women.	*"According to Ziba, men positioned themselves as the decision-makers and used religion as a disciplinary tool to preserve their traditions by controlling women's bodies and defining eligible embodiment and spaces for Muslim women's leisure".*
		Facilitators			
		Instructional support, supervision, expertise and encouragement	4	Instructional support, supervision, expertise and/or encouragement from a person (or people) who is (or are) knowledgeable about/educated regarding PA	*"If the instructor encourages me, I feel more engrossed, and don't think about whether I'm getting tired. It is more fun, and time flies"*
		Social media posts and	2	Social media posts and imagery of physically fit (often considered 'perfect') women's bodies and of women participating in PA.	*"I saw a video clip on IG (Instagram) [...]. A girl was spinning on a pole [...]. She looked so cool and graceful. I wanted to try it too"*

		imagery of fit women			
		Active role models (especially women)	2	Having active role models. Does not depend on the presence/absence, nature or extent of any relationship but is enhanced if that role model is a woman.	*"I am inspired by Sania Mirza. She is not only an excellent tennis player, but also a great inspiration for young women like me"*
		Doctor's orders	1	Advice from health professionals to be active.	*"Many participants attended swimming lessons due to their GPs recommendation"*
		Activity-related social support	9	Social support which is specifically and directly relevant to supporting the active behaviour (e.g. by attending exercise classes together).	*"In the beginning, when I was still scared of riding my bike alone outside, I used to slowly ride short distances while my husband jogged beside me"*
		Social norms that are supportive of women's PA	2	Often unspoken societal rules that situate PA as a socially acceptable behaviour for women.	*"Everything is different here! Everybody rides a bike."*
		Wider social support	2	Social support that enables PA by helping women to fulfil the roles and responsibilities that typically act as a barrier to PA (e.g. by providing childcare).	*"For one participant, co-workers facilitated them to finish work slightly early some days so they could come to an exercise session"*
		Both			
		Societal beauty standards	3	Culturally defined ideals and perceptions about what is or isn't physically attractive and desirable.	*"[Muscles] are not pretty [on women]. They destroy the feminine delicateness, and that is not pretty."* [B]
					"Based on Korean popular culture, 'apple hip' refers to the shape of a women's hip and buttocks which resembles the shape of an apple. Aesthetic exercises also include 'apple hip' workouts by mainly focusing on hip and glute" [F]
			7		*"If a woman rode a bike in my country, the community would label her as immodest and indecent. In our*

		Stigma and social disapproval		Societally held negative beliefs about something and the disapproval associated with not adhering to these societal expectations.	*community, if people gossip about a girl, it becomes a problem, and she risks damaging her reputation."* [B]
					"Some interviewees mentioned being encouraged by family and friends to do more physical activity [...] for various reasons, including beauty, fitness, and health. The encouragement and expectations, if not fulfilled, would contribute to perceptions of laziness." [F]
Physical opportunity	**Environmental context and resources**	**Barriers**			
		Adverse or challenging personal circumstances	1	Adverse or challenging personal life circumstances (e.g. homelessness, poverty, bereavement, forced migration).	*"I have been good at sports since my childhood, my parents always supported me, and I always wanted to participate in national competitions and make my parents proud. But my father's sudden death changed everything for me. . .my dreams, plans, aspirations. . . all changed"*
		High cost of PA participation	1	The financial cost of engaging in PA.	*"I noticed they have a swimming pool, I would like to try and learn how to swim. I did go in there to ask but it was quite expensive. If the university did discounted learn to swim sessions, that is definitely something I would sign up to."*
		Driving for transport	1	Driving as a primary mode of transport (often relates to the physical environment and appropriateness of different modes of transport).	*"I exercise less now than when I lived back home, I don't walk or run as much [now] because I drive"*
		Infrastructure that is not supportive of PA	1	Not having the basic physical and organisational structures and amenities to support PA (e.g. bike paths, sports fields, gyms).	*"Sama highlighted the lack of a suitable traffic system, bike paths, and regulations in Syria [for cycling]"*
		Limited opportunity to	2	Not having the opportunity to participate in PA, to practice and gain confidence or develop the necessary skills.	*"I've never played sports or exercised. I wasn't interested in any of those things. Maybe it was because I didn't get the chance to try it when I was young."*

		practice or develop skills			
		Not having appropriate clothes or equipment	1	Not having appropriate clothing or equipment to engage in PA and to feel dignified whilst doing so (e.g. appropriate footwear, sports bra or an exercise mat).	*"I don't really have sportswear or suitable footwear to take part"*
		Poor timetabling of PA	1	Timetabling of PA opportunities that does not suit women's daily schedules	*"The sessions don't give you enough time to get ready, shower, have lunch and get back to your next lesson…I would prefer if [sport and PA sessions] lasted for 30–40 min instead of 1 hour."*
		Poor promotion of PA opportunities	1	Poorly promoted opportunities to engage in PA.	*"Well…I don't think there is much advertising, I saw people advertising sport at the fresher's fayre (university induction), but I haven't seen any advertising since"*
		Facilitators			
		Appropriate equipment/ Clothing	2	Having the right equipment and/or clothing to engage in PA and to feel dignified whilst doing so (e.g. appropriate footwear, sports bra or an exercise mat).	*"Some respondents participate in mixed-gender aquatic leisure places while retaining their hijab. This group has developed their own alternative styles of hijab to be able to participate in aquatic leisure activities while also remaining loyal to their religious identities"*
		Infrastructure that is supportive of PA	2	Having the basic physical and organisational structures and amenities to support PA (e.g. bike paths, sports fields, gyms etc.).	*"To be honest, I find it quite safe to cycle in Freiburg. The bike lanes are spread across the city, and everything is well-organized. This environment inspires you to learn cycling and incorporate biking into your daily routine"*
		Low cost (or free) PA opportunities	2	Having low cost/free appropriate PA opportunities available.	*"If it's cheap it might make me go [to PA classes]"*
		Single sex spaces	5	Spaces for women to be active without men being present (including ensuring that men cannot see into the space from outside).	*"Participants were happy that the interventions were women-only and that they were surrounded with women*

					similar to themselves in a small private gym-space where they felt safe from judgment"
		Both			
		Aspects of available activity types	4	Aspects of available activity types, which appeal (or not) to the individual.	*"Walking isn't, like, super empowering because a lot of people can do it"* [B]
					"Most commented on how much they valued the design of the interventions (i.e., the exercises and machines selected, easy low intensity intervention start, gradual progression)" [F]
		Migration	4	The relocation of people away from their usual place of residence to another (usually involves crossing international borders).	*"They explained that being a migrant and lack of access to traditional and 'free' support for childcare restrict further their leisure time and activities."* [B]
					"After coming to New Zealand as a skilled migrant, she was attracted to the aquatic leisure culture of the country and started to learn and practise body surfing three times per week in the ocean."[F]
		Socioeconomic status	1	A person's social and economic position. Relates to factors such as education, income and occupation.	*"Women from higher social strata enjoy the freedom to make choices about their destinations, means of transportation [including active travel], and companions. […] In contrast, the Somali and Iraqi narrators did not report significant differences between the velomobility behaviors of different social classes in their respective countries" [B&F]*
Reflective motivation	**Goals**	**Barriers**			
		Competing goals and priorities	6	Goals (or priorities) of the individual that get in the way of being active (e.g. education, socialising), often by leaving little available time.	*"I have children and have other priorities, that take up time… so, I don't get much time to do sport"*
		Facilitators			

		Prioritising PA	2	The cognitive process of prioritising PA over other tasks that are demanding attention and/or resources.	*"If you want (to do something), you can, because you make time. I remember even when my mother was sick, I arrived on time [to the intervention] arriving at 2.30 p.m. and staying until 4 p.m. I looked after my mother and I went to the PA sessions. Another person would have said "poor woman, I'm not going to leave her alone."*
		Health and fitness goals	2	Having goals related to improving or maintaining physical health and fitness.	*"As I grow older, I want to continue to have all the movements and like function that I have now,"*
		Physique/ bodyweight goals	2	Having goals related to improving or maintaining physique/bodyweight.	*"I think it's like nine out of ten women who want to be skinny and one wanting to actually be healthy. For me I do it [PA] to maintain my physical body shape"*
		Defiance/ Resisting gender stereotypes	4	A drive to resist the conventional expectations that are placed on men and women.	*"Our society does not like girls dressing like boys, and people do not like girls wearing tracksuits and short trousers to play sports. I have been criticized for wearing sports trousers. I rejected these notions because they are socially constructed ideas."*
	Intentions	**Facilitators**			
		Intention to be active	1	Having the intention to engage in PA.	*"I am going to do PA because I want to."*
		To achieve 'me-time'/engage in self-care	5	Using PA with the intention of achieving some 'me-time' as an act of self-care.	*"When I swim, it's something I do for myself, I don't think about others. Now it's myself I have to think about."*
		Intention to manage/change physique/ bodyweight	2	Using PA with the intention of changing or managing physique/bodyweight.	*"I start thinking, "Well, if you want to change yourself and you wanna be happy and you want to lose weight, you need to be working out."*
	Beliefs about consequences	**Barriers**			
		Anticipated stigma	5	Expecting to be stigmatised or receive negative social responses whilst engaging in PA.	*"I want to avoid the risk of running into people who will throw some negative comments at me. [. . .] Let's*

					assume I'd dress in a burkini, which I would not do, because . . . let me try to put that in a nice way, I don't think that I'd be able to cope with those kind of people that will stop and tell me that I shouldn't be there or that I should take the burkini off."
		Belief PA is harmful	2	Holding a belief that engaging in PA is likely to result in injury or be harmful in some way.	*"if we are realistic, boxing destroys the face, and if you have seen, wrestlers have broken ears. [this] may not be important for men, but the reality is, it is very important for women."*
		Facilitators			
		Beliefs in positive consequences of PA	7	Expecting positive consequences from PA.	*"Women declared that an ideal body is attainable if they engage in strict exercise and body discipline"*
		Belief that PA is appropriate for women	2	Having a perception that (general or specific) PA is suitable for women in terms of the activity itself and the outcomes of engaging	*"Yes, women's sports like gymnastics have a more feminine nature, and sports like boxing have a more masculine and aggressive nature."*
		Both			
		Perceptions of safety	5	How safe or unsafe women perceive engaging in PA to be (may relate to perceptions of environmental safety or to consequences of participation that relate to personal safety)	*"the lack of a suitable traffic system, bike paths, and regulations [...make...] it dangerous to ride a bike"* [B]
					"To be honest, I find it quite safe to cycle" [F]
	Beliefs about capabilities	**Barriers**			
		Perceiving PA as masculine	2	Having a perception that (general or specific) PA is suitable for men and not women.	*"it is better if women do not play aggressive sports because women's bodies are more sensitive.'*
		Mental exhaustion/ fatigue	2	A state of extreme mental tiredness.	*"I become too fatigued and unmotivated to continue my normal workouts"*

		Facilitators			
		Self-efficacy	5	Belief in one's ability to engage in PA (regardless of actual ability)	*"I feel I'm capable of anything. I feel that I can go walking, go to Zumba, do squats"*
		Both			
		Being premenstrual	2	Being at the point of the hormonal cycle that happens shortly before menstruation	*"So generally, I like being really active, I'm at the gym five or six days week. But the [...] premenstrual feelings [stop] me from being active I feel like. Like I don't have the motivation, I just get grumpy and tired and unmotivated."* [B]
					"Participants reported increasing their exercise, due to perceived premenstrual fatness and increased negative feelings about the body." [F]
	Social role and identity	**Barriers**			
		Lack of identification with participants	2	A belief that those who participate in PA are "not like me" (can be related to a specific activity or to being an active person generally).	*"I find it difficult to fit in [within University sport] because I am 42, a lot of the university students are 18–21 (years old) so I feel very awkward."*
		Ageing and approaching womanhood	1	Getting older, nearing adulthood and taking on the role of a woman (as opposed to a girl)	*"When girls are children, they are permitted to play whatever they want. But when they grow up, they are asked to leave sport(s)."*
		Traditional gender norms, roles and expectations	9	The norms, roles and expectations that have traditionally been placed upon women (primarily relates to being a mother, wife and caregiver)	*"that felt more natural like mummy doing [bedtime] and daddy going out to the gym"*
		Facilitators			
		Shared sisterhood/ sense of	3	A sense that people who participate in PA are "like me" and that I fit in with participants (can be related to a specific group/activity or to being an active person generally).	*"We've formed a group, we are more united, I think. And then, we encourage each other (among ourselves)"*

		belonging in active spaces			
		Body dissatisfaction	2	Holding negative thoughts or feelings about one's body	*"Weight loss was one of the most recurring themes, and most participants were not satisfied with their body type, size, and weight and wished to lose weight to become 'healthier' and 'slimmer' by engaging in more physical activity or doing sports."*
	Optimism	**Facilitator**			
		Optimism	1	Having the confidence that engaging in and/or sustaining PA is possible and will happen	*"Participants were optimistic that participation [in a PA intervention] would encourage them to get physically active or help them get back to being active after years of being inactive"*
Automatic motivation	**Reinforcement**	**Barriers**			
		Social sanctions	5	Social responses to individuals engaging in PA (often in the form of social disapproval)	*"My relatives object to my sports activities. They say that it is indecent for girls to do jumps and run races"*.
		Facilitators			
		Positive consequences of PA	7	Experiencing positive consequences because of engaging in PA (e.g. improved self-esteem, sleep, stamina, performance in other sport, feeling stronger, overcoming injury etc.)	*"After I do a strength training workout or something like that, and I feel, like, super strong, and like, I don't know, I feel like I could really do just about anything after I finish that. And that makes me feel, like, very empowered."*
		Fun & enjoyment	12	Intrinsic enjoyment of the activity itself or the context in which it is occurring.	*"So I think with me enjoying the type of physical activity I do, it really helps [...] because if I'm not going to enjoy it, then I'm not going to do it"*
		Both			
		Past experience of PA	3	(Positive, negative or lack of) past experience of engagement in PA	*"'I couldn't imagine myself playing sports. I've never done that before."* [B]

					"We used to run a lot at school and do long distance running, I have not done this for about 5 years. I used to enjoy it a lot though, I would join in if they did this at the university as I remember winning some of the competitions" [F]
	Emotion	**Barriers**			
		Fear	3	Fear of injuries, of being embarrassed, of getting left behind, of lack of safety etc.	*"I was afraid of falling down and getting injured"*
		Nerves, anxiety and apprehension	2	Nerves, anxiety and apprehension about PA participation (may relate to the setting in which PA occurs, or the activity itself)	*"While some described being concerned that they would either injure themselves or feel pain with exercise, others described being concerned that they would not be able to perform the interventions and expressed anxious feelings of being less fit or able than other women."*
		Guilt	3	A sense (accurate or not) that one has compromised a moral standard (often for personal gain).	*"Participation in EXOFFIT meant they were doing something just for themselves that was not related to caring for others or work and some felt selfish with their time in participating." [*B]
					"At the time, I'll be telling myself, "Oh, I don't need to work out. I'll just have a rest." But then the guilt kind of settles in" [F]

4.4.1. Physical capability

Three determinants related to 'physical skills'. Weakness was aligned with 'biomechanical capability' (the proposed additional domain within the TDF) and could present a barrier to PA. This impacted perceptions of safety during PA.

4.4.2. Psychological capability

Misinformation about the implications of PA was an especially pronounced barrier for Muslim women, as many had been led to believe that certain types of PA would compromise their moral and social standing as a religious woman, by damaging the hymen:

"I have heard that jumping from high places can damage virginity" [8P].

Routines that were unsupportive of PA appeared most pronounced for Mothers because:

"There are fixed things, aren't there, when you're a mother?" [11P].

Behavioural regulation was therefore particularly challenging for mothers, although planning and scheduling could offset this and enhance women's psychological capability to be active.

4.4.3. Social opportunity

Women's social opportunity to be active was most prominently limited by barriers that could be considered related to their gendered societal position. Muslim women, Korean women, obese women and women who used male-dominant PA spaces (including one woman who had

experienced stalking and harassment from a man in the gym, resulting in a Restraining Order) described male presence as a barrier to PA.

The complex interplay between religion and culture was heightened for women from Muslim, gender-conservative countries of origin who had migrated to Western countries. These women were inspired to be active based on social norms in their new country of residence, but had difficulty navigating competing and conflicting social norms and expectations between their origin and resident cultures. Where women from more gender conservative cultures were engaging in PA, only sports that suited traditional ideas of femininity were socially accepted:

"The image of a Korean female is incorporated with fragile and passive characteristics that have restricted women and girls from participating in physical activities/sports that are perceived to be active or aggressive" [3A].

One woman's *"narrative revealed that fear of losing patriarchal power, which perpetuates through religious and gender norms, is another factor that restricts Muslim women's participation in Aquatic Leisure Activities in the migration context. According to Ziba, men positioned themselves as the decision-makers and used religion as a disciplinary tool to preserve their traditions by controlling women's bodies and defining eligible embodiment and spaces for Muslim women's leisure"* [11A]. In some places, such as Iran, there were *"officially mandated dress codes [that] dissuade women from considering athletic activities"* [8A].

One woman described her husband as supportive of her running but showed how childcare was primarily her responsibility. She shared that were she to hypothetically tell her husband *"I'm going now [for a run], you put the kids to bed [then] obviously he'd be annoyed"* [12P]. This highlights a gendered experience whereby limited social support in the form of childcare presents a barrier to PA. This again appeared more prominent for migrant women, who rarely had wider family available locally to offer this type of support:

"My husband goes to his job and I am at home with my children [pointing to her sons]. I miss my mum and the support group that I used to have in Bangladesh" [11P].

Social media posts and imagery of physically fit women perpetuated societal beauty standards, pressuring women into PA, to manage their physique:

"Why am I even here [at the gym]? I'm hooked on those thoughts, on images of looking like a fitness model" [9P].

Women were driven to be active to adhere to societal beauty standards around slimness:

"We just say that we're losing weight, but it means 'trying to be thin'" [3P]

and having prominent and developed glutes:

"Based on Korean popular culture, 'apple hip' refers to the shape of a women's hip and buttocks which resembles the shape of an apple" [3A].

However, some women were dissuaded from partaking in PA because

"[Muscles] are not pretty [on women]. They destroy the feminine delicateness, and that is not pretty" [8P].

The idea of *"feminine delicateness"*[8P] was closely linked to stigma and social disapproval, which were again most pronounced for Muslim women from gender conservative backgrounds. Stigma and social disapproval could be related to women: undertaking PA generally, undertaking specific types of PA that were not perceived as feminine, undertaking PA with men present or undertaking PA in clothing that was not deemed suitably modest or culturally congruent.

4.4.4. Physical opportunity

Living somewhere with infrastructure that supports PA (e.g. bike paths, environmental safety and green/blue spaces) enhanced women's physical opportunity to be active.

Single-sex spaces were particularly important for creating the physical opportunity for Muslim women to be active, without social disapproval. One woman explained:

"I cannot go to public playgrounds, like many other girls, because boys mostly occupy public playgrounds, and my parents do not like it if we play in playgrounds. It is fine for me because I can play inside the campus [where there are single sex spaces to be active]" [4P].

Other women, including obese women and Korean women, described feeling more comfortable in single sex spaces. For body conscious women, "*not having a male present in the classes allows participants to feel secure and less concerned about revealing their bodies"* [3A].

Migration could impact women's PA variably depending upon a range of factors relating to their country of origin, new country of residence and personal circumstances. Those experiencing the greatest socioeconomic deprivation typically experienced more barriers to PA. However, some women *"did not report significant differences between the velomobility behaviours of different social classes in their respective [home] countries"* [2A] and it was noted that *"cycling offers numerous advantages, including reduced transportation costs. This is especially important because the majority of forced immigrants arrive in the host country without employment or a source of income"* [2A].

4.4.5. Reflective motivation

Reflective motivation was again the most heavily populated COM-B component, despite all beliefs in positive consequences of PA being grouped. For women whose cultural background did not consider PA appropriate for women, participation was an act of defiance and rebellion that had to be sensitively navigated using a combination of cultural awareness and compromise. One woman explained:

"In order to play sports and continue my studies [in a field related to sport], I had to understand the rules of my family and society. I was good at sports, but there was huge social pressure to leave sports because I am a woman. Even though my parents were supportive, I was

not allowed to study in higher secondary school because many relatives were against women going for higher education and women playing sports due to relatives and community. But I did not give up; I studied at home, appeared at the exams as a private candidate, and passed them with good grades. These two years gave me the strength to fight for my rights. In these two years, I kept encouraging myself and saying to my parents that I would go to college [to study sport] if I passed the higher secondary exams" [4P].

Women had the intention to be active, often to engage in self-care/'me-time' and/or to manage their physique. One woman shared:

"Everything I do is for others. This is for me. Just for me. My time.... I was achieving something just for me.... I just, it was my time and I loved that. I loved that I was able [to be] like 'I'm going to the gym. Do whatever. This is my hour.'" [1P].

Perceiving PA as masculine was a prominent barrier for women from gender-conservative cultures with societally and culturally held ideals around 'feminine delicateness'.

"One interviewee mentioned that her father encouraged her to do sports to learn how to physically defend herself against sexual harassment" [8A], but all other women who perceived the environment as unsafe experienced this as a barrier to PA. One Muslim woman described having to compromise on religious dress-code requirements whilst undertaking Aquatic Leisure Activities because of her beliefs about the

consequences of not doing so, based on her physical skills and beliefs about her capabilities:

"It doesn't fit [with Islamic teachings], I know. But, I don't want to wear a lot of stuff because I don't really know how to swim against currents. So, if I drown with lots of clothes around me, that's my biggest fear as well. So, when I play in the sea, I try to dress as less clothing as I can. So, if I drown in the sea, I have better chances to go to the surface without lots of clothes" [11P].

Muslim women who wore a 'burkini'[5] whilst swimming anticipated stigma both from Non-Muslim community members, who may perceive this as odd and from their religious communities, who may perceive the figure hugging nature of this swimwear to be inappropriate and/or who may hold negative beliefs about women engaging in sporting activities in mixed sex environments, or in general. One woman shared:

"I want to avoid the risk of running into people who will throw some negative comments at me. [. . .] Let's assume I'd dress in a burkini, which I would not do, because . . . let me try to put that in a nice way, I don't think that I'd be able to cope with those kind of people that will stop and tell me that I shouldn't be there or that I should take the burkini off" [6P].

Women had less confidence in their ability to be active when experiencing mental exhaustion/fatigue and hormonal changes

[5] A women's swimsuit that covers the entire body, leaving only the hands and feet exposed

associated with being premenstrual heavily impacted this. A minority of women described PA as being facilitated when premenstrual, based on increased body dissatisfaction coupled with beliefs about the positive consequences of engaging in PA for physique management, despite the apparent lack of any positive reinforcement:

"I push myself even harder even though I'm feeling more tired. And in the end, I feel ten times worse because I'm so tired but still dissatisfied" [9P] .

One woman discussed her internal dialogue when pushing through premenstrual exhaustion, to address body dissatisfaction. She described thinking:

"You need to rest and slow down, but I want you to look like [a fitness model]" [9P].

In respect of women's social role and identity, the barriers to PA were again primarily gender-centric. Traditional gender norms, roles and expectations appeared to be almost exclusively unhelpful for women's PA. These roles and expectations arrived in childhood, but amplified as womanhood approached and progressed:

"For girls, it is harder to engage in schools' sports activities because of the gender issues. In some communities and cultures, as a girl, you have responsibilities at home, you know, straight after school they [the girls] have to go home, do chores and help their mums. Also, as I

observed, it is not a priority for many families to send them [girls] to do sport and to pay the fees." [11P] .

4.4.6. Automatic motivation

Social sanctions were negatively reinforcing. These typically involved social disapproval from in-group gender-conservative community members, who considered active women deviant, inappropriate and shameful. One woman illustrated the culturally governed and gendered nature of this barrier:

"I was newly married when my mother-in-law prevented me from trying to learn how to ride a bike because it is not appropriate for girls, especially for married women, to ride a bike in Iraq." [2P].

Women experienced emotional barriers to PA participation including fear, nerves, anxiety and apprehension. In the previous synthesis guilt was a divergent determinant of PA. Here, guilt was exclusively experienced as a barrier, again connected to women's gendered roles as caregivers and nurturers, based on a sense that engaging in PA is selfish as women's time should be spent providing care. One woman gave up a programme of PA because it:

"meant that I got home as they [her children] were getting in the bath, yes so it didn't really fit that well. It wasn't very nice to miss tea with the children. Just sort of very brief hellos and goodnights and stories" [12P].

Mothers' disproportionate guilt was a pervasive barrier to PA.

4.5. Discussion

In this chapter, the qualitative evidence exploring women's barriers and facilitators to PA that was published between March 2020 and February 2025, but which did not aim to understand these barriers and facilitators in the context of pregnancy or Covid-19 and the associated restrictions, has been synthesised. Evidence was identified using forward citation searching, whereby articles that had referenced one of the articles analysed in Chapter 3, were screened for inclusion. There were 13 eligible articles that collectively described 71 determinants of women's PA. These findings support the implementation of forward citation searching within reviews/syntheses and provide further support for an addition to the TDF named 'biomechanical capability'. Migrant women, Muslim women and mothers experienced a particularly complex set of barriers and facilitators to PA. Women's barriers to PA were heavily gender-centric, primarily relating to their traditional gender roles as primary caregivers. Themes around women using PA as a form of self-care/mental health management were more prominent in this synthesis than the previous. Guilt however was no longer described as having divergent effects on PA, acting only as a barrier to women's PA in this synthesis. Body image remained impactful. Social support and defiance in the face of gender stereotypes/social pressure enabled women to overcome the gendered barriers they experience in respect of PA.

4.5.1. Operational findings

Almost no included articles had the key words used for evidence searching in the previous synthesis, yet 13 were identified using forward citation searching. Thus, in line with Hinde and Spackman's (2015) recommendations, forward citation searching can be considered an

effective, although probably not exhaustive, means of evidence searching for reviews/syntheses. When considering the limited application of forward citation searching within systematic review literature that is otherwise rigorous (Haddaway et al., 2022), it is especially important to advocate for its implementation (alongside other methods) if reviews/syntheses aim to retrieve all the available evidence on a given topic.

During data analysis, further support was provided for the inclusion of an additional TDF domain named 'biomechanical capability'. This category was helpful for mapping the barrier 'weakness' onto the TDF, as this clearly relates to some aspect of physical capability that is not skill-related.

Recent developments in Artificial Intelligence have relevance for undertaking future systematic reviews and evidence syntheses. This is however considered within the discussion chapter (Section 10.4.10.).

4.5.2. Socioeconomic status and women's PA

Changes in SES result in changes to health (Barakat & Konstantinidis, 2023). Whilst SES was highly impactful in terms of women's physical opportunity to be active across both syntheses, the specific factors related to this differed somewhat. Social disapproval, which is experienced more by people of low SES (Kraus et al., 2017), appeared to have remained significant across the two time periods. Perceptions of safety were important and women of low SES are more likely to live in less safe environments (Mouratidis, 2020), so experience more barriers in this regard. In this synthesis, pertinent features that impacted women's physical opportunity to be active and which were related to

SES included the high cost of participation, not having the appropriate clothing or equipment to engage in PA in a dignified way, adverse personal circumstances (including homelessness, poverty and forced migration), having had limited opportunity to practice and develop PA-related skills and living in an area where the local infrastructure is not supportive of PA (due to issues relating to safety, lack of bike paths, and limited availability of green and blue spaces). Migrants experience higher levels of unemployment and take longer to secure employment, than natives (Uhlendorff & Zimmermann, 2014), so migrant women are more likely to be unduly affected by SES-related barriers.

4.5.3. Demographic groups of women for whom PA determinants are most complex

Aligned with the documented rise in migration (Sumption et al., 2024), migrant women were better represented within the 2020-2025 literature than in 2015-2020. Migrant women's barriers and facilitators to PA were both pronounced and complex, especially for Muslim women who had relocated to non-Muslim countries. Contrary to findings from Safi and Myers (2021) however, women frequently found the social norms and infrastructure in their new countries of residence to be more supportive than in their country of origin. For these women, achieving PA required careful navigation and defiance in the face of traditional gender norms, roles and expectations. Mothers also had to carefully navigate barriers in respect of their gendered roles, with maternal guilt appearing to be an inherent part of motherhood (De Vaus, 1992; LeBeau, 2017; See Section 4.5.4), that made being active difficult.

4.5.4. The gender-centric nature of women's barriers to PA

Women's barriers to PA were heavily gender-centric. Patriarchal power structures involve males holding power over females. These structures exist in small-scale contexts, such as family or kin groups and large-scale institutional contexts such as organised religion and/or the government/state (Ortner, 2022). Women's PA was limited by patriarchal power structures and expectations around the female position as caregiver who must adhere to ideals about modesty and feminine delicateness. The concept of the patriarchy was particularly prevalent for women from Asian and/or Muslim cultural communities, where patriarchal practices such as arranged marriages, dowries, domestic labour and domestic finance are commonplace within the household, whilst patriarchal power structures impact education and the labour market outside of the household (Bhopal, 2019). Women in this synthesis consistently juggled competing goals and priorities, usually in the form of household chores and caregiving responsibilities, which left little time available to be active. Similarly to Chapter 3, women almost exclusively described experiencing negative emotions in respect of PA. Many felt nerves, anxiety, fear and apprehension regarding PA, with mothers consistently describing the cross-national experience (Collins, 2021) of maternal guilt. Guilt was only experienced as a barrier to PA in this synthesis and was focussed on not being present to care for children. Mothers described guilt based on being away from their children and for the additional strain their absence might place on an alternative care provider. Women consistently perceive the physical environment as less safe than men (Bozogáňová, 2016). Women are more concerned about cycling safety and on-street infrastructure

(Graystone et al., 2022), but here mainly described feeling at risk in male-dominated or culturally insensitive spaces.

For many women, culturally and societally held ideals about beauty and femininity presented a barrier to general and/or specific PA. Endorsement of Western beauty ideals that pertain to thinness is associated with sexism, hostility towards women and contributes towards female oppression (Forbes et al., 2007). Some women described coming from a culture where active women were perceived as unfeminine, deviant, shameful and immodest. Others had strongly held beliefs about the inappropriateness of aggressive sports for women and of not engaging in PA that might result in muscularity, which was considered masculine and thus, unattractive, unacceptable and undesirable. Women's body image is culturally driven (Abdoli et al., 2024) and varies significantly throughout the monthly hormonal cycle (Teixera et al., 2013), with body dissatisfaction and weight-preoccupation potentially peaking during the premenstrual stage (Carr-Nangle et al., 1994; Hildebrandt et al., 2015). Interestingly however, despite physique management remaining a pervasive facilitator, it appeared that most women who discussed the matter avoided PA when premenstrual, due to mental exhaustion and feelings of apathy alongside reduced physical capability elicited by hormonal changes. Women did not describe any positive reinforcement from undertaking PA when premenstrual. Nonetheless, a small minority of women described being active during this time based on increased body dissatisfaction, an intention to manage or change physique and a belief that PA would enable this.

4.5.5. Women's primary facilitators to PA

Body image can be considered a global mental health concern (Rodgers et al., 2023) with relevance for all ages, genders, sexual orientations and ethnicities (Gillen & Markey, 2023). Considering this, alongside the well documented decline in mental health since the Covid-19 pandemic (Leung et al., 2022; Robinson et al., 2020; Wu et al., 2021), it is no surprise that women's body image remained impactful in this synthesis. Women were driven to engage in PA to manage their physiques based on their own body dissatisfaction in the context of cultural/societal beauty ideals, coupled with beliefs about the consequences of engaging in PA for weight/physique. Women also described being motivated to engage in PA as a form of self-care/me-time. Many described experiencing guilt for doing so and women frequently seemed compelled to explain/justify themselves when describing PA as an act of self-care.

In Chapter 3, forced migration appeared akin to an adverse personal circumstance, creating a barrier to women's PA primarily based on the lack of local social support and, in keeping with previous research (Safi & Myers, 2021) due to there being limited culturally appropriate PA provision within Western society. However, in this chapter, migration provided some women with the opportunity to utilise supportive infrastructure and adhere to new active social norms in their new country of residence. Acculturation and family conflict may be associated (Bostean & Gillespie, 2018), so adhering to new cultural norms might be met with social disapproval from the cultural in-group. Migrant women therefore encounter a complex push and pull in their pursuit of PA, whilst juggling competing cultural and social norms and expectations.

Women are more impacted than men by the level of social support available (Shin & Park, 2023). Women care more than men about maintaining positive social relationships and this tendency towards sociotropy is culturally governed (Yang & Girgus, 2019). In this synthesis, social support prominently facilitated women's PA. Women described receiving more social support from other women than from spouses or offspring. This typically came in the form of encouragement/companionship during PA and less commonly in the form of childcare, which relieved women of some of their gender-typical caregiving responsibilities and freed up time for PA.

4.5.6. Strengths, limitations and future direction for research

This evidence synthesis has taken a refined approach to building on the conclusions drawn from Chapter 3. Operationally, findings have enabled practical recommendations for the implementation of forward citation searching in syntheses/reviews. This analysis has contributed to the development of the TDF, adding credence to the addition of 'biomechanical capability' as a TDF domain.

The range of PA types explored within this synthesis was more limited than before, which might limit the transferability, generalisability and comparability of findings. This time, there was no real exploration of women's barriers and facilitators to domestic/household or occupational PA. This might be considered problematic, but in the previous synthesis, it was recommended that researchers explore women's barriers and facilitators to different domains of PA separately. This synthesis has therefore begun to fulfil this recommendation, albeit incidentally. Because recreational and leisure-time PA elicit greater

health benefits than other PA types, this synthesis supports promotion of the types of PA that best improve health and wellbeing.

The CASP checklist may not be sufficiently sensitive to identify nuanced differences in the quality of research articles. Whilst the tool provides the opportunity to state whether a given criterion has been fulfilled, it does not provide the opportunity to indicate how well this was achieved or with what level of detail. For example, many articles mentioned having received ethical approval and adhered to ethical guidelines, but without detail about how this was fulfilled. The CASP tool would not provide a means of indicating which papers, if any, had provided further detail in this regard and so an amended version of the CASP checklist, with options to indicate that a criterion has been 'satisfied' or 'exceeded' is proposed. The author who contributed more than one article to the previous synthesis based on a single dataset (Lenneis) again contributed more than one article to this synthesis (Articles 5, 6 & 7). These findings again appeared to be based on a single dataset albeit contextualised differently. The views of migrant, primarily Muslim women living in Denmark who access single-sex swimming may therefore be somewhat overrepresented within this synthesis. As with the previous synthesis, the non-quantification of qualitative data is considered to appropriately mitigate this (See Section 3.5.6.).

Specific reviews/syntheses that focus on the barriers and facilitators to each PA type for the subgroups of women who are identified as experiencing particularly complex barriers and facilitators to PA (e.g. Migrant women, Muslim women and Mothers) would be helpful. Further work exploring the impact of the intersectionality of these and other

pertinent characteristics (e.g. obesity, SES) for women's PA would be complex, but highly valuable.

4.5.7. Real world implications

The findings of this synthesis largely align with those from Chapter 3. In a time of mass global migration there will inevitably be growing complexities associated with promoting PA for increasingly multicultural populations of women. At the individual level, women who are defiant in the face of gendered expectations and stereotypes likely have the best chance of living an active life. At the community level, women with strong social support will likely experience fewer barriers to PA. At the societal level, women who reside where there are active social norms will likely experience this as a PA facilitator. At the environmental level, women who live in areas with infrastructure that supports PA will find being active less challenging.

The importance of single sex PA provision for women cannot be overstated. This has most relevance for Muslim women, migrant women, obese women, shy women, women who have experienced harassment, women with poor body image and women who partake in PA that requires them to expose their body (e.g. pole fitness). However, when considering the relevance and importance of active role models and active social norms, reducing the visibility of women's PA, excluding certain women from active spaces and/or considering women's PA to be separate, different or unequal to men's may be counterproductive. Nonetheless, women's barriers to PA are undeniably gender-centric, so tailored programmes of PA that address this would be valuable, particularly for women who anticipate stigma, disapproval or judgement during PA. The gender-centric nature of women's barriers to PA is most

apparent for women from gender-conservative cultures and mothers, who could only feasibly engage in PA with social support in the form of childcare. Where mothers were provided the social opportunity to be active by others, they experienced an emotional barrier in respect of guilt based on a belief that they were not adequately fulfilling their duty of care to others, so PA was not positively reinforcing. Future interventions aiming to promote mothers' PA may therefore benefit from the introduction of self-compassion coaching, as maternal guilt mediates the relationship between self-compassion and health-related behaviour (Miller & Strachan, 2020). The provision of childcare might be practically useful but would be unlikely to alleviate maternal guilt. PA opportunities that include offspring might facilitate mothers' PA but may deny women the chance to achieve 'me-time'.

4.6. Summary and conclusion

Since the Covid-19 pandemic there have been influxes in migration and poor mental health. Culture, SES and body image continue to impact women's PA. Women describe using PA as a form of self-care and managing mood/mental health but also describe guilt for doing so. Many women require single-sex spaces to feel comfortable, confident and safe during PA. However, when considering the importance of social norms and social influences in encouraging women's PA, the potential ramifications of segregating this, or of excluding certain demographic groups of women from active spaces must be considered.

Women's barriers and facilitators to physical activity in the East Midlands, UK: Focus groups

5.1. Overview

An understanding of women's barriers and facilitators to PA across the literature has now been established using secondary data. Here, primary data collection has enabled a localised understanding of the specific barriers and facilitators to PA for women from the East Midlands, England. The subgroups of women for whom barriers and facilitators to PA are most complex are recapped and the compounding effect of holding intersectional identities is briefly introduced. The East Midlands, where this work was undertaken, is contextualised and its applicability as a geographical basis for this work explained. A series of focus groups were undertaken with women from the East Midlands, to identify barriers and facilitators to PA. This understanding has been used to inform a pilot PA intervention for women from the East Midlands, which was built using the BCW approach to health-related intervention development.

This phase of research aligns with the 'understand' phase of the BCW (Michie et al., 2014) and the 'define' phase of the Double Diamond (Design Council, 2005).

5.2. Introduction

Women experience barriers to PA that are linked to their gendered status. Within Chapter 4, overweight women and women who undertook PA in male-dominated settings were found to face additional barriers to PA, whilst women generally felt less capable of PA when premenstrual. Aligned with other findings (Sharara et al., 2018; Moreno-Yamas et al.,

2020), within Chapters 3 and 4, women of low SES experienced more barriers and less facilitators to healthy PA, compared to women of high SES. In Chapter 3, domestic, household and occupational PA appeared to be best facilitated for women of lower SES, whilst recreational PA and exercise (i.e. the PA types that elicit health and wellbeing benefits) were more challenging for these women to achieve. In keeping with literature discussed in Chapter 1 (See Section 1.3.2.), the evidence syntheses in Chapters 3 and 4 identified Muslim women, women from gender conservative cultures and migrant women to face particularly complex barriers and facilitators to PA. These groups would therefore benefit from targeted PA interventions. Chapters 3 and 4 highlighted the gendered experience of motherhood to involve additional barriers to PA, exacerbated by occupational responsibilities and ameliorated by wider social support. Intersectionality compounds disadvantage (Loets, 2024), so women who fall into numerous of these categories likely experience additional challenges in becoming active.

The East Midlands is home to some of the most deprived areas in the UK, including Nottingham, which is the 11th most deprived district area in England, out of 317 (Nottingham Insight, 2019). The East Midlands is 14.3% ethnically diverse (Business in the Community, 2023) and has significantly higher mortality rates than the English national average for all causes, across all age ranges, with no statistically significant improvements observed in recent years (OHID, 2025a). In 2023, mortality rates from diseases associated with physical inactivity such as cancer (OHID, 2025b) and cardiovascular disease (OHID, 2025c) were higher in the East Midlands than nationally. The number of people dying from preventable causes under the age of 75 was significantly higher in

the East Midlands than England (OHID, 2025d), yet people in the East Midlands self-report similar levels of PA to those self-reported nationally (OHID, 2025e). When considering the limitations of the subjective self-report of PA (e.g. Sallis & Saelens, 2000), alongside the more objective available data for causes of death in the region, the percentage of physically active adults in the East Midlands is likely much lower than the data suggests. Furthermore, based on the dose-response relationship between PA and health, increasing residents' PA across the region would improve public health, prolong life and reduce avoidable mortality, regardless of baseline PA.

In this chapter, numerous focus groups have enabled exploration of the barriers and facilitators to PA for a demographically diverse, yet physically healthy group of women from the East Midlands. Effort was made to recruit women of relatively low SES with dependents, to ensure that these groups of women who face additional challenges in becoming active are represented at the 'understanding' stage of the BCW approach to health-related intervention design (Michie et al., 2014).

5.2.1. Research question

What factors do women from the East Midlands perceive to determine their PA?

5.3. Method

5.3.1. Participants

There were 11 participants, one was transgender. Participants were purposively recruited via social media, with six recruited for each focus group, to enable management of group discussion dynamics. A maximum of four participants attended each focus group due to 'no

shows', but no further participants were recruited because data saturation was reached. Participants were eligible to participate if they self-identified as a woman, were aged 18-65, were not pregnant/post-partum and did not have any long-term health conditions that prevented them from moving unaided for ten minutes. Ages ranged from 19-59 (M=33.54). Participants' identifying number, age, ethnicity, religion, occupation, number of children, and Multiple Deprivation Index decile can be viewed in Table 9. The sample was of relatively low SES. All lived in the most deprived 50% of postcodes in the UK, >25% lived within the 10% most deprived deciles and 50% were either unemployed (N=2) or a student in part-time work/not in work (N=3). Over 50% were mothers.

Table 9: Participant demographics of focus group attendees

Participant no.	Age	Ethnicity	Religion	Occupation	No. Children	MDI decile[6]
1	40	White British	None	Unemployed	4	2
2	23	White British	None	Unemployed	1	1
3	35	Greek	Christian	Nursing home manager	0	2
4	39	Mixed White and Black African	Jewish religion	Employment advisor	2	3
5	19	White British	None	Office assistant	0	5
6	59	Jewish heritage	None	Managing Director of Not for Profit Org.	1	5
7	21	White British	None	Student	0	5

[6] Lower scores represent higher deprivation

8	53	Black Caribbean	None	Chef	3	1
9	28	Black Caribbean	None	Nursery practitioner	0	1
10	25	White British	None	Mental health worker/Student	0	5
11	26	White British	None	Support worker/Student	1	2

5.3.2. Materials

A focus group schedule (See Appendix 12), structured in line with the COM-B model, was developed. The participant information sheet provided to participants can be seen in Appendix 13.

5.3.3. Procedure

Three focus groups, each with 3-4 participants were conducted by the Lead Researcher in community settings. Participants were recruited using purposive and snowball sampling. Each conversation took 50-90 minutes. Focus groups were guided using the pre-determined focus group schedule but did not follow a strict order of questioning and participants were encouraged to elaborate and add their own thoughts. To close each discussion, participants were asked if there was anything they would like to add and reminded of the researcher's contact details, should wish to add thoughts later. The Lead Researcher remained in the room for 20 minutes afterwards, in case participants had additional questions or comments. Audio recordings were transcribed verbatim by the Lead Researcher.

5.3.4. Ethics

This study adhered to the BPS Code of Human Research Ethics (2018) and was granted ethical approval by Sheffield Hallam University's Ethics Committee (Ethics Review ID ER28012805). Everybody who took part

was informed that the groups would be audio recorded, provided informed consent, agreed to keep the discussion confidential and had their right to withdraw without giving reason explained. During transcription, data was anonymised where possible and pseudonymised where not. Participant names were replaced with pseudonyms and identifying information (e.g. locations, familial names) were altered. Data was stored on the University 'Q' drive and audio recordings were deleted following transcription. A detailed data management plan for this phase of research and onwards is available (See Appendix 14).

5.3.5. Data analysis

Transcribed data was input into NVivo 12 and subject to a 2-stage analytical process. Data was first inductively free-coded to ensure identification of the barriers and facilitators identified by women, without being confined by the paradigms of a pre-determined and potentially incomplete model of behaviour. These granular codes were then thematically organised, such that overlapping constructs could be clustered together (e.g. 'dark alleyways' and 'poor street lighting' were grouped under 'unsafe environment'). Identified determinants were then mapped onto the COM-B and the TDF, to enhance the utility of findings for intervention design. A coding framework is provided (Appendix 15).

5.4. Results

Women from the East Midlands described 36 discrete barriers and facilitators to PA, which have been mapped on to the COM-B model (See Figure 13) and the TDF. Table 10 displays the full range of PA determinants for women from the East Midlands, with definitions and

example quotes. Within the body of this report, the participant number of the individual speaking is indicated in superscript.

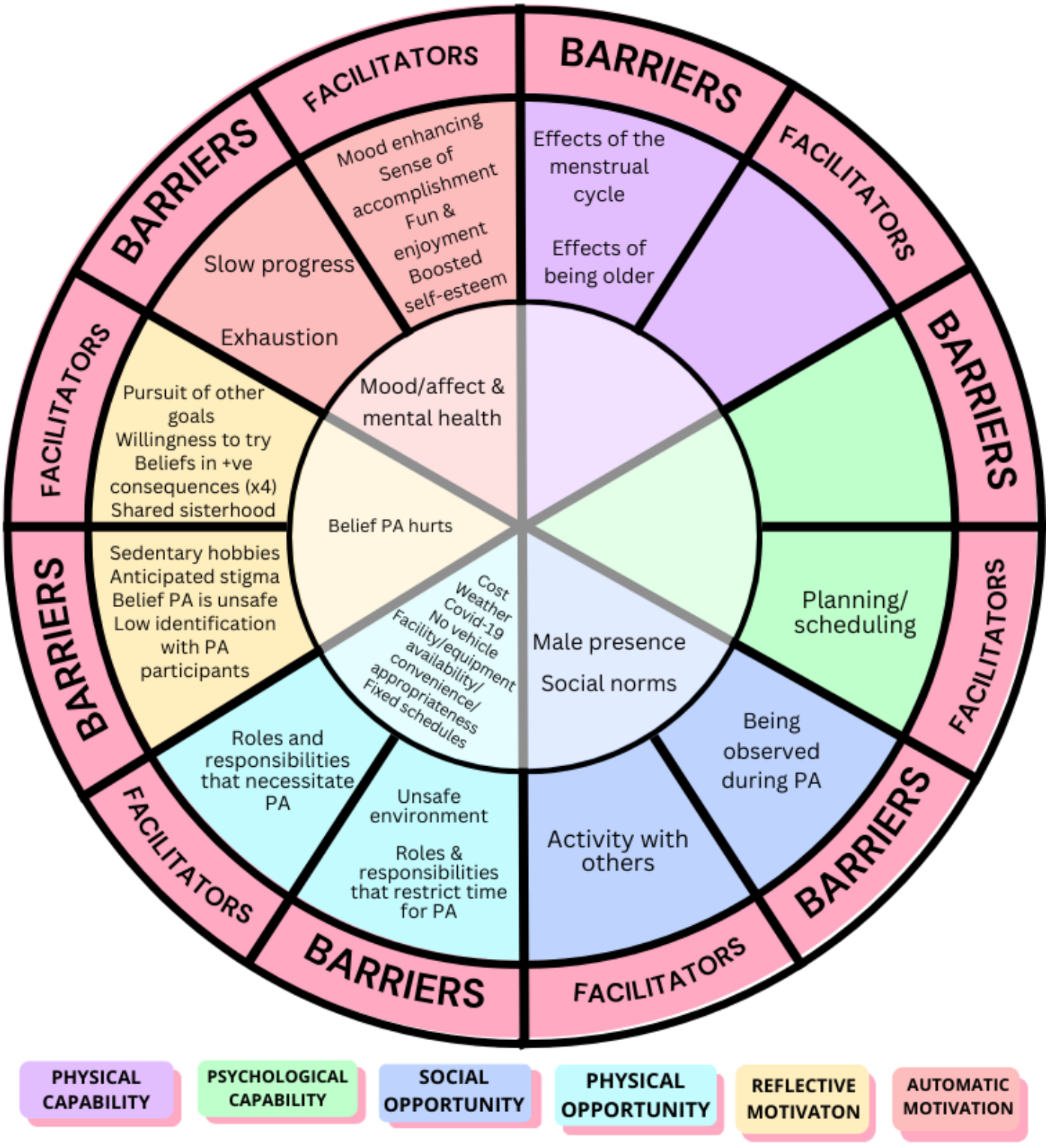


Figure 13: Women from the East Midlands' barriers and facilitators to PA, mapped onto the COM-B model

Table 10: A table showing the full range of identified determinants of PA for women from the East Midlands', mapped against the COM-B model and the TDF with definitions and example quotes

COM-B	TDF	Category	Definition	Example quote[7]
Physical capability	**Biomechanical capability**	**Barriers**		
		Effects of the menstrual cycle	Reductions in ability, mood, energy and motivation because of hormonal changes associated with menstruation.	*"I'm definitely a lot less active on my period because I just am [...] it's literally just that I'm exhausted all the time"*
		Effects of being older age	A reduction in physical ability associated with older age	*"Well I didn't get aches and pains when I was younger, when I was active, I just didn't get the aches and pains"*
Psychological capability	**Behavioural regulation**	**Facilitators**		
		Planning/ scheduling	Having the skills to engage in deliberate planning, organising and scheduling by the individual, to make time for PA	*"I try to form a like timetable, like a schedule for my days [...]so like, slot my stretches into the morning, into like a time slot in the morning"*.
Social opportunity	**Social influences**	**Barriers**		
		Being observed during PA	Having others present at the time of the activity who are (or who might be) watching	*"I'm like too self-conscious about like doing exercise if there's somebody watching"*
		Facilitators		
		Activity with others	Engaging in PA with others, regardless of supportiveness or relationship.	*"sometimes just having someone there does motivate you"*
		Both		
		Male presence during PA	The (immediate or peripheral) presence of men at the time and place of PA	*"I just thought 'oh my God no, I cannot have a man show me what to do on this [exercise] machine'" [B]*
				"I like there being men around when I'm exercising" [F]
		Social norms	Socially held ideas about what is/isn't acceptable and the associated approval/disapproval from others.	*"I've certainly been in circles where people are either a) obsessed with it [health & fitness] and everybody does it and you're stigmatised if you don't but I've also been in circles where 'what's wrong with you? You should just be*

[7] *Under subheading 'Both', quotes marked with a [B] illustrate that category acting as a barrier, whilst [F] denotes a facilitator*

				drinking beer and getting stoned. Why would you possibly want to go to the gym?'" *[B] [& F]*
Physical opportunity	**Environmental context and resources**	**Barriers**		
		Roles and responsibilities that restrict available time for PA	Including: 'dual roles/second shifts', being a student, being an employee, being a Mother and having a familial ethic of care.	*"Yeah like it could be your job, if you've not got a very active job, you might work long hours and then so that can stop you like going to the gym or going for a walk or playing with your kids."*
		Unsafe environment	Living in, working in or having to travel through an unsafe area as part of, or to engage in PA	*"If it wasn't for that little alleyway I have to walk down then I would probably walk but it's just that tiny bit where everyone gets stabbed!"*
		Facilitators		
		Roles and responsibilities that necessitate PA	Including: 'dual roles/second shifts', being a student, being an employee, being a Mother and having a familial ethic of care.	*"You have to be [active]. In work. Being a Mum. Running about after your kids all day"*
		Both		
		Weather	Aspects of the weather that facilitate or inhibit PA or access to facilities (e.g. snow, extreme heat)	*" Yeah well it's like who wants to go for a walk in this weather [raining outside]"[B]*
				"Yeah on the park there's that thing now isn't there that's like a little gym set [...] Yeah, I've been on there a couple of times... when it's hot" [F]
		Covid-19	The Covid-19 pandemic and the associated restrictions (as imposed by the government and recommended for health)	*"My PA came from walking to and from work, I loved it, absolutely loved it and then we all got sent home because of lockdown." [B]*
				"when lockdown first happened in March 2020, that is when I started to exercise regularly and I've been doing it ever since." [F]
				"there's just fucking nowhere to go [and be active]". [B]

Table 10: A table showing the full range of identified determinants of PA for women from the East Midlands', mapped against the COM-B model and the TDF with definitions and example quotes (Page 3 of 5)

		Facility/equipment availability, convenience & appropriateness	Convenience and appropriateness of facilities and equipment in terms of location, accessibility, the needs of the individual and the specifics of the activity.	*"Yeah I think it's good where I live. We've got everything around us like there's a big park, there's a gym down the road, my work is close enough to walk to, so I walk to and from work". [F]*
		Not owning a vehicle	Not owning a car or other vehicle.	*"I can't get to the gym. I can't drive" [B]*
				"I don't have a bike [or a car]. I walk everywhere" [F]
		Cost	The financial cost of engaging in PA (may include travel, equipment, memberships etc.).	*"I want to introduce weights into my regime, I obviously need to pay for them because I don't already have them so it's an added cost" [B]*
				"I'll walk an hour before I'll pay for the bus" [F]
		Fixed schedules	Fixed schedules that are/are not conductive to partaking in PA	*"If I finish work late then I don't have time to go to the gym because my shifts are 7-3 or 2-10 so like my gym will shut at 10 so I can't go to the gym after work"[B]*
				"I know that I don't go to work on a Monday, so I know that once I've done the school run like that's me-time so I'm more likely to go to the gym that day"[F]
Reflective motivation	**Goals**	**Barriers**		
		Sedentary hobbies	Hobbies that require little to no movement (e.g. reading, playing video games)	*"Playing video games makes me less active because like, I'll like sync into something and then I won't need to like stand up".*
		Facilitators		
		Pursuit of other goals that involve being active	Being active as a by-product of achieving a different goal (e.g. to walk around a museum, to spend time with friends)	*"when I lived in [a city] like it was just like a thing that I did where I sometimes just went out and wandered around and like I got way fitter, like my legs got way more developed and I had way more stamina and like it was, I wasn't trying to do exercise, I was just wandering around and seeing what there was"*
	Intentions	**Facilitators**		

		Willingness to try/conscious effort	A willingness to engage in PA and the conscious choice or effort to participate.	*"I make a conscious effort to go out my way to go to the gym"*
	Beliefs about consequences	**Barriers**		
		Anticipated stigma	Expecting to be stigmatised or receive negative social responses whilst engaging in PA.	*"I'm worried they'll be like 'oh, I've not seen you [at the gym] for a month, where have you been?'"*
		Belief it is unsafe to engage in PA	The perception that is it unsafe to participate in PA under certain circumstances/conditions, or in certain places	*"I want to, but I wouldn't feel very safe where I live walking at night."*
		Facilitators		
		Belief that PA improves appearance	A belief that PA will result in a better appearance (can relate to body shape/size and other facets of appearance, such as skin)	*"I mean it depends on the activity and the person's body and diet but a positive is that it makes you look better"*
		Belief that PA positively impacts other health behaviours	A view that health behaviours are interrelated and that being active will have positive knock-on effects to other health behaviours (e.g. smoking, eating, drinking)	*"I wanna eat better when I'm doing exercise"*
		Belief that PA burns off energy and relieves stress	A belief that PA is useful for getting rid of pent-up energy and stress.	*"It's a good time for me to burn off energy during my exercise"*
		Belief that PA improves physical health and fitness	A belief that engaging in PA will result in better physical health and fitness.	*"[I'm active] to try and stay fit and healthy"*
		Both		
		Belief that PA hurts	A belief that PA will cause pain or discomfort	*"If I'm training regularly and I'm on my feet all the time and I'm running around like I normally am, getting in and out of the car, shifting stuff around, then everything is aching by the end of the day" [B]*
				"I love feeling my muscles hurt. I love that!" [F]
		Barriers		

	Social role and identity	Low identification with activity participants	When a person believes that those engaging in PA are different from themselves (can relate to specific activity or generally being 'an active person')	*"I was like no, I can't be here [at the gym] because everybody looks a certain way and I don't. I stuck out compared to everybody else"*
		Facilitators		
		Shared sisterhood and sense of belonging in active spaces	A sense that people who participate in PA are "like me" and that I fit in with participants (can be related to a specific activity or to being an active person generally).	**Interviewer:** *"So would you be more inclined to be active with people who you felt were more like yourself?"* **Participant:** *"Yeah, I would"*
Automatic motivation	**Reinforcement**	**Barriers**		
		Slow/little/no progress	Delayed (or non-existent) positive outcomes associated with engagement in activity.	*"I'm thinking 'why am I not getting them results? Why am I having to always maintain myself at the gym?' [...] I want [cosmetic] surgery now because yeah, I feel like going to the gym will never get me what I want"*
		Exhaustion	Feeling tired after being active.	*"if I've just been active because I've been running around like a lunatic all day then I feel tired at the end of it"*
		Facilitators		
		Sense of accomplishment	Feeling that one has achieved something good (or beyond expectations) after being active.	*"I managed to break a mannikin's nose once [at boxing class] and I felt elated"*
		Mood enhancing effects	Experiencing an improvement in mood after being active (on an acute or chronic basis)	*"[Exercise] gives me better... a better... a better mood"*
		Boosted self-esteem	Having an improved self-esteem after being active (often in terms of body image)	*"If I've been to the gym I just feel so good about myself"*
	Emotion	**Facilitators**		
		Fun & enjoyment	Intrinsic enjoyment of the activity itself or the context in which it is occurring.	*"I also have skipping ropes that I like to use as well because that's fun"*
		Both		
		Mood/affect and mental health	An emotional state and a person's condition regarding their emotional and psychological wellbeing.	*"When I feel rubbish and depressed I don't move" [B]*
				"It can be a motivating thing that I'm very low in mood so like I'm just gonna drag myself to the gym" [F]

5.4.1. Capability

Women's physical capability to be active could present barriers in terms of the effects of the menstrual cycle and physical decline associated with ageing. Both these determinants were aligned with the additional TDF domain of 'biomechanical capability'. No PA determinants identified in this chapter aligned with the TDF domain of 'physical skills'.

Women agreed that:

"where I am in my period affects how active I am" [P10].

Their capability to be active was negatively impacted by lethargy, low mood and increased injury related to their menstrual cycle, particularly during the pre-menstrual phase. One woman explained:

"I've noticed that if I'm gonna hurt myself at the gym or pull a muscle or hurt myself or something then it will be the week before my period" [P10].

No women discussed or acknowledged a time during their menstrual cycle when physical capability to be active was improved.

The two participants aged 50+ within the sample both described a reduction in PA because of pain following PA. One explained:

"Well I didn't get aches and pains when I was younger, when I was active, I just didn't get the aches and pains. Yes, I occasionally got injuries but I didn't get the aches and pains from physically... I now can tell the difference if I don't train [...], for a couple of weeks then all my

aches and pains go but if I'm training regularly and I'm on my feet all the time and I'm running around like I normally am, getting in and out of the car, shifting stuff around, then everything is aching by the end of the day" [P6].

Older women may therefore face additional barriers to PA, or require/benefit from specific interventions that suit their physical capabilities and increased propensity for experiencing pain because of PA.

Psychological capability was barely discussed.

5.4.2. Opportunity

Some women's social opportunity to be active was negatively impacted if they were aware of being observed during PA. However, partaking in activity together with others was generally a facilitator that worked to create the social opportunity (via the provision of activity-related social support) and improve motivation (through increased enjoyment and belief in positive social consequences from participation):

"I've started a bootcamp [...] with a friend and she'd been before and she was like 'oh – come with me' and I was like 'fuck that. I do not wanna go and work out in a field, like... it's dark, it's cold' and then when I got there and I did it I thought yeah, I actually like this. It's actually really good. I wouldn't go and stand on a park on my own and do it though." [P11]

A small minority of participants enjoyed male presence during PA, but this was usually a barrier that made some women feel self-conscious

about their bodies and others feel under threat of potential or actual unwanted sexual/romantic advances:

"What about them men that go to the gym just to perve on women?[…] I had it the other week[…]Everywhere I moved he was there[but] they're literally just like next to you and staring at you. Everywhere I moved he was there, as soon as I left, he went […] Honestly, I felt so uncomfortable I just left". [P2]

Women's physical opportunity to be active was limited by living in, working in or having to travel through unsafe environments. Women expressed concern about specific aspects of the environment that were perceived as unsafe (e.g. alleyways), local areas with reputations for being unsafe and being outside after dark. There was consensus that safety should be considered:

"an issue for women at the moment in general" [P2].

Most women described having roles and responsibilities that both restricted and necessitated PA at different times, in different contexts. The primary roles and responsibilities discussed included motherhood and paid work. These roles and responsibilities appeared to facilitate active travel, domestic PA and occupational PA but limit time for exercise and leisure-time PA. One woman summarised this by saying:

"*Having a little one keeps me more active but I wouldn't say it helps because I'm running around all the time but I'm not physically committing to go to the gym*." [P11]

Women's roles and responsibilities often dictated their fixed schedules, which in turn could either create or limit the physical opportunity to be active. One woman described how her professional role had changed from being a nurse, to working in management. Management duties were inherently less active than nursing but this change meant moving from shift patterns to regular 9-5 office hours, which facilitated PA.

"*because my work is quite standard now, standard office hours. Once I finish, I grab my gym bag, change to my gym clothes or go to the gym and it's just a part of my routine now. Before, when I was on shift patterns, I just couldn't do that*" [P3].

Not owning a vehicle facilitated active travel out of necessity and to avoid public transport costs but presented a barrier to leisure time PA and exercise, particularly for people with few financial resources and those living in rural areas. Not owning a vehicle created a barrier that was both direct (e.g. by making accessing active spaces challenging) and indirect. One mother explained:

"*I don't drive so it's hard for me to like take [my son] to my Mum's [so I can exercise]*" [P2]

Covid-19 and the associated restrictions had variable effects on women's PA. Women who were more active at baseline seemed to undertake less PA during lockdown, particularly sport, exercise and active travel. For women who had previously been sedentary however, lockdowns appeared to provide a new opportunity for PA. Since the

pandemic, those whose activity levels had been negatively impacted described having since returned to their usual activity levels, whilst those whose PA increased throughout lockdowns described lasting positive effects.

5.4.3. Motivation

Women's reflective motivation to be active was impacted by factors that aligned with the TDF domains of goals, intentions, beliefs about consequences and social role/identity.

Pursuit of other goals that involve being active (e.g. taking kids to the park for their enjoyment, sightseeing on foot) facilitated PA by necessitating it without requiring specific PA-focussed motivation. One woman said:

"*I think for me, like doing exercise for the sake of exercise just feels so bad but like doing activity in service of something that I actually enjoy is like, it's an acceptable price to pay [...] it's like the physical activity is a side effect of doing something that you wanted to do anyway* [P7]".

Some women anticipated negative social judgement from others when entering active spaces, particularly following a hiatus, which seemed to elicit feelings of shame for not being committed enough to a consistent and uninterrupted programme of PA:

"*because I know that I'm sporadic with the gym [...] if I was going to the gym where people I know are then I'm worried they'll be like 'oh, I've not seen you for a month, where have you been?'*" [P11]

Body image was impactful in determining women's PA in different ways. Women described a desirable body type as:

"*a skinny waist and a big bum*" [P2] .

There was consensus that:

"[with PA] it's not just losing weight, it's changing shape [...] because it used to be embarrassing to have a big bum and now everybody wants one" [P1] ,

This illustrates the changing nature of societally constructed and culturally governed beauty ideals, that differentially impact women's PA at different time points.

Women who self-described as 'fat' felt a particularly pronounced sense that others who engage in activity are 'not like me'. One woman explained:

"*Going to the gym everyone was slim bar me so* [...] *That's why I don't go back*" [P1].

Many participants explained that their PA was heavily motivated by a desire to change their physical appearance. However, slow results made PA feel futile:

"*I want [cosmetic] surgery now because yeah. I feel like going to the gym will never get me what I want* [P2]*"*.

The context and domain of PA heavily impacted how reinforcing it was. Sadie stated:

> *"If you want to go to the top of the hill to see an amazing sight that you've been really wanting to see and then you did that, you'd feel on top of the world climbing up there but if you had to climb up to the top to go and get your camera because you'd left it up there then it wouldn't feel the same would it?* [P6]".

Personal agency and the freedom of choice to engage in PA (or not) therefore seemed integral to ensuring PA is positively reinforcing.

5.5. Discussion

Women from the East Midlands identified 35 discrete determinants of PA.

5.5.1. Capability

Although the women in this sample could largely be considered capable of undertaking PA based on eligibility requirements for participation, they rarely discussed their capability to be active. Just two determinants were identified beneath the physical capability domain. Both were barriers (effects of ageing and effects of the menstrual cycle) and could be categorised beneath the additional TDF domain of 'biomechanical capability'. The relevance of the menstrual cycle here adds credence to earlier findings (Section 4.4.5.) about the significance of women's hormonal changes for determining PA. This was previously identified as impacting women's motivation (beliefs about capabilities), but here was identified as impacting physical capability. Just one discussed determinant of PA was mapped onto psychological capability

(planning/scheduling), this facilitated PA. In line with previous findings within this thesis (e.g. Section 3.5.5.), women in this study infrequently considered their capability to be active. Physical capability to be active was only discussed when restricted, whilst psychological capability was only discussed when enhanced. Awareness of physical capability may therefore increase as ability decreases or women's aversion to appearing immodest (Mancuso et al., 2019) might simply render them unwilling to discuss their own strengths. However, psychological capability showed the inverse pattern, as women identified helpful mental skills that facilitated their PA, but failed to discuss skills they did not have. Considering women's aversion to immodesty, these absent mental skills might therefore be considered 'unknown unknowns' (e.g. Rumsfeld, 2011; Davies & Thompson, 2010), in that women may not only fail to possess these mental skills, but may in fact lack awareness of their existence or absence. In critical realist terms therefore, whilst certain psychological deficits were not observable within the empirical data (because they were not discussed by participants), their existence at the level of the 'real' can be hypothesised, as these deficits would be necessary to explain the 'actual' failure to elicit and maintain PA.

5.5.2. Opportunity

Opportunity was the COM component with the most divergent categories. Whether these facilitated or inhibited PA appeared most impacted by PA domain, female gender roles, SES and how urban/rural each woman's local area was.

Women's social opportunity to be active appeared heavily impacted by gender-centric issues including perceptions of safety, whereby women consistently perceive the physical environment as less safe than men

(Bozogáňová, 2016) and women's propensity for juggling dual roles in terms of motherhood and paid work (Hothschild, 1989/2003; Craig, 2007). Some of these divergent opportunity-related factors (e.g. not owning a vehicle, fixed schedules and cost) appeared to facilitate active travel and domestic/occupational PA but inhibit exercise or recreational PA. These factors are therefore unlikely to effectively promote women's health and wellbeing (See Sections 3.5.1. & 4.2.). Women of lower SES appeared to disproportionately experience divergent determinants as barriers, illustrating a compounding effect of the intersectionality of gender and SES. Women of low SES frequently described living in an environment with little opportunity to engage in PA safely within their financial means. This aligns with findings that environment safety is worse in deprived locations (Mouratidis, 2020). Women living in rural areas spent more time discussing how their physical opportunity to be active was limited, compared to those who resided in urban locations. This related primarily to transport issues and lack of available PA provision. Urban/rural residence may therefore further intersect with other parts of women's identity to compound their disadvantage, as outlined by Loets (2024).

5.5.3. Motivation

Women's motivation to be active was the most discussed COM-B category, contributing over half of all determinants. Aligned with findings from Kandel et al. (2021), women most frequently discussed being motivated to be active based on beliefs in the positive consequences of PA. However, hiatuses from PA appeared to negatively impact reflective motivation by generating negative beliefs about the consequences of participation, in the form of anticipated social disapproval. Women who self-described as 'fat' anticipated greater social disapproval during PA

and were concerned about visibly standing out within active spaces. This reduced women's sense of identification with active people and their motivation. This aligns with earlier findings of this thesis outlining the importance of body image for determining women's PA (See Section 3.5.4.) and relates to findings that overweight women anticipated the greatest stigma within spaces associated with weight loss, or gain, (Stevens, 2018). When women's PA was motivated by a desire to alter physique, slow, little or no progress easily hampered motivation. Women in this study wanted 'a small waist and a big bum'. For much of the late 20th and early 21st century, Western women reported a desire for slimness and weight loss (e.g. Conor-Greene, 1988; Cheney, 2011). Over the past decade however, Western beauty ideals for women have shifted towards "strong is the new skinny" (Tiggeman & Zaccardo, 2018), meaning that "strong is the new sexy" (Washington & Economides, 2016). This should be considered during intervention development and is likely helpful for PA promotion, as whilst weight loss can be achieved through diet alone provided an energy deficit is created (Yannajoulia et al., 2019), muscular hypertrophy is best achieved through exercise (e.g. Schenfield, 2010).

5.5.4. Strengths, limitations and future direction for research

This study has provided a baseline understanding of women from the East Midlands' barriers and facilitators to PA, which can be used to inform a pilot PA intervention, in line with the BCW approach. There are some limitations which ought to be addressed via future research however. Upon analysis of these findings, some differences transpired between the barriers and facilitators identified according to women's rural-urban classification. This was unexpected, so rural participants may not have been adequately recruited for this study. Future research

might therefore seek to better understand determinants of PA for women living in rural locations, to ensure interventions are appropriately targeted. Participants in this study were clearly diverse in terms of PA level. This may have limited the applicability of these findings, in terms of promoting PA for the most sedentary women. To maximise the beneficial impact of a health protection approach (See Section 1.4.2.), future research should specifically aim to recruit highly sedentary women without a health condition and involve them in intervention design as early as possible, although the longitudinal nature of intervention development might make participant retention challenging (See Section 1.5.). Nonetheless, participants in this study were relatively diverse in terms of age, ethnicity, occupation and motherhood status, so findings from this research might be transferable to diverse women.

5.6. Summary and Conclusion

Women in the East Midlands rarely discussed their capability to be active, describing only a small number of physical weaknesses and psychological strengths. Women's social opportunity to be active was limited by gendered issues, including safety concerns and managing dual roles/second shifts. Women of low SES had limited physical opportunity due to the scarcity of resources, whilst the environmental context most limited PA for women of low SES and those from rural areas. Women's reflective motivation to be active was boosted by positive beliefs about the consequences of PA, particularly in relation to body image. Taking a hiatus from PA and perceiving oneself as fat appeared to increase negative expectations regarding the consequences of PA, as women anticipated social disapproval from others for their lack of commitment or their (perceived) overweight

bodies. Women who felt they were making slow/non-existent progress (usually related to physique management/weight loss) were discouraged from PA. It is however promising for PA intervention design that women in this study aspired towards ‘a small waist and a big bum’, rather than striving for thinness.

Chapter 6: Study 4

Co-designing a physical activity intervention for women from the East Midlands: Co-design Workshops

6.1. Overview

This chapter documents the next phase of intervention development, according to the BCW. The applicability of co-design as a methodological approach is briefly discussed before the first of two co-design workshops are introduced. The aims, content, interpretations and results of Workshop 1 are reported. Workshop 2, which was informed by the findings of Workshop 1 is then introduced and its aims, content, interpretations and results reported and discussed. The chapter closes with an overall discussion of co-design.

This phase of research aligns with Stage 2 of Michie et al.'s (2014) BCW ('Identify intervention options') and with the 'develop' phase of the Design Council's (2005) Double Diamond.

6.2. Introduction

In Chapter 5, (See Table 10 & Figure 13) barriers and facilitators to PA that were identified by women from the East Midlands were mapped on to the COM-B model (Michie et al., 2011) and the TDF (Michie et al., 2005). The next phase of intervention design, according to the Behaviour

Change Wheel (BCW; Michie et al., 2014; See Figure 6), involves identifying intervention options that fulfil the APEASE criteria for intervention design and evaluation (see Michie et al., 2014 & Section 2.4.3.). The BCW outlines 9 intervention functions (See Section 2.3.3.), which link to the COM-B model and the TDF, acting as the next ring of the Behaviour Change Wheel. Table 11 shows how the COM-B model, the TDF and these intervention functions interconnect. The BCW can be further used in conjunction with the Taxonomy of BCTs (Michie et al., 2013; Michie et al., 2015; See Section 2.3.4.), which was developed to provide a common language for the discussion of BCTs, to offer clear definitions and to provide a framework for the coding of BCTs that are included in intervention design. Any one component of an intervention can fulfil multiple intervention functions and BCTs simultaneously. For example, the message *'Following the guidelines of 150 active minutes per week reduces your chance of dying young and improves your mental health'* uses the intervention functions of 'education' regarding activity guidelines and outcomes of PA as well as using 'persuasion', as the phrase "dying young" is likely to evoke negative emotions. This same message also covers numerous features from the Taxonomy of BCTs including information about health/emotional consequences and salience of consequences. Although the optimum number of BCTs that should be included in intervention design remains unclear, intervention designs that match BCTs to the most impactful determinants, ensuring the broad spectrum of COM components are addressed, using a range of intervention functions are likely to elicit positive health-related behaviour change. Intervention options should therefore be mapped onto these frameworks and those that best fulfil a broad range of criteria should be prioritised during intervention design.

Co-design can be used to design interventions that are more engaging, satisfying and useful (Thabrew et al., 2018; See Section 2.4.1.). Rigorous evidence demonstrates that including community members during the research process promotes positive intervention outcomes for effectiveness and community engagement (Andersson et al., 2015), but without clarity regarding the magnitude of any effects. In a nutrition context, intervention studies using participatory research approaches were more likely to report positive health behaviour outcomes (Tay et al., 2021). In a PA context, co-design has been used to develop interventions with various populations (e.g. Brown et al., 2020; Marini et al., 2021; Ramage et al., 2020), but with little evaluation of the impact of co-design for PA intervention effectiveness. Nonetheless, despite its widespread use in health-related intervention development, a rapid review revealed that co-design was rarely well described or evaluated (Slattery et al., 2020). This PhD programme of research will therefore fill this gap somewhat, by providing a detailed and transparent account of the co-design process, materials used, theoretical frameworks incorporated, methods of analyses and outcomes.

Table 11: A table showing how the COM-B model, the TDF and the intervention functions interlink and map against one another

Frameworks		Intervention functions								
COM-B category	**TDF domain**	**Education**	**Persuasion**	**Incentivisation**	**Coercion**	**Training**	**Restriction**	**Environment**	**Modelling**	**Enablement**
Psychological capability	Knowledge	X				X				X
	Skills	X				X				X
	Memory, attention and decision processes	X				X				X
	Behavioural regulation	X				X				X
Physical capability	Physical skills					X				X
Social opportunity	Social influences						X	X	X	X
Physical opportunity	Environmental context and resources					X	X	X		X
Reflective motivation	Social/professional role and identity	X	X	X	X					
	Beliefs about capabilities	X	X	X	X					
	Optimism	X	X	X	X					
	Beliefs about consequences	X	X	X	X					
	Intentions	X	X	X	X					
	Goals	X	X	X	X					
Automatic motivation	Reinforcement			X	X	X		X		X
	Emotion		X	X	X				X	X

Two co-design workshops were undertaken. The aim was to facilitate the collaborative development of a pilot PA intervention for women from the East Midlands, based on the PA determinants identified in Chapter 5. However, each individual workshop had its own objectives. The first involved prioritising the PA determinants that were identified in Chapter 5 and identifying strategies to capitalise on these high priority determinants. The second involved finalising decisions about the final intervention design and its included BCTs/component parts, based on APEASE analysis of the strategies proposed in Workshop 1.

6.3. Workshop 1

6.3.1. Introduction to co-design workshop 1

In Chapters 3 and 4, women's barriers and facilitators to PA were found to differ according to age, ethnicity, religion, migrant status, occupation, socioeconomic status, body image and/or motherhood status. In Chapter 5, analysis of the barriers and facilitators to PA for women from the East Midlands revealed that, for this participant group, the urban/rural status of their place of residence also seemed impactful.

Parks et al. (2003) identified significant differences in the PA levels of people living in urban and rural neighbourhoods, with those living in rural areas being significantly less active. Adolescents living in urban areas were more likely to experience safety concerns as a barrier to PA than their rural counterparts, whose primary barriers related more to the poor availability of local PA opportunities (Martins et al., 2021). In a systematic review of qualitative studies exploring PA determinants for

African American adults, neighbourhood safety relating to drugs, crime and violence was a particular barrier for women aged 18-50, which limited use of parks and open spaces for PA regardless of availability and accessibility (Siddiqi et al., 2011). Crime rates are generally higher in urban than rural areas (Statistical Digest of Rural England, 2022), but poor public transport links and poor accessibility are especially challenging for those living in rural areas (Gates et al., 2019). Considering the observed differences related to the urban/rural status of place of residence, both during the focus groups and in the literature more generally, participants in Workshop 1 were grouped according to whether they self-described their local area as urban or rural.

The goals of Workshop 1 were as follows:

1. To ascertain which of the PA determinants identified in Chapter 5 women from the East Midlands perceive to be most impactful
2. Generate strategies that women believe might facilitate their PA in respect of these determinants
3. Consider how appropriate these suggestions might be for inclusion within a pilot PA intervention design for women from the East Midlands.

6.3.2. Workshop 1 Methods

6.3.2.1. Participants

Nine women aged 20-62 years (M=42.11, SD=16.71) took part in Workshop 1. To ensure women who had given their time to the previous phase of research (See Chapter 5) felt valued, participants were prioritised for this phase of research, if they had previously attended a focus group. Four participants were successfully recruited in this way and a further five were recruited via snowball sampling. There were

initially twelve participants recruited, as this was considered the maximum number that could be managed by one facilitator. However, there were three non-attendees, one had joined a focus group previously and the other two were recruited via that individual, using snowball sampling. Participants indicated their age, ethnicity, religion, occupation, number of children and whether they considered themselves to live in an urban area or rural area (See Table 12). There were four urban women and five rural women. Women living in an urban area were aged 27-40 (M=31.25, SD=6.4). Women living in a rural area were aged 20-62 (M=50.8 SD=17.77).

Table 12: A table showing the demographics for each participant in Co-design Workshop 1

Participant no.	Age	Ethnicity	Religion	Occupation	No. Children	Urban/ Rural
1	27	White British	None	Civil Servant	2	Urban
2	40	Mixed White and Black African	Jewish	Employment Advisor	2	Urban
3	26	White British	None	Substance Misuse Practitioner	0	Urban
4	32	Mixed White and Black Caribbean	None	Legal Secretary and Student	0	Urban
5	60	White British	Jewish	Musician	1	Rural
6	20	White British	None	Personal Assistant	0	Rural
7	51	White Non-British	None	Software Tester	0	Rural
8	61	White British	None	Clinical Psychologist	2	Rural
9	62	White British	None	Librarian	1	Rural

6.3.2.2. Ethics

This study received ethical approval from Sheffield Hallam University's Research Ethics committee (Ethics Review ID: ER28012805) and was undertaken in line with the BPS Code of Ethics (BPS, 2018)

6.3.3. Workshop 1, Activity 1 (W1A1)

6.3.3.1. W1A1 Materials

Participants were provided with colour coded flashcards (See Figure 14). Each contained information about one PA determinant identified previously (see Chapter 5). Cards were colour coded according to the COM-B component and included the name of the barrier (simplified to avoid jargon and aid accessibility where necessary), an indication as to whether this factor was a barrier/facilitator/both, the definition and an illustrative quote.

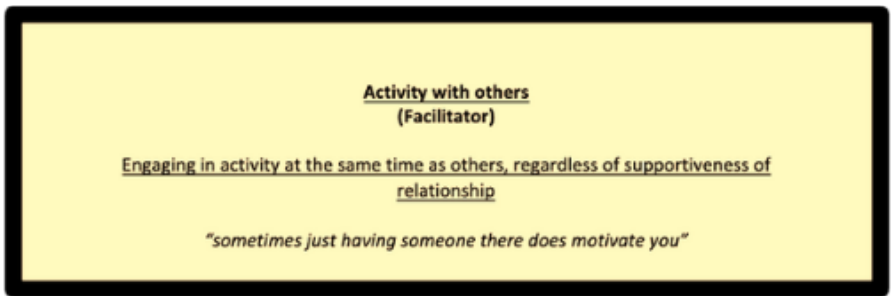


Figure 14: An example card from Workshop 1, Activity 1

6.3.3.2. W1A1 Content

Participants were asked to choose five, or more if there was disagreement, of each of the following (including at least one card of each colour, to ensure suggestions related to all the COM-B components):

a. Barriers to PA considered the most problematic

b. Facilitators to PA considered the most helpful

c. Divergent categories considered to have the most potential to be addressed by a PA intervention

6.3.3.3. W1A1 Results

There were 26 prioritised PA determinants. Table 13 outlines the prioritised determinants and whether they were prioritised by urban women, rural women or both. Urban and rural women largely agreed which determinants should be prioritised. Just three suggestions came uniquely from the urban group, with eight exclusively from the rural group. This left 15 mutual priorities.

Table 13: A table showing which determinants were prioritised by which subgroups of participant with findings mapped on to the superordinate COM-B components

	Urban	**Rural**	**Mutual**
Most problematic barriers			
Capability		Effects of older age	Effects of the menstrual cycle
Opportunity	Being observed during PA		Roles and responsibilities that restrict available time for PA Unsafe environment
Motivation		Slow/little/no progress Anticipating social disapproval	Exhaustion
Most helpful facilitators			
Capability		Planning/scheduling	
Opportunity			Activity with others
Motivation	Willingness to try/conscious effort		Mood enhancing effects Sense of accomplishment Improved health& fitness Burns off energy/relieves stress Improvements in self-esteem Enjoyment
Divergent categories with most potential			
Capability			
Opportunity	Male presence during PA	Cost Not owning a vehicle	Social norms Facility and equipment availability, convenience and appropriateness, Fixed schedules
Motivation		Mood/mental health Belief that PA will hurt	Level of identification with active people

6.3.4. Workshop 1, Activity 2 (W1A2)

6.3.4.1. W1A2 Materials

For Activity 2, all participants were provided with the APEASE criteria, a brief definition of each element (See Table 14) and a list of questions that began *"How might we…"*. This activity was based on the How might we framework for co-design for community inclusion (Sutton-Long et al., 2016), a tool for reframing problems in this specific context. Before the workshop, "How might we" questions were devised for each of the PA determinants that were identified in Chapter 5. For example, in relation to the facilitator 'enjoyment', the devised question was *"How might we make physical activity more enjoyable for women?"*. The full list of "How might we" questions is available to view in Appendix 16.

Table 14: A table showing the APEASE criteria with the simplified definitions, as provided to participants within the workshop

Acceptable	for the people who will be taking part.
Practical	in terms of what is needed to take part, who will be delivering sessions and what is expected of people who take part and how long an intervention could run for
Effective	i.e. Can lots of people take part and would it be likely to increase their PA levels
Affordable	for the people running it and for the people taking part
Side-effects	want to avoid negative side effects as much as possible
Equity	will it make the gap between advantaged and disadvantaged people bigger or smaller?

6.3.4.2. W1A2 Content

Based on the determinants that each group prioritised in Activity 1, in Activity 2 participants were asked to answer the *"How might we…"* questions for their group's prioritised determinants. Participants were

asked to consider the APEASE criteria and note down suggestions that might adhere to these criteria.

6.3.4.3. W1A2 Results

Activity 2 generated diverse suggestions for ways to overcome barriers and/or capitalise on facilitators to PA. After the session, all suggestions were transcribed verbatim and collated, with repetitions removed. Where two suggestions were worded differently but considered the same, the 'Educated Friend' (JKL) was consulted for a second opinion. There were no disagreements at this stage. This collation resulted in 63 unique suggestions for ways to overcome barriers or capitalise on facilitators. Appendix 17 includes a full list of suggested strategies mapped onto the COM-B model, aligned with the associated determinant(s), assessed against the APEASE criteria and identified in terms of the relevant intervention function according to the BCW. Appendix 17 also details which group proposed each item, whether it was endorsed by others, whether it could be considered appropriate for inclusion in the final intervention design and a justification for this decision.

6.3.5. Workshop 1, Activity 3 (W1A3)

6.3.5.1 W1A3 Materials

All participants were provided with all suggestions generated during Activity 2 and with gold star stickers.

6.3.5.2. W1A3 Content

The Lead Researcher facilitated a large group discussion in which participants reported their answers to the "How might we…" questions to the wider group. Participants were asked to 'endorse' up to 3 ideas that they would most like to see included in the intervention, using

stickers. They were encouraged to consider the suggestions in relation to the APEASE criteria and to endorse only items they believed could fulfil these. Little guidance was provided around the resources available, except to explain that the intervention would be delivered by one individual (the Lead Researcher) and that the lower the financial cost, the better. Participants were informed that if they were uncertain about whether a suggestion adhered to the APEASE criteria, they should include it, as this could be removed at a later stage if considered inappropriate.

6.3.5.3. W1A3 Results

There were 14 endorsed suggestions:

1. Flexible activity options
2. Activities that require no equipment
3. Timetabling/diaries/group diaries
4. Have diverse goals to work towards
5. Include goal setting support
6. Optional cameras for online sessions (not mandatory)
7. Be active in groups/pairs
8. Use green spaces
9. Develop a supportive culture by gathering women with similar goals/ideas/abilities
10. Include testimonials/anecdotes from relatable women
11. Provide relatable role models
12. Use promotional materials including social media
13. Offer taster sessions for exploration of different activities
14. Women only sessions

The two most highly endorsed suggestions were endorsed three times each (offer flexible activity options and provide role models). A further three suggestions received two endorsements each (timetabling/diaries/group diaries, use green spaces and develop a supportive social culture by linking up women with similar goals/ideas/ability).

6.3.6. Workshop 1 Findings

6.3.6.1. Workshop 1 analysis

All unique proposed strategies to overcome barriers, capitalise on facilitators or get the best out of divergent categories were mapped onto the COM-B model, matched to the relevant intervention functions from the BCW and assessed against the APEASE criteria by the Lead Researcher (See Appendix 17). APEASE analysis was conducted using a traffic light system, with red signifying a problematic suggestion when assessed against that element of the APEASE criteria, amber indicating a potentially slightly problematic suggestion and green indicating that a suggestion was unproblematic. Suggestions that were assigned 'red' for any aspect of APEASE were eliminated from the selection process. Suggestions deemed to fulfil or potentially fulfil the APEASE criteria were considered for inclusion in intervention design.

Those that fell into one of the following two categories were included:

A. Item scored 'green' on all aspects of the APEASE criteria;
B. i. Item scored no 'reds' and two or less 'ambers' on the APEASE criteria

   and

ii. was either contributed by both groups (rural and urban) or endorsed during Workshop 1, Activity 3.

Factors that had not been eliminated but did not fulfil the above the criteria were brought forward for further deliberation in Workshop 2.

6.3.6.2. Workshop 1 outcomes

Of the 63 unique suggestions, 23 were excluded as outlined above. Suggestions most failed to satisfy the practicability criteria of APEASE. Examples of suggestions that were excluded on this basis include *"quit your job/cancel all work plans"* and *"one-to-one personal training for all participants"*. Coercion is generally not considered an acceptable or practicable intervention in a PA context (Murtagh et al, 2018; Michie et al., 2014), so suggestions such as *"peer pressure to force people to attend"* were also excluded. Just one suggestion that did not fulfil the inclusion criteria was included in the intervention design at this stage *("Have a group leader")*. This was assessed as 'amber' for equity, was suggested by the rural group only and not endorsed. However, although it might have been possible to deliver an intervention without a visible leader via automation of communication, this was unachievable within the timescales of this PhD and so a group leader was considered an unavoidable inclusion for final intervention design. Consequentially, 19 suggestions were incorporated into the intervention design at this stage and a further 21 were brought forward for deliberation in Workshop 2. Included and potential suggestions are available to view in Appendix 17, mapped against the COM-B component addressed, the PA determinants addressed, the APEASE criteria, associated intervention functions, urban-rural status of suggestion contributors, endorsements and justification for inclusion/exclusion. A range of BCT's from the

Behaviour Change Taxonomy were covered by the included and potential intervention options. Each was mapped onto the Taxonomy (Appendix 18).

6.3.7. Workshop 1 results

A range of components that could be included in an intervention and which might promote women from the East Midlands' PA were proposed, mapped onto the COM-B model and the TDF, matched to their relevant intervention functions from the BCW, assessed against the APEASE criteria and coded to the Taxonomy of BCTs. This allowed for inclusion of acceptable, feasible suggestions and exclusion of suggestions considered inappropriate, according to pre-established frameworks.

Women identified potential intervention design suggestions around:

- Accessibility (of activity opportunities and spaces)
- Incorporation (into daily routines and frequented spaces)
- Education (to improve related skills and to promote beliefs in positive consequences)
- Goals (including goal setting, monitoring, tracking, reviewing and rewarding)
- Social factors (including social dynamic management and group cohesion)
- Limitations, restrictions and practical recommendations

6.3.7.1. Accessibility and incorporation

Women described wanting accessible activity opportunities regarding price, location, venue type and activity type. This theme of accessibility was closely linked to physical opportunity within the COM-B model. Some participants expressed a belief that accessibility could be enhanced by activity opportunities that were incorporated into their daily routines and frequented spaces. These desires were reflected in women's requests for free, flexible activity options and online classes that could be completed at home without specialist equipment, accessible 'on demand'.

6.3.7.2. Education, skill and knowledge development

It was suggested that PA might be facilitated through education, to improve activity related skills and promote beliefs in the positive consequences of PA to enhance physical and psychological capability. Women felt their capability to be active could be further enhanced by having a group leader/facilitator/co-ordinator, role modelling of the techniques and behaviours, presentation of statistics/information around the benefits of PA, peer support to develop skills, progress/transformation pictures/videos to heighten awareness of what could be achieved through PA and/or via testimonials/anecdotes from relatable individuals, to enhance understanding of the benefits of PA for women they considered similar to themselves (and therefore who might be likely to experience similar results based on participation in a programme of PA).

6.3.7.3. Goals, social factors and limitations

In terms of motivation, women described methods for bolstering both automatic and reflective processes, including having the option to select from a range of achievable goals and providing support with goal

setting, monitoring, tracking, reviewing and appropriate reward/reinforcement. Women clearly desired more social opportunity to be active and highlighted the importance of group cohesion, which they felt could be achieved using group activity/buddy systems for people with similar goals/ideas/abilities. Further, suggestions were made regarding managing social dynamics through group leadership, codes of conduct and women only sessions. Other limitations, restrictions and practical recommendations included having the option of no mirrors to avoid being observed/feeling self-conscious and having appropriate facilities for menstruation (primarily toilets nearby).

6.3.7.4. Demographic differences in determinants and solutions

There were some differences between the barriers and facilitators prioritised by urban and rural participants. Some might be explained by differing population densities (e.g. being observed during PA was considered highly relevant for urban women) and availability of transport options (e.g. not owning a vehicle was considered highly problematic for rural women). However, contrary to previous findings (Martins et al., 2021; See also Section 5.5.2.) rural and urban women identified and prioritised largely similar determinants. Many of the observed differences between the rural and urban group seemed unlikely to be related to participants' urban/rural status (e.g. mood/mental health was only prioritised by rural women) and this was reflected during the endorsement process from Activity 3, whereby suggestions were endorsed by participants from both groups, regardless of who had contributed them. For this sample, these urban-rural differences were therefore less pronounced than anticipated based on findings in Chapter 5. Thus, in practice, methods of PA promotion may be similarly applicable for urban and rural women. Rural women considered online

access an acceptable means of addressing their more limited opportunity for PA, so hybrid or online interventions may provide an inclusive remedy.

The mean age of the urban participants was significantly lower than the rural participants' mean age (mean difference = >19.5 years), which may have contributed to some observed differences. For example, effects of being older age and belief that PA will hurt were only highlighted as problematic by rural women, who were generally older than their urban counterparts. Siddiqi et al. (2011) found rural women aged over 50 to have different barriers to PA compared to rural women aged 18-50, but primarily linked this to rural women's reduced physical opportunity to be active (e.g. due to limited public transport). Co-design Workshop 1 however, found differences in terms of older women having negative beliefs about the consequences of being active and experiencing reduced physical capability for PA.

A further factor that seemed to elicit differential responses between participants was baseline activity level. During group discussions, participants who described regular PA participation were more dominant, spoke more and expressed ideas of what a PA intervention should look like more strongly. This may relate to their (perceived, perhaps self or other appointed) status as 'Experts by Experience', who participants may have considered to have more valid opinions in respect of PA. However, this is also reminiscent of the sampling bias within PA research generally, whereby those experiencing the greatest PA-related inequalities, who are most in need of intervention, are frequently the least well represented within PA research (Mendoza-Vasconez et al.,

2016). Women who described undertaking regular PA contributed different ideas to those who described a sedentary lifestyle. This has potential negative ramifications for the next stage of intervention design, if women who are less active have not had their views adequately represented at this stage. Future PA intervention co-design may benefit from grouping women according to their baseline activity level, rather than their urban/rural status or otherwise. From a researcher perspective, this dynamic, whereby people of differing PA levels were making different contributions with varying confidence, was challenging for one person to facilitate across three groups of up to four people simultaneously. Having an appropriate ratio of workshop facilitators to participants and taking care to ensure that the voices, preferences and beliefs of those most in need of intervention are heard and incorporated into intervention design, was therefore important when developing and conducting co-design workshop 2.

6.4. Workshop 2

6.4.1. Introduction to Workshop 2

According to the BCW, once intervention options have been assessed against the APEASE criteria, the next phase of intervention design should involve identifying specific intervention content (BCTs) and implementation options (mode of delivery).

6.4.1.1. Included elements

Following analysis of Workshop 1 outcomes, it was evident that participants felt they would benefit from both group exercise sessions and support to incorporate more PA into their individual daily lives and

routines. Women requested PA opportunities that were free and could be accessed flexibly, with numerous suggestions that classes operate in-person, online live and be available online on-demand. Online interactive sessions ameliorate issues of accessibility in education for people in isolated locations (Deichakivska et al., 2024) and throughout the Covid-19 pandemic, online PA classes were perceived by participants to promote accessibility (Suderman et al., 2022) despite barriers in terms of technological difficulties, digital literacy, digital inaccessibility and low motivation. Accessibility promotes equity (van Wee, 2022), but accessibility of PA opportunities was lower for people living in more deprived areas (Estabrooks et al., 2003). To further ensure accessibility, women described wanting PA opportunities that required no specialist equipment and could therefore be completed at home, which was positive in terms of APEASE analysis.

6.4.1.2. Unclear elements

At this stage, it remained unclear what specific type(s) of PA women would be most likely to engage in. Women proposed a range of educational sessions that might positively impact their PA but it was unclear which, if any, should be prioritised. Many participants mentioned the importance and relevance of goals for their PA . However, there were contradictory suggestions for how these should be incorporated, with some considering shared group goals to be preferable and others proposing that goals should be varied and individualised. How any intervention could appeal to diverse women in terms of urban/rural status, age and baseline PA level remained unclear.

6.4.1.3. The approach

A series of co-design workshop tasks were devised, to identify specific intervention content and implementation options. Considering the need

for clarification around best intervention options for diverse women, personas were introduced.

Co-design Workshop 2 was structured around the superordinate categories identified in Workshop 1. Its purpose was to finalise decisions about intervention options that should be included in the pilot.

6.4.2. Workshop 2 Methods

6.4.2.1. Participants

Participants were invited to attend Co-design Workshop 2 if they had attended Workshop 1, as the tasks were considered to follow on from previous discussions. However, due to attrition, Workshop 2 involved four women: One had been involved in all phases of research to date, two had attended only Workshop 1 and one was recruited via snowball sampling. Two participants resided in rural locations and were in their early sixties. Two resided in urban locations and were in their early thirties. Participants rated themselves as active (all self-ratings were 3/5 or more). Although likely overreported (e.g. Liu et al., 2016; Salllis & Saelens, 2000), this may be problematic based on the importance of representing the views of the most inactive women when aiming to develop effective public health interventions.

6.4.2.2. Personas

Personas were incorporated, to ameliorate the issues of sampling bias identified above (6.4.2.1.). Personas have been found useful during the design and development process, appearing to support development of final design outcomes with superior useability (Long, 2009) and helping to clarify the end-user of any design (Dharwada et al., 2007). Personas were described only in terms of the most relevant characteristics (age,

urban/rural status and activity level). Each was chosen to represent prototypical participants who had engaged with earlier phases of the research and to elicit discussion about demographic characteristics that had appeared to drive discrepancies during Workshop 1. Each persona and its attributed characteristics can be seen in Table 15.

Table 15: Participant characteristics for Co-Design Workshop 2

Name	Age	Location	Activity status
Anne	58	Lincolnshire countryside	Inactive
Bethany	20	Nottingham city centre	Somewhat active (e.g. walks for transport)
Camille	32	Rural Nottinghamshire	Very active (exercises at a high intensity most days)
Dana	45	Peterborough city centre	Inactive

6.4.3. Workshop 2, Activity 1 (W2A1): Accessibility & incorporation

6.4.3.1. W2A1 Materials

Participants were provided with a blank 'mind map' that said "Activities (classes/sessions)" and some coloured pens, with one colour to represent the self and a different colour for each persona.

Charts were also provided, such that participants could provide responses to each question.

6.4.3.1. W2A1 Content

Before participating in Workshop 2, participants were informed that based on findings from Workshop 1, the intervention would include the following:

- Free exercise classes that are adaptable for different abilities and which can be attended in-person in accessible locations, live online and/or on-demand online from home without any equipment
- PA incorporated into daily routines (including things like active travel and use of green spaces where possible)
- The option to work towards a range of self-selected, achievable goals
- The development of a supportive social culture

Participants were then introduced to the four 'personas' and informed that their own thoughts and feelings would be relevant for all activities, but that they would also be providing responses on behalf of the personas for some activities.

Mind mapping has been found useful for idea generation within co-design, including enabling participants to easily indicate how features of digital health and fitness apps could be adapted to better suit their PA behaviours (Harrington et al., 2018). Participants were first asked to complete a mind map indicating the types of PA they might undertake. Free thinking was encouraged and it was explicitly stated that all suggestions were valid and acceptable. Participants were next asked to consider the suggestions on the mind map and specify which they, and each persona, might enjoy.

Participants next indicated 1) What times they felt classes should occur, 2) How long each class should be, 3) How many weekly classes there should be, 4) How many weekly classes they would personally attend in-person, 5) How many weekly classes they would attend, combining both online and in-person attendance and 6) How frequently incorporated activity challenges should occur

6.4.3.2. W2A1 Results

Women offered 12 unique suggestions for activities that they might be interested to take part in (See Figure 15). Each suggestion could be endorsed a maximum possible number of 20 times, once by each attendee and up to four times each for each persona (one from each participant). The four most endorsed activity types were yoga/stretching (17 endorsements), circuits (16 endorsements), walking (15 endorsements) and booty building (13 endorsements).

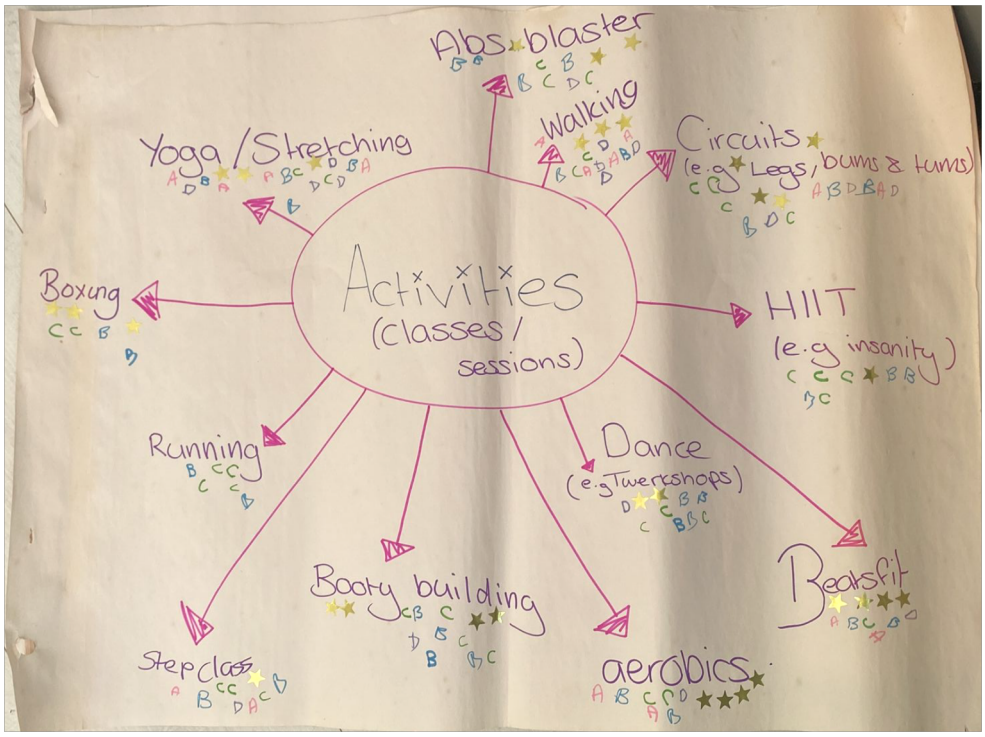


Figure 15: The mind map generated by participants in Workshop 2, Activity 1

Participants indicated that they would like their PA classes to take place either between 9am and 11am or 6pm and 8pm on weekdays. There was agreement that exercise sessions should be 45-60 minutes, 3-4 times weekly but participants indicated they would probably attend one in-person session and one/two online weekly. All agreed that incorporated PA challenges should be set daily, including weekends.

6.4.3. Workshop 2, Activity 2 (W2A2): Education

6.4.3.1. W2A2 Materials

Participants were provided with short descriptions of three proposed educational sessions from Workshop 1 (positive consequences of PA, planning/scheduling and taster sessions).

6.4.3.2. W2A2 Content

Participants indicated which educational sessions they and each persona might attend and rated how impactful they believed each would be at increasing PA for themselves and each persona. All scores were out of 10, with 0 being no impact at all and 10 being the biggest positive effect on PA imaginable.

6.4.3.3. Results

All participants indicated they would be happy to attend all three proposed educational sessions but rated the likely impact of each on their PA levels, as 5/10 or 6/10.

6.4.4. Workshop 2, Activity 3 (W2A3): Goals

6.4.4.1. W2A3 Materials

Participants answered a qualitative paper-based questionnaire about goal setting. There were 9 items. The first asked *"What is your primary PA-related goal?"*. There were 7 follow-up questions and a closing question (*"what goals do you think would be important to each persona?")*.

6.4.4.2. W2A3 Content

Participants answered the first 8 questions for themselves and provided four answers to question 9 (one for each persona).

6.4.4.3. W2A3 Results

<u>Participants:</u>

All participants had appearance/size/weight-related goals. Despite being asked to select one goal, three of the four participants also wrote "to get fitter".

Suggestions for measuring and monitoring appearance-related goals included using weighing scales, using the "fit" of clothes and visually/through progress photos.

Suggestions for measuring and monitoring fitness goals were generally more vague, but participants proposed counting repetitions or measuring distances travelled.

One participant felt their goals could be achieved through PA alone, two indicated that a combination of PA and controlled diet would be needed

and one mentioned only diet, despite indicating having the goal of improving fitness and stating this could be measured by counting and tracking the number of repetitions completed whilst exercising.

Three of the four participants indicated they would like to share progress with the group, the fourth felt they may be comfortable with this but would certainly be happy to share with the group leader.

Suggestions for support that might be enable goal accomplishment included none, progress diaries/apps and check-ins with the group or group leader.

Rewards that participants felt would be motivational included sense of accomplishment, improvements in performance at other activities that they already do, social events and prize money.

Participants unanimously agreed they would not enjoy being competitive with other participants in relation to their appearance or fitness related goals.

Personas:

All participants felt Anne (58 year-old, rural dwelling and inactive) would have goals relating to the initiation of PA and monitoring steps.

Bethany (20 year-old, urban dwelling and somewhat active) was considered likely to have appearance, fitness and behavioural goals (e.g. hit 10k steps a day).

Camille (32 year-old rural dwelling and highly active) was considered likely to have some goals relating to appearance but mainly goals to achieve highly within PA (e.g. 'personal bests').

Participants expected that Dana (45 year-old, urban dwelling and inactive) would have appearance, self-esteem and behavioural goals

6.4.5. Workshop 2, Activity 4 (W2A4): Social

6.4.5.1. W2A4 Materials

Participants were provided with gold star stickers and a sheet containing "Would you rather…?" questions, with dichotomous and opposing answers. 'Would You Rather' is a co-design technique that has been recently formalised (Simko et al., 2021) based on the conversational game of the same name. This method is designed to guide focus groups in discussing and making decisions related to trade-offs, dilemmas, tensions and risks. Questions were as follows, "Would you rather…":

1. Be active individually or as part of a group
2. Have a group leader or use peer learning and organisation
3. Have competitive or non-competitive PA
4. Have a code of conduct or not

6.4.5.2. W2A4 Content

Participants selected between two opposing intervention options for themselves and each persona.

6.4.5.3. W2A4 Results

There were 20 maximum votes available for each question. Participants showed a preference for group (14/20), non-competitive (13/20) PA with a group leader (18/20) and code of conduct (20/20).

6.4.6. Workshop 2, Activity 5 (W2A5): Limitations, restrictions & practical considerations

6.4.6.1. W2A5 Materials

Participants were provided with gold star stickers and five shared empty bar charts, one for each limitation/restriction/practical consideration.

6.4.6.2. W2A5 Content

Participants were asked to indicate, using the gold stars, the importance of each limitation/restriction/practical consideration on a 5-point Likert type scale. Five was considered necessary for PA, 3 indicated that a factor was unimportant either way and 1 indicated that a factor would inhibit PA. Participants were asked to place one sticker on each chart, to indicate the importance of that factor to them personally.

6.4.6.3. W2A5 Results

All but one factor was rated 3/5 by all participants. Three of the four participants indicated a preference for women only sessions (scoring this 4/5), but none considered this crucial and one considered it 'irrelevant'.

6.4.7. Workshop 2 Findings

6.4.7.1. Workshop 2 analysis

Most of Workshop 2 was analysed using a 'majority wins' approach, based upon participants' 'votes' and those allocated for each persona. For some activities, the personas' "opinion" was not considered applicable. For example, participants were not asked to indicate what

time of day personas would attend sessions, as it seemed important that sessions fit in with participants' actual schedules, rather than personas' imaginary ones. Where no clear preference was identified, the decision-making process is outlined in Figure 16.

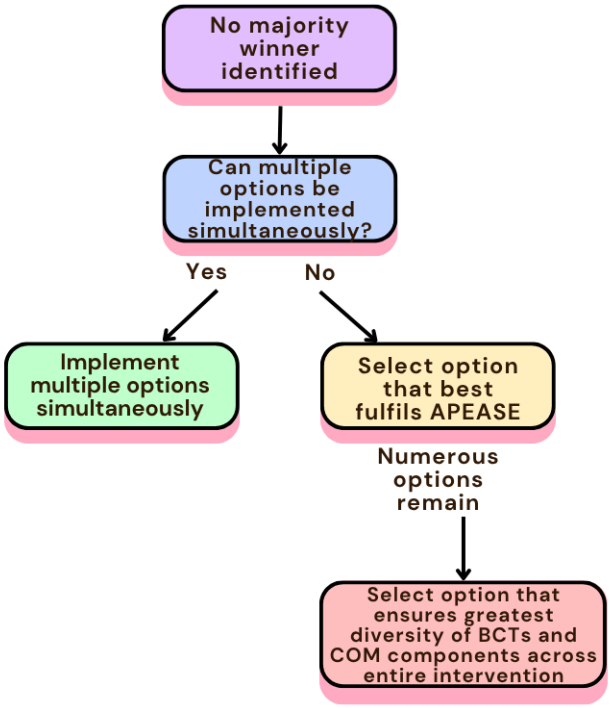


Figure 16: A flowchart showing the decision-making process if there was no clear preference indicated in terms of intervention options

Using this approach, when four activity types were similarly popular, all were incorporated into the final intervention design. However, when participants indicated they would be happy to attend all three proposed educational sessions but that these would likely have a maximum impact of 6/10 on PA, implementing all three was considered impracticable based on the limited anticipated impact. Thus, goal-setting was selected for inclusion as it fulfilled a broad range of

intervention functions and BCTs that were otherwise not well integrated within the intervention design and because it effectively supports PA promotion for diverse populations (McEwan et al., 2016).

'Activity 3: Goal-setting' provided various suggestions around participants' preferences. Where two could not be simultaneously implemented (e.g. there had to be consensus about whether goal-setting should be competitive), the option that best fulfilled the APEASE criteria was incorporated (a non-competitive approach was preferred by the majority, considered to better fulfil the criteria of equitability and deemed unlikely to have unintended negative side-effects).

6.4.7.2. Workshop 2 Outcomes

Workshop 2 clarified uncertain features of the final PA intervention design and allowed consideration of the likely preferences for diverse women in terms of urban/rural status, age and baseline PA.

Regarding PA options, accessibility and incorporation into daily lives, it was decided that the exercise classes would involve a combination of stretching, circuit training and 'booty building' within one all-encompassing 45-60 minute class. This class would happen 3x per week on weekdays at whichever proposed time could be accommodated within an appropriate, local, affordable and fit-for-purpose community space. The incorporated activity challenges were planned daily, to include walking. To suit the lifestyles and preferences of diverse women, PA challenges were variably cued. Some were attached to contextual cues that involved deliberate acts by the participant whilst undertaking a typically inactive task (e.g. complete squats whilst boiling the kettle),

some were cued by contextual features of the environment that were somewhat outside of the individual's control (e.g. complete sit-ups whenever there's an advert break on the television) and some encouraged participants to make conscious choices to change previously sedentary behaviour (e.g. using motorised transport) into active behaviour (such as cycling).

It was considered that education around the positive consequences of PA could be achieved without specifically allocated time, through: a) Proper instruction whereby the group leader described the benefits of each exercise during sessions and b) during goal-setting education, in which goal-setting was informed by discussion of the positive consequences of PA and progress was tracked, monitored and reviewed. SMART goal-setting was utilised to support this process (S.M.A.R.T; Doran, 1981). SMART has undergone critique for its overuse within PA research (e.g. Swann et al., 2023), but University students who implemented SMART goal-setting better achieved their goals, had higher need satisfaction and had more positive affect, compared to a control group that engaged in unstructured goal-setting (Bahrami et al., 2022). Further, a fitness-focussed intervention for adolescents saw better outcomes when SMART goal-setting was incorporated (Lu et al., 2022). Goal-setting education involved instructor-led sessions and a purpose-made goal-setting workbook (See Appendix 19), designed to guide the goal-setting process and encourage: consideration of the behaviours that would need to be completed to achieve goals; identification of barriers and facilitators to these behaviours; self-reflection; evaluation; monitoring and review. All intervention components were optional and

this was reiterated throughout, to promote ethicality and reduce participant burden.

Although not the focus of the intervention, women expressed a desire to track eating behaviours/caloric intake alongside their PA, based on their physique-centric goals. However, weight-loss-focussed interventions can be ethically questionable (Ten Have et al., 2011), as despite some health benefits, there may be issues in terms of: uncertain and/or unfavourable impacts on physical health; negative psychosocial consequences including uncertainty, fear, concerns, blame, stigma and unjust discrimination; a disregard of the social and cultural value of eating; privacy often being disrespected or violated; oversimplification of the responsibility of overweightness; and infringements on personal freedom. Aligned with participants' requests and based on the documented associated between body image and women's PA (See Sections 1.3.3., 3.5.4., 4.5.5. & 5.5.3.) space was allocated in the workbook for participants to track calories, weight and measurements if they wished to. Nonetheless, to promote intervention ethicality, behavioural goals were emphasised and encouraged during the taught sessions and weight loss/calorie restrictive goals were not mentioned by the Lead Researcher. Women wanted the freedom to choose whether their progress was private or shared, but it was decided the instructor should be available to support and reinforce this process for those who were comfortable. Tangible rewards for goal-accomplishment and/or weight loss were considered unethical and unaffordable. Instead, women acknowledged the intrinsic reward that sense of accomplishment and improvements in health and wellbeing from programme participation would bring. Creating a competitive within-

group culture was considered unethical, inequitable and inappropriate. Having a group leader and an explicit code of conduct were considered likely to support development of a positive social culture.

Most of the proposed limitations, restrictions and practical considerations from Workshop 1 that were undecided through APEASE analysis were considered unimportant by women in Workshop 2. There was however a preference for women-only sessions, so this was considered during selection of the space, promotion of the programme and marketing/recruitment.

6.4.8. Workshop 2 Discussion

Co-design Workshop 2 gave participants the opportunity to indicate their preferences in relation to features of the proposed PA intervention that had previously remained uncertain following Co-design Workshop 1. The women in Workshop 2 made decisions regarding the type, duration and frequency of PA; indicated their thoughts, feelings and expectations for a range of educational sessions on their PA behaviour; communicated that they have varied goals that could be monitored, evaluated and reviewed using a range of measurement techniques, but which were primarily related to appearance and fitness; and indicated a preference for female-only group activity that was led by an instructor, was non-competitive and had an explicit code of conduct.

Personas were found useful for the consideration of the needs of diverse women in respect of urban/rural status, age and active/sedentary status. However, this approach might be considered to contribute to and/or perpetuate stereotypes (Turner & Turner, 2011), which although

heuristically useful, can be harmful within society. Personas should therefore be cautiously integrated into research. It is beyond the scope of this thesis to build upon findings from Long (2009) and Dharwada et al. (2007) by drawing firm conclusions around the impact of including personas during intervention co-design on behavioural outcomes. However, anecdotally, personas aided group discussion that incorporated relatively diverse views, with few participants.

The findings of Co-design Workshop 2 might be considered limited due to the small sample size, which lacked diversity somewhat. However, the sample included a 50/50 split of women in their 30's and 60's, women from urban and rural areas, women of different religions and there was some, albeit limited, ethnic diversity. Despite participants self-rating their activity level as 3-5 out of 5, self-reported PA is inherently overestimated due to social desirability bias (Adams et al., 2005; Prince et al., 2008). It would therefore be reasonable to assume that these women are less active than their self-ratings indicate and that findings have relevance for less active women. Personas were implemented to offset some issues associated with sampling bias.

The relative infancy of co-design for health-related interventions including the limited evidence on its effectiveness (Constantin et al., 2022) and the limited availability of evidence describing appropriate co-design workshop methodologies/practice (Slattery et al, 2020) offer both a rationale for and limitation of, this research. These knowledge gaps render the data collection methods and activities within Workshop 2 somewhat experimental and grounded in limited theory within co-design. Nonetheless, activities that have empirical backing in other

contexts, alongside the prescriptive, systematic and empirically grounded frameworks used to identify barriers/facilitators and analyse intervention options, should compensate for this. This chapter goes some way towards remedying the scarcity of practical examples of co-design workshop activities that researchers can implement, to facilitate participants in communicating their preferences, needs, attitudes and expectations.

Co-design Workshop 2 provides insight into women's desires for a broad range of scalable and flexible activity opportunities in terms of the activity itself, methods of engagement, levels of intensity, timing and goals. This flexibility seems key to engaging diverse women in PA and is likely explained by the many competing priorities that women are juggling in terms of paid and domestic work and responsibilities, alongside trying to be active (e.g. Bantham et al., 2020; Sørensen & Gill, 2008; See Section 1.3.2.). The unanimous decision to include a code of conduct alludes to women's requirements for non-judgemental spaces to be active (See Table 10 and Section 5.4.3). This may be further reflected in their preference for female-only activity sessions, as women who were active in male-dominated spaces described anticipating and experiencing stigma from men during PA (See Section 4.4.3. & 4.4.5.). Most women in the workshops considered PA primarily a means of managing body shape/weight and secondarily a means of promoting health/fitness. This aligns with evidence around women's longstanding desire to become slimmer (e.g. Conor-Greene, 1988; Cheney, 2011), but from an intervention delivery perspective, means that the ethics of capitalising on this desire for physical changes must be carefully considered. The cultural shift towards "strong is the new skinny"

(Tiggeman & Zaccardo, 2018) and thus, “strong is the new sexy” (Washington & Economides, 2016) ideologies, may facilitate healthier physique management practices than traditional Western beauty ideals around slimness. However, for women experiencing body dissatisfaction, self-esteem reduced further following exposure to imagery of conventionally beautiful women’s bodies (Johansson et al., 2005) and focussing high levels of attention on women’s bodies via body scanning facilitated PA for active, but not sedentary women (Grogan et al., 2017). The ethical complexities associated with centralising women’s bodies in their PA-related narratives and leveraging women’s body dissatisfaction to promote health-related behaviour, cannot therefore be understated.

Workshop 2 answered various questions about intervention options, yet some features of the intervention remained dependent on logistical, financial and organisational factors. These factors included: the specific location of the exercise classes, the complete content of these classes and the incorporated activity challenges, the exact time of the in-person sessions, which platforms to use for live streaming and uploading content, the method of communication with participants and the content of the code of conduct. Future research might consider including a third phase of co-design workshops for further clarification. However, due to the longitudinal nature of co-design processes and the observed issues with retention of relatively small sample sizes associated with qualitative research (as was observed in this phase of research), the costs and benefits of a third wave of co-design workshops must be carefully balanced. Additionally, due to the cyclical nature of the iterative and reflexive co-design process, this phase of research

could theoretically continue indefinitely and so resources, time-consideration and the relative benefit of further waves of co-design must be balanced. The possibility and relative benefit of a third phase of co-design might pragmatically be determined by factors including financial budget and diversity of the training capabilities/expertise of those responsible for delivering workshop content. Identification of best methods of recruitment and retention for co-design, particularly regarding the most underserved and in-need communities would be highly valuable.

Co-design Workshop 2 can be considered a 'smorgasbord' of co-design techniques that have been sampled, implemented and reported. Participants perceived that free, flexible and accessible activity options were a prerequisite for any PA intervention aiming to include and appeal to diverse women. A non-competitive, supportive, empowering and non-judgemental social environment was identified as key, but male presence was considered to threaten this. Women's PA was motivated mainly by desire for weight loss and partly by a desire to be fit and healthy. This presents ethical issues for researchers and intervention providers, who must tread carefully if maximising the PA-facilitating potential of body dissatisfaction.

Co-design Workshop 2 enabled clarification of uncertain features of the final pilot intervention, using a range of interactive activities. These workshops have been developed using an intricate web of complementary theoretical frameworks, systematic processes and empirical evidence. Personas were anecdotally useful for the representation of prototypical and underrepresented members of the

target demographic. “Would You Rather?” activities helped clarify preferences between dichotomous options. Further evidential support would be needed to formally assess whether there are certain tools or techniques that are used within co-design, that consistently improve intervention efficacy. The co-design literature is in its relative infancy and whilst some small part of the large gaps in the knowledge base can begin to be filled by this PhD thesis, to ensure that this field maintains its integrity and fulfils its potential there is much work yet to be completed.

6.5. Advancing the field of co-design

There is little doubt that co-design has potential as an efficacious (Andersson et al., 2015) and empowering means of approaching intervention development. A growing body of literature is taking a co-design approach to the creation of interventions aiming to target health-related behaviour generally and PA behaviour specifically (e.g. Brown et al., 2020; Fylan et al., 2021; Marini et al., 2021; Ramage et al., 2020). However, in keeping with the conclusion of Slattery et al.’s (2021) rapid review, a large gap in the co-design literature clearly remains, due to the paucity of publications evidencing the co-design process with transparency and replicability.

Considering the growing popularity of co-design for product and intervention creation alike, without clear guidelines about methods for designing, delivering, evaluating and reporting co-design approaches, research output in this field will inevitably be at worst, poor and at best, inconsistent. Appendix 20 therefore provides a tentatively proposed 12 step guide, which might act as a first outline for how co-design of a

health-related behaviour change intervention might look, although this is yet to undergo scrutiny or evaluation. Future researchers are invited to take parts of this approach they consider useful. If anybody follows this step-by-step process, evaluation of the resulting interventions would be useful. Other researchers are warmly encouraged to propose alterations and/or additions to these guidelines, according to their own experiences, evaluations and requirements.

6.6. Summary and conclusions regarding co-design

Despite its broad scope, the field of co-design has not yet been honed to its fullest potential. This chapter has taken small steps towards building upon this field of research, by providing a detailed account of the co-design process and including a first prescriptive proposal for implementing co-design protocols and procedures within its appendices. Other similar contributions, plus comprehensive systematic review and evidence synthesis of the co-design literature would enhance this field of research. The development of a taxonomy of empirically grounded co-design workshop activities and a "How to" guide, which is grounded in the best available evidence would have obvious utility for advancing the field. Nonetheless, co-design has promise for the collaborative development of a range of user-friendly outcomes, including PA interventions. The 4-week pilot PA intervention for women from the East Midlands that was developed throughout this process is reported, in line with the TIDieR Checklist requirements in Appendix 1.

Chapter 7: Intervention outcomes and treatment fidelity: A quantitative evaluation

7.1. Overview

The 4-week pilot intervention that was developed in Chapter 6 and described in Appendix 1 is quantitatively assessed here in terms of its treatment fidelity and its efficacy at increasing PA, improving fitness and enhancing psychological wellbeing. Descriptive statistics provide insight into how the pilot intervention was received by participants. Cautious inferences are made about the efficacy of the pilot intervention at increasing women from the East Midlands' PA, based on tentative inferential analyses. Intervention efficacy and treatment fidelity are discussed, strengths and limitations are considered and demographic subgroups of women who would benefit from further involvement in future co-design/redevelopment are identified.

This phase of research aligns with the delivery stage of the Design Council's (2005) Double Diamond and offers a first chance at implementing the pilot intervention, which was designed using the BCW approach to intervention development (Michie et al., 2014).

7.2. Introduction

Based on the findings of the Co-design Workshops (See Chapter 6), a 4-week pilot PA intervention was developed with and for women from the East Midlands. The included intervention options aimed to consider those specific barriers and facilitators that women perceived to most influence their PA, ensuring that the full spectrum of the COM-B

components was addressed using diverse intervention options and BCTs, that fulfilled the APEASE criteria.

Aligned with the iterative nature of the double diamond design process, piloting any intervention on a small scale is a prerequisite for developing and implementing a full-scale intervention. Pilot studies provide useful evidence of potential for intervention effectiveness and quantification of feasibility of recruitment and retention (Bell et al., 2018). Piloting an intervention allows for identification of pragmatic strengths and weaknesses of the intervention design, providing insight into the potential outcomes, efficacy, acceptability to the target demographic and feasibility in a local community context. Whilst pilot studies typically fail to provide information about effect sizes due to small sample sizes (Leon et al., 2011), only once collation and analysis of outcomes has been completed can an informed, yet cautious decision be made about whether a programme can and should be run at full-scale. Usually, piloting an intervention will identify areas for improvement, making redevelopment necessary. However, researchers should be open minded when piloting interventions and be willing to terminate an intervention where appropriate. Any pilot intervention would be unlikely not to require at least some small redesign/redevelopment before running at full-scale and this opportunity for empirically grounded redevelopment, makes piloting a vital part of rigorous and evidence-based intervention development.

Bellg et al. (2004) and Borrelli et al. (2005) agree that treatment fidelity refers to the methodological strategies that monitor and enhance the reliability and validity of behavioural interventions, to evidence that

behavioural changes are elicited by the intervention and not some other extraneous variable. Treatment fidelity can relate to treatment design, training providers, delivery of treatment, receipt of treatment and enactment of treatment skills. Carroll et al., (2007) identified implementation fidelity as an important factor that impacts both the credibility and utility of research. However, in their scoping review, O'Shea et al. (2016) found treatment receipt and treatment skill enactment to be frequently ignored within intervention literature. To address this limitation of the knowledge base, the intervention's treatment fidelity was assessed throughout the course of the pilot intervention, in line with procedures outlined by Borrelli (2011), to include the elements of treatment fidelity that have most relevance at this stage: treatment receipt, behavioural enactment and behavioural adherence.

A systematic review revealed no relationship between the duration and efficacy of PA interventions (Greaves et al., 2011). However, for online interventions, better outcomes appeared to be associated with having more than five contacts and short follow up times of less than three months (Vandelanotte, 2007). A systematic review and meta-analysis of RCTs aiming to target inactive adults' PA found interventions aiming to promote PA, but not those aiming to reduce sedentary behaviour, to effectively elicit and maintain PA (Howlett et al., 2018). Aligned with findings from O'Shea et al. (2016), only one of the 26 included studies in Howlett's review, which spanned a publication period of almost 30 years, documented treatment fidelity. Nonetheless, those that included evidence-based BCTs were most effective. A review of reviews exploring PA interventions in primary care found the largest effect sizes for the

most sedentary participants (Sanchez et al., 2015). This is promising for health promotion because, for sedentary people, modest elevations in physical fitness were associated with large health-related improvements (Warburton et al., 2006).

An overview of systematic reviews by Singh et al. (2023) included 97 reviews with a total 128,119 participants and explored the effectiveness of PA interventions for improving depression, anxiety and distress. PA interventions had a medium positive effect on all three variables across all population groups, with the largest benefits observed for groups including healthy individuals, post-partum women and people suffering with depression, HIV and kidney disease. One systematic review and meta-analysis (Liu et al., 2022) showed that women suffering with perinatal depressive symptoms saw the best improvements of those symptoms with PA interventions of longer than 12 weeks. However, Rogerson et al. (2020) pooled data from 318 “Green Exercise” interventions, identifying a positive impact of these interventions on wellbeing but found intervention duration not to mediate this relationship. It is therefore unclear whether a four-week PA intervention might positively impact wellbeing, although healthy adults, women and those with low baseline wellbeing might see the largest effect sizes in this regard.

For obese adults, factors that limited adherence to lifestyle interventions included poor motivation, environmental/societal/social pressures, lack of time, health and physical limitations, negative thoughts/moods, socioeconomic constraints, gaps in knowledge/awareness and lack of enjoyment of exercise (Burgess et al.,

2017). Early weight loss success, better baseline mood, being male and being older were associated with intervention adherence. Lower Body Mass Index was associated with increased likelihood of adherence to lifestyle interventions. This may seem intuitive, but is interesting and somewhat surprising when considering other findings that targeted PA interventions appear to be most efficacious for those who are the most sedentary at baseline, in conjunction with the strong positive correlation between sedentary behaviour, inactivity and obesity (Biddle et al., 2010). For older adults, dropout from an exercise intervention was associated with greater indicators of cognitive decline, low self-efficacy for overcoming barriers and factors relating to physical fitness (Mullen et al., 2013). An exploration of 14,522 adult leisure centre members identified those who were younger, had shorter memberships and who visited less frequently to be at greatest risk of dropout (San Emeterio et al., 2020). At least some wellbeing-related and demographic factors therefore appear to influence withdrawal from PA. However, factors that predict attrition from PA or PA interventions remain unclear because research exploring differences between programme or intervention 'completers' and 'dropouts' is sparse. This is unsurprising because recruiting participants who have withdrawn from research, into a further phase of research is inherently difficult.

Within this chapter therefore, the demographic and wellbeing characteristics of participants who signed up and completed the pre-participation questionnaire were compared, based on whether they did or did not engage following sign-up. The 4-week pilot intervention was assessed using quantitative measures of treatment fidelity (treatment receipt, behavioural enactment and behavioural adherence), efficacy (at

increasing physical activity) and health-related outcomes (fitness and wellbeing). Descriptive statistics provide insight into how the pilot intervention was received. Tentatively conducted and interpreted, within subjects, inferential analyses allow cautious conclusions to be drawn about the pilot intervention's outcomes and efficacy. These can be used to inform intervention redevelopment, beyond completion of this PhD.

7.3. Method

7.3.1. Participants

Participants were recruited through social media (See Appendix 21). There were 45 enquiries and 25 women aged 18-63 who signed up. Ten enquiries came from women who decided not to participate and a further ten women were informed that there were no more spaces available on the programme. Nineteen women engaged in some way throughout the 4-week programme, six did not. For pragmatic reasons such as room capacity, 25 was considered the maximum possible number of participants. Thus, as is typical of pilot studies, statistical power or clarity on effect sizes of any outcomes could not be achieved (Leon et al., 2011). A table showing how participant characteristics differed between those who participated, those who didn't and the total pooled participant group can be seen in Table 17. All participants from Co-design Workshop 2 (i.e. those who made explicit choices about features of the final pilot intervention design) engaged with intervention, although one dropped out in Week 1.

Table 17: A table showing participant characteristics overall and then split according to whether they did or did not engage

Characteristic	Combined		Engaged		Did not engage	
N	25		19		6	
Age	Mean=34.52	SD=12.04	Mean=36.42	SD=12.69	Mean=28.50	SD=7.66
	Min=19	Max=63	Min=20	Max=63	Min=19	Max=41
Ethnic origin	84% White, N=21 16% Mixed, N=4		84.2% White, N=16 15.8% Mixed, N=3		83.33% White, N=5 16.67% Mixed, N=1	
Highest level of education	Mode=Some Uni no degree		Mode=Graduate/Professional Degree		Mode =Some Uni no degree[A] & Uni Bachelors[B]	
	N = 6/24	25%	N = 5/18	27.78%	N = 2/6[A], 2/6[B]	33.33%[A], 33.33%[B]
Total household income (£)	Mode = 20k-39,999		Mode = 20k-39,999		Mode = <20k[C] & 20k-39,999[D]	
	N = 9/25	24%	N = 9/19	47.37%	N = 2/6[C], 2/6[D]	33.33%[C], 33.33%[D]
MDI decile	Mean = 5.00	SD = 2.83	Mean = 5.06	SD = 2.90	Mean = 5.5	SD = 2.81
	Med = 5.00	IQR = 4	Med = 5.00	IQR = 3	Med = 7	IQR = 3
Wellbeing baseline (out of 35)	Mean = 24.88	SD = 4.19	Mean =25.42	SD = 4.46	Mean = 24.20	SD = 1.3
	Med = 23.00	IQR = 3	Med = 23	IQR = 5	Med = 24	IQR = 2
Activity level	36% Active, N = 9 28% Fairly active, N = 7 36% Inactive, N = 9		47.37% Active, N = 9 31.58% Fairly active, N = 6 21.05 % Inactive, N = 4		0% Active, N = 0 16.67% Fairly active, N = 1 83.34% Inactive, N = 5	
Attended co-design workshop	48%, N = 12		63.16%, N = 12		0%, N = 0	

7.3.2. Measures

Revised PAR-Q

The Physical Activity Readiness Questionnaire (PAR-Q; Appendix 22) is an internationally renowned, self-administered, widely used and evidence-based exercise pre-participation screening tool (Warburton, 2011). First piloted in 1978 (Jetté, 1978) and revised in 1999 (Adams, 1999), it aims to detect the small number of people who may be at risk from increasing PA. Participants indicate 'yes' or 'no' to 7 statements including *"Has your doctor ever said that you have a heart condition and that you should only do physical activity recommended by a doctor?"*.

Anybody who answers 'yes' to any item should consult a doctor before increasing PA. Answering 'no' to all items on the PAR-Q was a prerequisite for participation.

Adverse events screening

To protect the health of participants and ensure that nobody experienced adverse events from programme participation, at the end of each week all participants were provided with a short definition of 'an adverse event' and asked to indicate on a 5-point Likert-type scale ranging from 'not at all' to 'severe ill health/physical harm' the extent to which they had experienced any during the past week, due to programme participation. If somebody indicated that they had experienced ill health or physical harm, they were asked to provide further details.

Treatment fidelity

A short self-report questionnaire that aimed to gather data on treatment receipt and behavioural enactment was purpose-developed, based on Bellg et al.'s (2004) recommendations for monitoring enactment skills.

To measure treatment receipt, following each exercise class, participants were required to indicate out of 10, how much they agreed with each of six statements (e.g. *"I understood today's exercise class"*). Higher total scores indicated better treatment receipt.

Behavioural enactment was measured at the end of each week, using a 2-item self-report retrospective recall quantitative questionnaire. Participants were asked to indicate how many days they had used the

behavioural or mental skills they had learnt in the programme in the previous seven days. Examples skills were provided for each question.

Behavioural adherence was measured using participants' attendance at exercise classes (whether online or in-person) and their self-report of participation in the daily PA challenges, which happened via WhatsApp.

The Short Active Lives Survey (SALS)

The Short Active Lives Survey (Sport England, 2018) is a self-report measure of PA, which gathers data on light and moderate/vigorous intensity activity, but does not differentiate between moderate and vigorous intensity exercise. The measure is considered easy to complete, easy to administer and useful for its ability to quantify active minutes, then allocate nominal labels. Participants indicate whether, over the past week, they have engaged in each of walking, cycling or sport/fitness/dance. They next specify how many days and minutes they engaged in each and whether they were out of breath. The scoring enables each person to be categorised as active, fairly active or inactive. The number of items in the measure depends on how many PA types a participant indicates they engage in. This measure was completed at pre-participation, at the end of each week and 4-weeks post-intervention.

Fitness

Various standard fitness tests were completed in the first and last session of the programme, to tap into different components of physical fitness. Participants worked in pairs, scoring one another for each test, to minimise the likelihood of inaccurate/over reporting associated with

self-report. Where participants had specific injuries or limitations that prevented them from completing a specific fitness test (N=1), a suitable alternative was provided. Although not ideal, this was considered unproblematic, as the change in fitness from before to after the pilot intervention was deemed important, rather than participants' initial fitness scores. The same adaptation was utilised at time point 2.

The 'sit and reach' test assesses participants' linear flexibility (Mayorga-Vega et al., 2014). This test requires participants to sit on the floor with their legs out straight in front of them and then to reach forward towards or past the toes and measure how far past the heel the fingertips reach. When scoring, a positive number is used to denote that a person can reach past the heels (flexible) and a negative number indicates that a person cannot reach as far as the heel (inflexible). If fingertips reached in line with the heel, this was allocated a score of zero.

To measure cardiovascular fitness, participants were asked to count the number of high knee steps they could complete in 60 seconds, then to measure their pulse and indicate the beats per minute (bpm) in the minute immediately following completion of the high knees test. Higher scores on the high knee test and lower heartrate in the minute immediately after, both indicate better cardiovascular fitness.

Participants' upper body strength was measured using the maximum number of push-ups that could be completed in a minute. To ensure this test was appropriate for women, who typically have less upper body strength than men, participants were asked to complete push-ups on their knees, rather than toes. One participant had difficulty kneeling due

to injuries and so completed push-ups standing and leaning forwards, with hands resting on a ballet bar to eliminate pain.

Lower body strength was measured using the maximum number of bodyweight squats that could be completed in 60 seconds.

The Short Warwick-Edinburgh Mental Well-being Survey (SWEMWBS) 7-item scale

The Short Warwick-Edinburgh Mental Well-being Survey 7-item scale (SWEMWBS; Appendix 23) is a short-form adaptation of the full 14-item scale (WEMWBS; Tenant et al., 2007). This was completed at pre-participation, weekly throughout and four-weeks post-intervention. The SWEMWBS is valid and preferable to its 14-item counterpart for use where respondent burden is an issue (Stewart-Brown et al., 2009). Users indicate on a 5-point Likert-type scale ranging from '*none of the time'* to '*all of the time'* the answer that best describes their experience over the past two weeks on items including *'I've been feeling relaxed'*. The measure provides a total wellbeing score. Higher scores indicate better psychological well-being.

7.3.3. Ethics

This pilot intervention was completed in line with the British Psychological Society's code of ethics (BPS, 2018) and granted ethical approval by Sheffield Hallam University's Research Ethics Committee (Ethics Review ID: ER47741740). The space and activity were thoroughly risk assessed (see Appendix 24). The exercise programme was designed and delivered by a qualified fitness instructor with public liability insurance. All participants were deemed safe to engage in exercise,

according to the PAR-Q. Everybody provided informed consent and was made aware of their right to withdraw from the programme, without giving a reason or being treated differently. All data was stored in line with GDPR guidelines and WhatsApp 'broadcasts' were used, to eliminate risk associated with creating groups where contact details and information are readily available to other group members.

7.3.4. Behaviour Change Wheel Mapping

Table 18 shows how each of the features of the intervention map onto the COM-B model, the TDF, the relevant intervention functions and policy categories within the BCW, the relevant Behaviour Change Techniques from the taxonomy (v1), the mode of delivery and how each was operationalised.

Table 18: A Behaviour Change Wheel mapping table showing how each component of the intervention can be mapped against the relevant frameworks

Feature	COM	TDF	Intervention functions	Policy categories	BCT's	Delivery modes	Operationalised how?
3x weekly circuit classes (in-person)	Physical O	Environmental context and resources	Environmental restructuring	Service provision	Restructuring the physical environment (12.1)	Face-to-face (group)	By delivering 3x circuit classes in-person at a local community centre on Monday, Wednesday and Friday evenings.
3x weekly circuit classes (online)	Physical O	Environmental context and resources	Environmental restructuring	Service provision	Restructuring the physical environment (12.1), Instruction (4.1), Demonstration (6.1), Practice (8.1)	Digital/remote (Synchronous)	By live streaming the same circuit classes that happened in-person via Zoom, using an access code provided to all participants
Online anytime class library	Physical O	Environmental context and resources	Enablement	Service provision	Adding objects to the environment (12.5)	Digital/remote (Asynchronous)	Recorded versions of each workout were filmed by the instructor and uploaded to a YouTube channel, that all participants could access, following each circuit class.
Daily activity challenges	Automatic M	Reinforcement/intentions	Incentivisation	Service provision/ Communication	Prompts/cues (7.1), Non-specific incentive (10.6), Behavioural practice (8.1), Habit formation (8.2)	Digital/remote (Asynchronous)	Daily challenges were sent out each evening for the following day. An example message would read "Tomorrow, your daily activity challenge is to complete 10 squats each time you boil the kettle. I'll look forward to hearing how you got on at the end of the day. If you have any questions, don't forget that I'm always happy to help ☺"
Goal-setting workshops	Psychological C	Goals/behavioural regulation	Education/training	Service provision	Goal setting (behaviour; 1.1), Action planning (1.4)	Face-to-face (Group & individual)	Goal setting workshops involved guided completion of the custom made goal-setting workbooks (see Appendix 19). The instructor supported participants to spend 20 minutes at the beginning of each week planning some SMARTER goals. Participants were encouraged to select behavioural/fitness goals, as opposed to (e.g.) weight-loss goals but were free to choose the goal that they felt would most motivate them, with the instructors support to ensure goals fulfilled the SMART criteria.
Regular contact with instructor	Psychological C	Social influences/Skills	Enablement	Service provision/ Communication	Social support (practical; 3.2)	Digital/remote (Synchronous)	The instructor was available before and after all sessions, both online and in-person for participants to share progress with/ask questions etc. All participants received daily contact from the

							instructor via WhatsApp and were reminded daily within (e.g.) daily activity challenge messages, that they were free to ask any questions they may have.
Feedback from instructor	Psychological C	Knowledge/ Skills/ Behavioural regulation	Education/training	Service provision	Feedback on behaviour (2.2), Social support (unspecified; 3.1)	Face-to-face (Group) & Digital/remote (Asynchronous)	During sessions, the instructor supported, encouraged and corrected the form of those in the classes (including those online if cameras were on and it was possible to do so). For example, comments such as "really nice form from [name] there" or "[name], those are looking good but just remember to keep that core really nice and tight throughout the whole movement to protect that lower back". When participants reported any attempt at a daily activity challenge, the instructor would reply with an encouraging message such as "Great work – smashing those goals!" or "Sounds like a busy day with stuff that got in the way so well done for even trying!"
Flexible activity options	Physical C	Biomechanical capability*/Skills	Enablement	Guidelines	Instruction on how to perform the behaviour (4.1), Behaviour substitution (8.2), Problem solving (1.2)	Face-to-face (group) & Digital/remote (Asynchronous)	The instructor provided lower and higher impact alternatives for all exercises during the sessions in-person, live online and when recording the sessions for the online anytime library. Tweaks were also provided for anyone with specific needs/minor injuries in the live sessions. For example, when squats were included, participants were given the option to choose full squats, half squats (lower impact option) or jump squats (high impact option). However, someone with a knee injury might have been encouraged to complete a supported wall squat, to reduce pressure on the knee joint.
No need for equipment	Physical O	Environmental context and resources	Enablement	Service provision	Instruction on how to perform the behaviour (4.1)	N/A	All sessions were completed using only bodyweight, such that no equipment at all was needed to join the sessions (excluding a device with internet access for online sessions/receiving WhatsApp updates etc.)
Free to attend	Physical O	Environmental context and resources	Environmental restructuring	Fiscal measures/ Service provision	Material incentive (removing cost; 10.1)	N/A	The classes were free for participants. The lead researcher provided her time for free as the lead instructor and funding was provided by Sheffield Hallam University to hire the space at the community centre. This would typically be operationalised through grant funding however, if run at full-scale.

Cameras optional (for online participants)	Reflective motivation/social opportunity	Beliefs about consequences/social influences	Enablement	Guidelines	Reducing negative emotions/Restructuring the social environment	N/A	It was made clear to participants that they could join online without their cameras if they wished to. This was reiterated at the start of each session and no pressure was ever placed on participants to turn cameras on.

7.3.5. Data analysis

Descriptive statistics were provided for measures of treatment fidelity throughout the programme (specifically treatment receipt, behavioural enactment and behavioural adherence) and intervention efficacy at increasing PA (using the Short Active Lives Survey) before, immediately after and 4 weeks following completion of the pilot intervention.

Health-related outcomes were assessed using fitness testing (undertaken on the first and final session of the 4-week pilot intervention) and the SWEMWBS (completed, before the intervention weekly throughout on a Friday and at 4-weeks follow-up). Tentatively undertaken t-tests were completed, in line with recommendations from DeWinter (2013) about their utility with small sample size, alongside the more conservative non-parametric equivalent, Wilcoxon Rank Sum. Changes in fitness on the first and final sessions were statistically analysed but for wellbeing timepoints 1 (before) and 3 (end of week 2 of the 4-week pilot) were compared, as only these two data points met the parametric assumptions and this was considered the most conservative option.

7.4. Results

7.4.1. Adverse events

There were 51 responses to the adverse events screening question across the 4-week programme. Of these, there were 38 instances when participants indicated experiencing no adverse events from programme participation. On the remaining 13 occasions, participants reported experiencing ‘mild ill health or physical harm’ in the form of

breathlessness, muscle soreness, aching and/or tightness (25.49% of responses).

7.4.2. Treatment fidelity

7.4.2.1. Treatment receipt

The number of participants completing the treatment receipt measure was reflective of the numbers in attendance for each session (N=5-14). Treatment receipt of the pilot intervention was high. Mean total scores for each session were between 49.62 (SD = 7.05) and 56.33 (SD = 3.35 & 4.59) out of 60. Median total scores for each session were between 51 (IQR = 6) and 59 (IQR = 4.25). Total scores for treatment receipt across all sessions ranged from 22 to 60 but tended to be high. Scatter plots, including a linear line of best fit indicated some marginal improvement in mean treatment receipt score over time, although there were high baseline scores, which left little room for improvement (See Figures 17 & 18 respectively). Further, due to the variable normality of distribution and sample size for each session, these scatter plots must be cautiously interpreted.

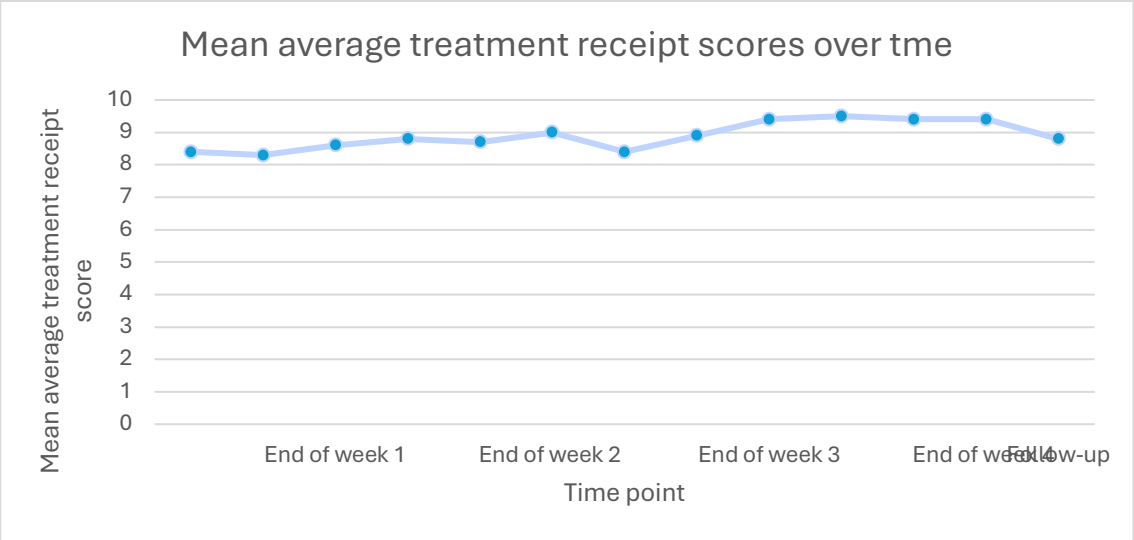


Figure 17: A scatter plot showing treatment receipt scores throughout the intervention

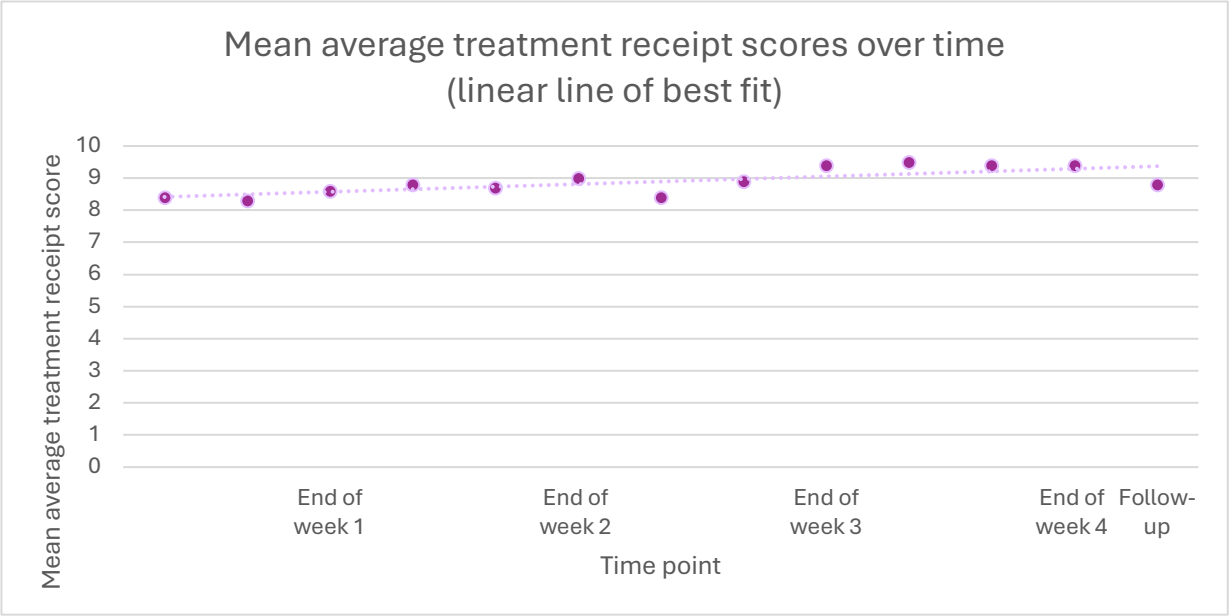


Figure 18: A scatter plot with a linear line of best fit showing treatment receipt scores throughout the intervention

7.4.2.2. Behavioural enactment

Mean and median scores for enactment of behavioural skills were relatively constant (4.88-6 out of 6). Mental skill enactment was similarly constant but slightly lower (all mean and median scores between 4 and 5 out of 6).

7.4.2.3. Behavioural adherence

Behavioural adherence was assessed in terms of in-person/online participation in the exercise classes and participation in the daily activity challenges.

7.4.2.3.1. Exercise class attendance

Exercise class attendance over time, split according to mode of attendance (hybrid, online and the combined total), can be seen in a line graph in Figure 19. Session 1 had the highest attendance (N=17). The

lowest attendance (N=6) was at the halfway point. Eight people attended the final session. Attendance was consistently highest on Mondays. One participant attended all 12 sessions, two attended 11 and two attended ten. Table 19 shows means, medians, standard deviations and interquartile ranges for the average number of times each person who participated in the programme attended an exercise class, split according to online, in-person and combined attendance. Across all 19 people who engaged in the exercise classes, there were a combined 228 engagement opportunities, 118 of which were utilised (≈51%). Table 20 shows the total number of attendances across the entire programme and the average number of people in attendance at any one session in person, online and combined.

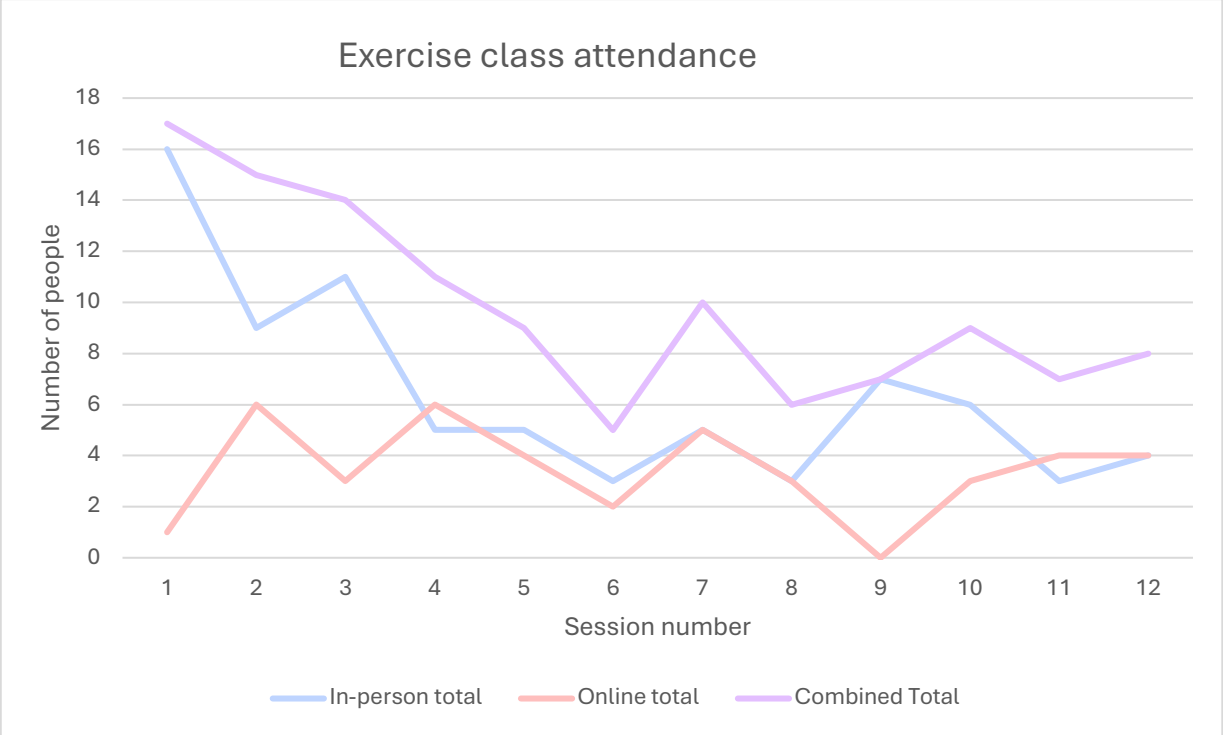


Figure 19: A line graph showing how many participants attended each session of the programme in-person, live online and in combination throughout the programme

Table 19: A table showing the average number of exercise classes each participant attended in-person, online and overall throughout the intervention (max. possible 12).

Average attendance per person			
	In-person attendance	**Online attendance**	**Combined attendance**
Mean (SD)	4.05(3.64)	2.16(3.27)	6.21(3.51)
Median (IQR)	3(3)	0(3.5)	6(6.5)

Table 20: A table showing how many people attended the exercise classes in total and on average, in-person, online and combined.

Average attendance per session			
	In-person attendance	**Online attendance**	**Combined attendance**
Absolute	77	41	118
Mean (SD)	6.42 (3.90)	3.41(1.83)	9.83(3.76)
Median (IQR)	5(3.75)	3.5(1.50)	9(4.74)

7.4.2.3.2. Daily PA challenge engagement

There were 28 total physical activity challenges that participants could have engaged in. Nine participants did not engage, 16 did. Six of the nine who did not engage with the PA challenges, did not engage with any elements of the programme and so their data was removed. Just one

participant completed all 28 daily PA challenges. Table 21 shows the total number of opportunities that participants collectively had to engage in the PA challenges, how many they collectively reported attempting, how many they collectively reported completing, how many unsuccessful attempts were made completed and the median number of attempts per participant. Eight of the 13 incomplete attempts were made by one participant (61.54%), who made 19 total attempts, successfully completing 11 times. The number of engagements in each daily activity challenge over time can be seen in a line graph in Figure 20. The 'squat at the kettle' challenge received the highest engagement every week of the programme, no challenge had noticeably poorer engagement. The number of accumulated opportunities to engage with each different exercise for all participants across the total number of weeks can be seen in a bar chart, split according to how many opportunities were or were not taken in Figure 21.

Table 21: A table showing daily PA challenge engagement

	Cumulative opportunities to participate in the PA challenges	**Challenges collectively attempted**	**Challenges collectively completed**	**Challenges attempted but not completed**	**Median no. of attempts made per participant who engaged**
Total	532	148 (27.82%)	129 (24.25% of total, 87.16% of attempted)	13 (8.78% of total attempts)	5 (IQR = 15.5)

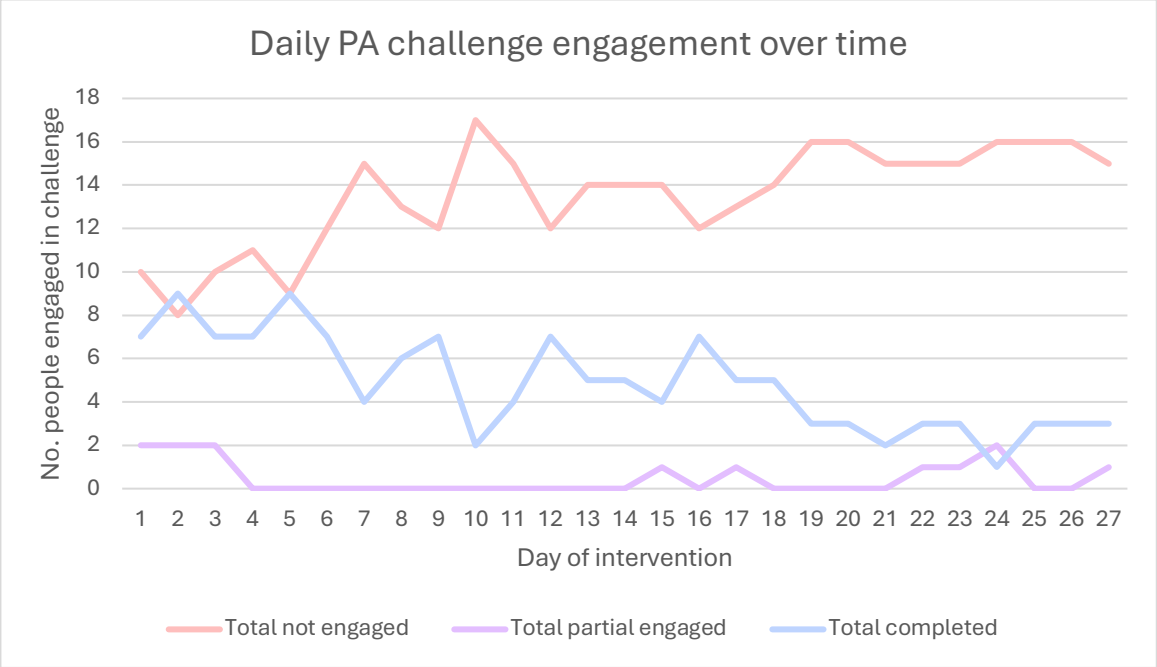


Figure 20: A line graph showing participant engagement in the daily PA challenges over time

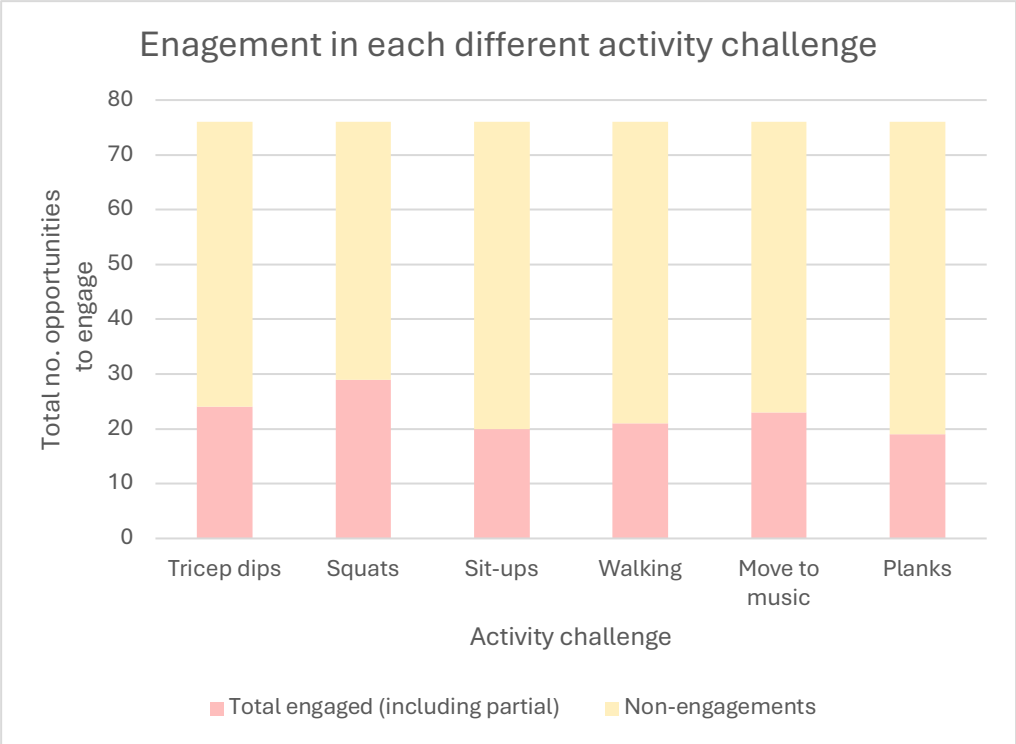


Figure 21: A bar chart showing the level of engagement for each of the different daily PA challenges

7.4.3. Efficacy and health-related outcomes

Leon et al. (2011) state that pilot interventions cannot provide information about effect sizes due to the small sample size inherent in their design. However, De Winter (2013) found no principal issues with using a t-test with participant groups as small as two, particularly where large effect sizes are observed. Thus, t-tests have been tentatively completed to indicate intervention outcomes and feasibility. However, these must be interpreted with scepticism, particularly where smaller effect sizes are observed. For circumspection, all undertaken t-tests were two-tailed and to enhance transparency, the non-parametric alternative, Wilcoxon Matched Pairs Signed Rank analysis was also conducted and reported, as much of the data violated parametric assumptions.

7.4.3.1. Activity level

At pre-participation, there was an almost equal split of participants across the three activity levels (9 inactive, 7 fairly active, 9 active; See Figure 22). However, inactive participants were most likely not to engage following sign-up, with 5 of 6 non-participants being inactive at baseline. Figure 23 shows the baseline activity level of participants who engaged in the programme by attending at least one exercise class, either online or in-person (4 inactive, 6 fairly active, 9 active). Compared to the general population, active women are overrepresented within this sample and inactive women are underrepresented. Figure 24 shows a line graph that indicates how many women fell into each activity level category across the six time-points (before, weekly throughout and 4-weeks follow-up). Immediately following the 4-week pilot intervention there were more ‘active’ women and less ‘fairly active’ or ‘inactive’ women. Four weeks

later, the number of 'inactive' participants had returned close to baseline, but the number of 'fairly active' women had reduced by 83.33% and the number of 'active' women had increased by 33.33%.

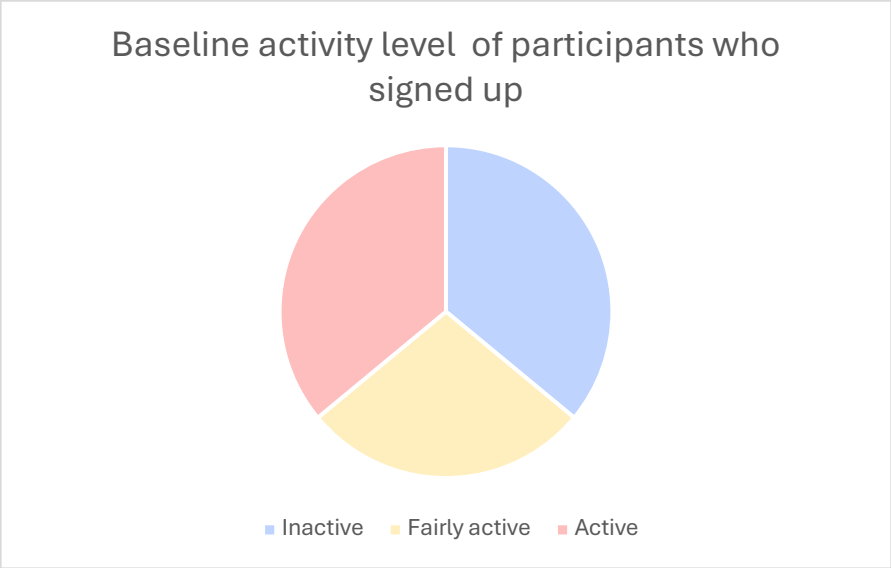


Figure 22: A pie chart showing the baseline activity levels of participants who signed up to the intervention.

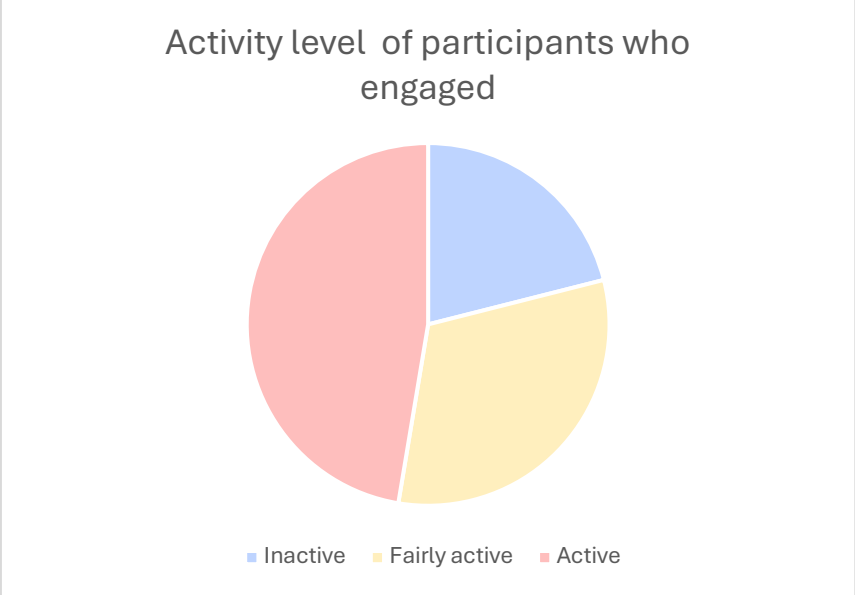


Figure 23: A pie chart showing the baseline activity levels of participants who engaged in the pilot intervention by participating in at least one exercise class

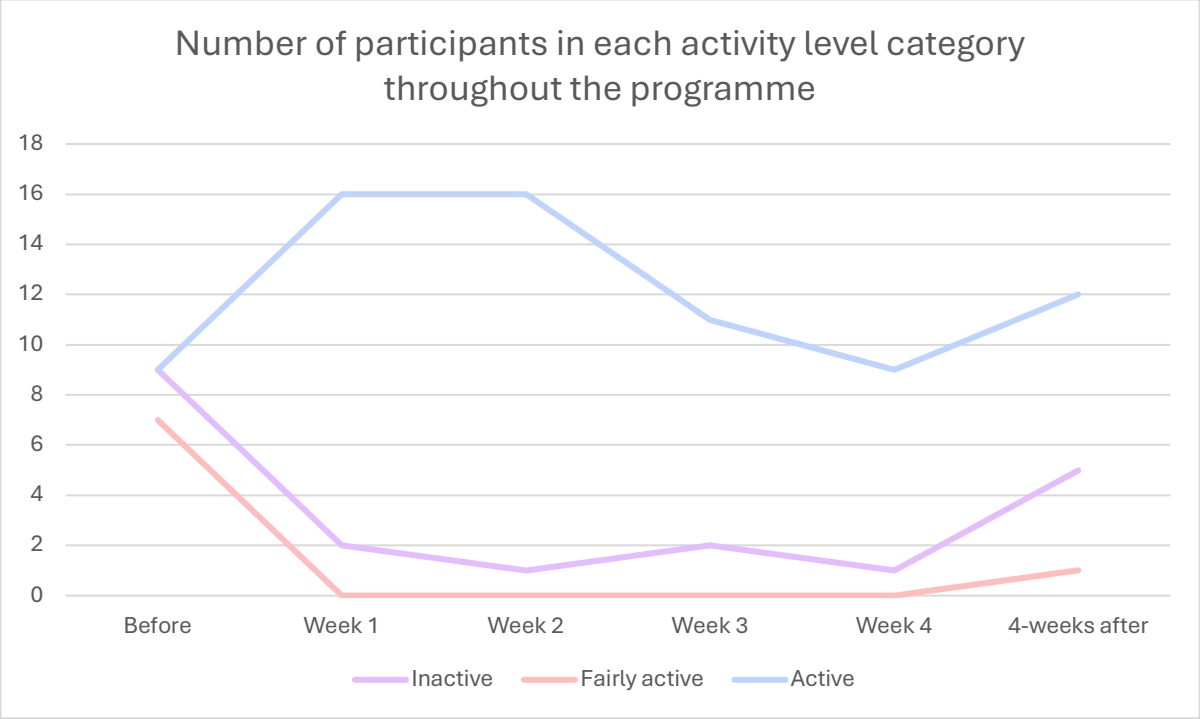


Figure 24: A line graph showing how many participants fell into each of the 3 categories of PA levels at each of the 6 time points across the pilot intervention programme

7.4.3.2. Fitness

Despite 18 people attending the first class (17 in-person, one online), only 12 were willing to take part in the fitness testing and share their fitness scores. Nine participants shared their post-intervention fitness testing results, but one of these was only comfortable participating in and sharing the results of their sit and reach test, which measures flexibility. All data sets excluding the high knee test were normally distributed according to Shapiro Wilk (0.038). In Table 22, descriptive statistics exploring the full participant group's fitness testing appear to show improvements in all facets of physical fitness. Whilst little

numerical change in heartrate is observed in the 60 seconds after the high knee test. This indicates improved fitness because participants completed a larger number of high knees but did not see a similar elevation in heartrate. A similarly elevated heartrate would indicate that higher effort levels, rather than improved fitness, were responsible for an increase in the number of high knees completed in 60 seconds.

When including only data from participants who completed both sets of fitness testing, nine participants remained in the pool for analysis (See Table 23). All data sets were normally distributed, according to Shapiro Wilk, except the sit and reach test (Shapiro Wilk = 0.044). Descriptive statistics for participants who contributed to both fitness tests show similar findings to that indicated by the total participant pool (i.e. general fitness improvements with little-to-no difference observed for heartrate in the 60 seconds immediately following the high knee activity), suggesting that any observed differences are likely down to fitness improvements, not sampling error.

Heartrate following the high knees test was not included for inferential analysis, as this measure alone was not meaningful and needed to be understood and interpreted in the context of the high knees test.

When only paired scores were included, all fitness testing data was normally distributed according to Shapiro Wilk and met the parametric assumptions. As the descriptive statistics suggested, tentatively completed two-tailed paired t-tests revealed statistically significant improvements in all facets of physical fitness, to at least the .004 level, all with large effect sizes of >1.49. Wilcoxon rank-sum showed similar

findings with statistically significant improvements across all fitness measures (p-values = 0.007-0.008).

The t-test showed statistically significant improvements in flexibility according to the sit-and-reach test (t(7)=4.57, p = .003, d = 1.62). A Wilcoxon signed-rank test showed similar findings (W=0.00, p = .007) with a large effect size (d= -1.00).

A t-test revealed statistically significant increases in the number of high knee steps completed within a minute, to measure cardiovascular fitness (t(7)=.4.21, p = .004, d = 1.49). Wilcoxon signed-rank revealed a comparably significant and large effect (W=0.00, p = .007, d = -1.00).

A t-test revealed a statistically significant difference between the max number of push-ups completed in 60s, to measure upper body strength (t(7)=4.87, p = .002, d = 1.72). Wilcoxon signed-rank showed analogous findings (W=0.00, p = .007, d = -1).

A t-test showed that the maximum number of sit-ups completed in 60s to measure core strength (t(6) = 4.68, p = .003, d = 1.7) and the maximum number of squats completed in 60s to measure lower body strength (t(7) = 4.68, p = .002, d = 1.65) both significantly improved with large effect sizes. Wilcoxon signed-rank showed similar outcomes for both sit-ups (W=0.00, p = .008, d = -1) and squats (W=0.00, p = .007, d = -1).

Table 22: A table showing the fitness testing data for all participants who contributed data at any time point. Data is available for the first and last session of the programme, with quantified differences and an indicative qualitative status

Fitness test	Data type	Beginning	End	Difference	Indicative direction of effect
Sit and reach	**Mean (SD)**	5.1 (8.03)	9.75 (8.08)	+4.65	Improvement
	Median (IQR)	7.4 (5)	11.5 (7.5)	+4.1	Improvement
High knees in 60s	**Mean (SD)**	120.33 (42.9)	190.75 (28.68)	+70.42	Improvement
	Median (IQR)	108 (68)	197 (35.5)	+89	Improvement
Heart rate in 60s immediately after high knees	**Mean (SD)**	143 (16.95)	133.75 (19.57)	-9.25	Improvement
	Median (IQR)	141 (28)	141 (27)	0	Improvement
Push-ups 60s	**Mean (SD)**	29.56 (10.43)	39.13 (11.56)	+9.57	Improvement
	Median (IQR)	27 (15)	37.5 (16.5)	+10.5	Improvement
Sit-ups in 60s	**Mean (SD)**	30.33 (9.07)	38.43 (9.9)	+8.1	Improvement
	Median (IQR)	26 (17)	36 (12)	+10	Improvement
Squats in 60s	**Mean (SD)**	29.11 (4.81)	41.25 (5.2)	+12.14	Improvement
	Median (IQR)	31 (5)	41 (5.5)	+10	Improvement

Table 23: A table showing the paired fitness testing data from participants who completed before and after measures. Data is available for the first and last session of the programme, with quantified differences and an indicative qualitative status

Fitness test	Data type	Beginning	End	Difference	t-test p (d)	Wilcoxon p (d)	Indicative direction of effect
Sit and reach	**Mean(SD)**	1.07(10.25)	8.22(8.84)	+7.15	.003 (1.62)	.007 (-1	Improvement
	Median (IQR)	5.5(17.38)	10(14)	+4.5			Improvement
	N(Missing)	12(13)	9(16)	-3			
High knees in 60s	**Mean(SD)**	107.58(43.55)	190.75(28.68)	+83.17	.004 (1.49)	.007 (-1)	Improvement
	Median(IQR)	98(88)	197(35.5)	+99			Improvement
	N(Missing)	12(13)	8(17)	-4			
Heart rate in 60s after High knees	**Mean(SD)**	138.91(26.12)	130.11(21.32)	-8.8			Improvement
	Median(IQR)	140(29)	141(28)	+1			No change
	N(Missing)	12(13)	8(17)	-4			
Push-ups in 60s	**Mean(SD)**	30.25(9.15)	38.11(11.23)	+7.86	.002 (1.72)	.007 (-1)	Improvement
	Median(IQR)	30.5(11.25)	36(14)	+5.5			Improvement
	N(Missing)	12(13)	9(16)	-3			
Sit-ups in 60s	**Mean(SD)**	31.58(11.83)	37.38(9.64)	+5.8	.003 (1.7)	.008 (1.65)	Improvement
	Median(IQR)	31(18.75)	34(11.5)	+3			Improvement
	N(Missing)	12(13)	8(17)	-4			
Squats in 60s	**Mean(SD)**	31(5.74)	40.33(5.59)	+9.33	.002 (1.65)	.007 (-1)	Improvement
	Median(IQR)	31.5(4)	40(7)	+8.5			Improvement
	N(Missing)	12(13)	9(16)	-3			

7.4.3.3. Wellbeing

All 25 participants completed the wellbeing questionnaire at pre-participation. Participants who engaged with the intervention were asked to complete the measure a further five times (at the end of each week and four weeks post-intervention). The number of participants who completed the wellbeing measure at each time point and the average total wellbeing scores for each week can be seen in Table 24. Whether scores on the SWEMWBS were normally distributed varied, so means and standard deviations are reported alongside medians and interquartile ranges. Whilst some very small improvements in wellbeing were observed based on raw data, this was marginal, non-significant and unobservable at 4-weeks follow-up. A bar chart showing the average wellbeing scores across all six timepoints can be seen in Figure 25.

Shapiro Wilk revealed that wellbeing was normally distributed at all time points, excluding the final session (p = .023). As such, paired-samples two-tailed t-tests were conducted between time points 1 and 3, to ensure data met the parametric assumptions. Aligned with the indications of the descriptive statistics, no significant difference was observed in wellbeing scores using t-tests (t(12)=-0.15, p = .885). Wilcoxon signed-rank test also revealed non-significant findings (W=50.00, p = .778).

Table 24: A table showing the number of participants that completed the wellbeing measure at each time point, with average total scores (out of a maximum possible 35)

Time point	**N**	**Mean Total Wellbeing (SD)**	**Median Total Wellbeing (IQR)**	**Shapiro-Wilk p**
1 (before)	25	24.88(4.19)	23(3)	0.017
2 (End of week 1)	18	24.61(5.10)	23(7.50)	0.058
3	13	26.54(3.71)	27(3)	0.434
4	9	27.22(4.87)	28(7)	0.223
5 (End)	17	26.59(5)	27(8)	0.343
6 (4-weeks post)	14	24.57(4.20)	23.50(3.50)	0.130

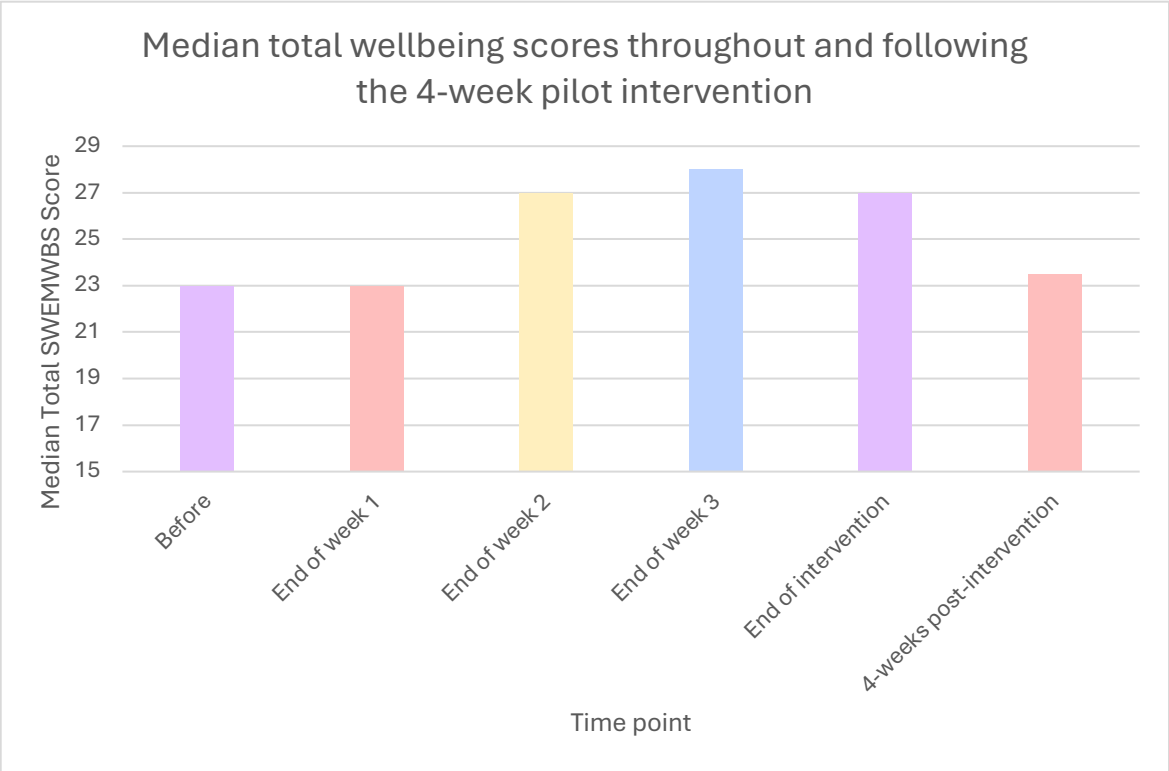


Figure 25: A bar chart showing how median total wellbeing scores changed over time throughout and following the intervention

7.5. Discussion

In this chapter, a 4-week pilot PA intervention for women from the East Midlands, which was co-designed using Michie et al.'s (2011) Behaviour Change Wheel approach to intervention design and development, was quantitatively evaluated. The intervention was assessed in respect of treatment fidelity (specifically treatment receipt, behavioural enactment and behavioural adherence), efficacy (at increasing PA) and health-related outcomes (fitness and wellbeing). Differences between participants who engaged with the programme and those who signed up

but did not participate were explored, to identify groups of women who were motivated to engage in PA interventions yet failed to do so. Participants were compared in terms of age, ethnic origin, highest level of education, total household income, Multiple Deprivation Index decile, wellbeing score at baseline, activity level at baseline and past participation in the co-design process.

The programme of PA was safe and appropriate for the target demographic. No participants experienced any significant adverse events beyond the usual signs and symptoms expected when a person starts a new programme of exercise (muscle tightness/soreness and temporary breathlessness). As predicted, treatment fidelity of the intervention was consistently self-reported as high, with some evidence of a trend towards treatment receipt increasing over time. On average, each person and each session had around 50% attendance. Participants were around twice as likely to attend the exercise classes in-person, compared to online, which may be explained by evidence from one study that found in-person exercise classes to be considered significantly more enjoyable than online ones (Ntovoli et al., 2024). In a nationally representative survey of 1,000 Americans, around 1/3 of participants said Monday was the day they were most likely to be active (Data decisions group, 2019) and in the 4-week pilot PA intervention for women from the East Midlands, Mondays were consistently the most well attended classes. This may be explained by the 'Fresh Start Effect' (Dai et al., 2014), whereby Monday acts to the week, as New Year's Day does to the year, bringing with it new motivation and the perceived opportunity to turn over a new, active leaf. Most participants engaged in at least one PA challenge. Around 1/4 of the total accumulated opportunities to

participate in a daily PA challenge were utilised and participants almost always completed a daily activity challenge they started. Behavioural adherence was therefore considered reasonably good.

The programme appeared to effectively support some women to be more active and improve their fitness. Fitness testing was not completed at follow-up for pragmatic reasons, but self-reported PA for the group, as measured by the Active Lives Survey remained higher at follow-up than baseline. Despite findings from Rogerson et al. (2020) that intervention duration did not mediate the impact on wellbeing, no statistically significant difference in wellbeing scores was observed. Liu et al. (2022) found interventions of >12 weeks to elicit best improvements in wellbeing for mothers with perinatal depressive symptoms. This may however be explained by women's gender (as opposed to their perinatal or depressed status) and so women may generally require longer PA interventions than men, to achieve significant improvements in wellbeing. A longer, future iteration of the pilot intervention might therefore yield statistically significant improvements in wellbeing that the pilot did not.

Howlett et al. (2018) found interventions aiming to promote PA, rather than reduce sedentary behaviour to be the most effective for inactive adults. Sanchez et al. (2015) found a PA intervention for Primary Care patients to be most effective for the most sedentary participants. However, despite the pilot intervention for women from the East Midlands aiming to target both sedentary and active behaviours, the programme did not effectively increase PA for the most inactive participants long-term. A systematic review found no consistent

pattern of predictors of dropout from weight loss interventions, yet clarified that identification of those at risk of dropout would enhance intervention effectiveness and cost-effectiveness (Morshko et al., 2011). None of the participants who were active at baseline became non-participants, whilst all but one of the non-participants were inactive at baseline. Inactive women therefore seem at greatest risk of attrition. Engagement in the co-design process appeared to increase the likelihood of intervention engagement however. Women who engaged in the co-design process accounted for more than half the women who engaged in the programme, but none of the women who signed up and then failed to engage. Whether this is because co-design results in interventions that are best tailored to co-design contributors, or is because co-design acts as a 'foot in the door' (Freedman & Fraser, 1966; Beaman et al., 1983) that drives compliance, remains unclear. However, just two women who were considered to have completed the intervention had not contributed to its development during previous phases of research and neither of these women were inactive at baseline. With a critical realist ontology, we can consider the differences between those who did/did not engage in the programme to be evidence of pre-existing, real-level structures (baseline PA level and previous involvement in intervention design) that interact with intervention mechanisms at the actual level to produce differential engagement/behaviour change. Empirically, these can be observed as variations in participation, adherence and outcomes. In short, rather than the intervention itself directly producing outcomes of healthy behaviour change, instead the mechanisms of change are triggered differently depending upon the context for the individual. Regardless of the underlying mechanisms, recruiting sedentary participants into co-

design might increase the likelihood of programme engagement, although predicting the likely longevity of any effect is beyond the scope of this thesis. If non-participation rates here are representative however, then around 50% of sedentary sign-ups might not engage in PA interventions. This would effectively double the cost per beneficiary of any intervention and so oversubscription of spaces onto PA interventions for sedentary women might be one way to improve cost-effectiveness. It is noteworthy that recruitment to intensive physical activity interventions appears feasible, as evidenced by high initial interest and sign-up rates but that it is retaining participants over time, particularly within higher-burden programmes, which remains a significant challenge. The poor retention of women who were inactive at baseline suggests that those with the greatest potential to benefit may also face the greatest barriers to sustained engagement. Age may also have influenced retention, with participants who completed the programme tending to be older than those who withdrew. Ultimately, although recruitment demand exceeded available places, overall attrition was high, highlighting a disconnect between initial motivation and the practical realities of maintaining participation in a higher-burden intervention. From a critical realist perspective, these patterns further reflect the interaction between individual agency and underlying contextual and structural conditions, whereby engagement and retention are generated not just by motivation, but by the extent to which intervention mechanisms can be activated within participants' social, material and life-course contexts. Further research should explore best methods of recruitment and retention of inactive women and perhaps also younger women, into PA intervention and associated co-design research.

At follow-up, the number of fairly active women had reduced by >80% and the number of active participants had increased by 33%, but the number of inactive women had returned almost to pre-intervention levels. The programme therefore appeared most effective for women who were 'fairly active' at baseline, as measured by the Active Lives Survey. Why the pilot PA intervention did not inspire sedentary women into PA is unclear and will be explored in further detail in Chapter 8. The women who benefitted most from the pilot intervention somewhat reflect the women who attended Co-design Workshop 2 in terms of self-reported PA, so perhaps personas were ineffective for ensuring appropriate representation of diverse women. Further, more active women were more dominant within the workshop discussions (See Section 6.3.7.), so more skilful workshop facilitation might have better amplified sedentary women's voices and improved intervention effectiveness for this group.

Self-reported treatment fidelity was high. However, there are issues with the methodological processes used to assess treatment fidelity of PA interventions for adults (Lambert et al., 2017), primarily due to a lack of clear conceptualisation of its features. The limitations associated with self-report in respect of socially desirable responding and overreporting (e.g. Paulhus & Vazire, 2007; Prince et al., 2008) have relevance here and no valid or reliable measures of treatment fidelity currently exist, which provides some direction for future research. In their systematic review exploring methods for assessing treatment fidelity in PA interventions for adults, Lambert et al. (2017) identified self-report as a highly popular approach, critiquing the methodological rigour of the literature

generally. Notably, no disproportionate or overstated findings in respect of treatment fidelity were found when self-report measures were used, compared to more objective or provider-assessed measures. Further, objective measures of behavioural adherence (exercise class attendance and daily PA challenge engagement) revealed predictably variable (because there were more sessions/challenges available than participants were expected to attend/engage in), but reasonably good adherence to the target behaviour of PA for those who remained engaged. The threshold at which treatment fidelity should be considered 'high' is however unclear, so conclusions must be cautiously drawn.

Aligned with Vandelanotte's (2007) recommendations for producing successful online PA interventions, the follow-up time was short, at just 4-weeks. This may call the longevity of observed effects into question, but time-sensitivity was considered important to limit attrition, because of the small sample size. The Active Lives Survey could not capture increases in PA for participants who were active at baseline due to ceiling effects of the measure, so the intervention effectiveness may be somewhat understated. Further, the Active Lives Survey fails to consider occupational or domestic PA, which are both typically higher for people of lower SES (Ahn et al., 2019; Hesig, 2011). The measure might therefore be disproportionately likely to inaccurately categorise the PA levels of people of low SES, which in turn might drive inequality for various reasons (e.g. people of low SES might be more likely to be incorrectly assigned to an intervention that is targeted towards inactive people, reducing intervention appropriateness and potentially increasing risk of injury).

Mirroring findings from Warburton et al. (2006), almost all fitness measures showed large improvements over a relatively short time, with large effect sizes and highly significant p-values. Aligned with recommendations from Sanchez et al. (2015) and with the BCW approach to intervention design, multiple evidence-based BCTs were included in the pilot intervention. BCTs that O'Shea et al. (2016) identified as enhancing intervention effectiveness that were included in the pilot intervention included action planning, instruction on how to perform the behaviour, prompts/cues and behaviour practice/rehearsal. A systematic review and meta-analysis found no difference between multicomponent goal-setting interventions regardless of whether theory-based approaches to goal-setting were used, or whether PA data was collected using objective or self-report measures (McEwan et al., 2016). As such, the limitations of SMARTER goal-setting and self-report measures of PA are considered unlikely to have significantly impacted outcomes. Some participants were however unwilling to contribute scores for the fitness testing. People are less likely to share failure than success (Eskreis-Winkler & Fishback, 2020), so those with best results are more likely to have contributed scores and the impact of the programme on physical fitness might be skewed to appear larger than it was for the wider population. The non-standardised nature of the fitness testing process, use of self-report and the small sample size must be acknowledged. However, effect sizes were large, so based on findings from De Winter (2013) that t-tests can be meaningful with tiny sample sizes if effect sizes are large, it is reasonable to have some confidence in the validity of these findings.

This pilot intervention was designed, delivered and evaluated as part of a PhD programme of research, which allows for unusually detailed reporting. The intervention is empirically grounded and has utilised various appropriate and complementary theoretical frameworks. The programme of PA increased the number of women who were categorised as active and improved physical fitness for those who engaged.

Participant numbers were generally small and response rates were variable and smaller still. The intervention had positive health-related outcomes, with good recruitment capabilities (although perhaps not for inactive women), but potentially limited retention. This would need to be considered and addressed prior to any full-scale iteration of the intervention and the small, variable participant numbers have implications for the interpretation of findings, despite the evidenced utility of t-tests with small sample sizes (De Winter, 2013) and the supplementary use of the more conservative Wilcoxon Signed-Rank analysis. A further limitation lies in the absence of follow-up fitness testing, due to pragmatic issues with space hire. Had this been undertaken, stronger conclusions might have been drawn regarding the longevity of the programme's impact. Despite evidential support for pilot intervention implementation, exploration of the literature failed to find concrete information that could quantify the impact that piloting has on full-scale intervention effectiveness. Future clarification on the impact of piloting interventions, implementing co-design methodologies and of each specific BCT included in the intervention on final intervention effectiveness would be useful for streamlining the intervention development process and reducing the burden of intervention

development, delivery and participation, without compromising effectiveness.

To deliver the intervention at full-scale, there are further issues that should be addressed. Firstly, for one person to deliver the intervention alone using WhatsApp was time consuming and complicated. This would need to be managed, most likely via the use of technology and automation, possibly via an App, for the intervention to viably be run at full-scale. Aligned with the Medical Research Council's guidance for complex intervention development (Skivington et al., 2021), the next step in intervention development would involve implementing the intervention as part of an RCT. Various features could be considered relevant for a control group, but comparison of the efficacy of co-designed programmes of PA, compared to provider-designed or self-designed programmes would advance the body of research. In future, undertaking a similar co-design process with only the most sedentary women would be beneficial, to amplify the voices of those who most require PA interventions and increase the likelihood of successful PA interventions for this group. The feasibility of recruiting this group of women however raises questions. The importance of the specific individual providing the intervention might also require consideration during full-scale intervention delivery, based on the documented salience and importance of social influences for determining women's PA (See Section 1.3.3.).

7.6. Summary and conclusion

This co-designed, empirically grounded, pilot PA intervention for women from the East Midlands successfully increased some women's PA and

improved their physical fitness. Women who were involved in co-designing the programme seemed more likely to engage. Women who were inactive at baseline were motivated to sign up and saw increases in PA through programme participation but were generally less likely to engage and/or to have maintained observed PA increases at follow-up. Thus, the most in-need group continues to be underrepresented in PA intervention settings. The most sedentary women might simply require longer PA interventions to elicit lasting change, but whilst considering the difficulty engaging and retaining inactive women, future work should involve them at every stage of the design, delivery, evaluation and redevelopment process to elicit better tailored interventions and promote participant engagement in the resulting programme. The present pilot intervention could improve women's health and may have potential for full scale redevelopment, although intervention design should be more closely targeted to women's baseline PA levels and the delivery process/methodologies should be streamlined, to enhance time-efficiency and cost-effectiveness during design and delivery. Nonetheless, this pilot intervention might provide the starting point for an evidence-based full-scale behavioural intervention aiming to increase women's PA through a combination of circuit classes, behavioural prompting and goal-setting in a non-judgemental and supportive safe space.

Chapter 8: Study 6

Exploring women's experience of pilot intervention participation through exit interviews: Barriers & facilitators, acceptability & feasibility, reasons & remedies for attrition

8.1. Overview

In the previous chapter, quantitative methodologies allowed for initial assessment of the likely efficacy of the pilot intervention and facilitated identification of demographic characteristics that might predict level of engagement in PA interventions. In this chapter, qualitative methodologies complement the findings of chapter 7, by providing insight into women's perceptions of the intervention, its efficacy and reasons for withdrawal/non-participation. Women's barriers and facilitators to programme participation and how acceptable they perceived the intervention to be are explored. Findings are mapped onto the COM-B model (Michie et al., 2011), the TDF (Michie et al., 2005; Michie et al., 2017) and the Theoretical Framework of Acceptability (TFA; Sekhon et al., 2017). Reasons for dropout/non-participation are identified alongside strategies that might be included in a full-scale iteration of the intervention, to limit or prevent attrition. This chapter therefore serves to ensure that the findings of this PhD have maximum utility for intervention redevelopment. For 'fairly active' women who are demographically similar to the pilot intervention participants, this would likely require minor alterations. Development of an intervention that

appropriately targets the most sedentary women however would require more substantial redevelopment.

This phase of research aligns with the discovery stage of the Design Council's Double Diamond (Design Council, 2005), so findings from this phase of research are useful for further defining the problem and developing a solution, prior to full-scale delivery. This phase of research can also be considered to revisit Stage 4 of Step 1 'Understand the behaviour: identify what needs to change using COM-B' in line with the BCW (Michie et al., 2011) and to be a part of the evaluation process.

8.2. Introduction

The seven components of acceptability, according to the TFA (Sekhon et al., 2017) are affective attitude, burden, ethicality, intervention coherence, opportunity costs, perceived effectiveness of the intervention and self-efficacy over the behaviours required to participate (See Section 2.6.3.). Acceptability is concerned with how suitable the intervention is for recipients (Feeley et al., 2009), making it integral to participant engagement and retention, which impact intervention effectiveness and cost-effectiveness. Semi-structured interviews that include questions on the components of the TFA are useful for understanding prospective, concurrent and retrospective acceptability of an intervention (Sekhon et al.,2017). However, the TFA is considered incomplete, with suggestions that relabelling 'opportunity costs' to also include 'opportunity gains' would better illustrate the perceived gains, profits or values that an intervention has for participants alongside and outside of its efficacy (Paynter et al., 2023).

Miller and Brennan (2015) put out a call to action for intervention providers to measure and report attrition from obesity treatment programmes to enhance intervention effectiveness and cost-effectiveness. A systematic review revealed trends, but no clear-cut indicators that could reliably predict dropout from weight loss interventions involving overweight or obese adults (Moroshko et al., 2011). Being older and more educated appeared to decrease the likelihood of attrition, whilst greater body dissatisfaction, poorer body image, more past dieting attempts, lower levels of PA, poorer mental health, lower self-efficacy and lower levels of social support appeared to increase the likelihood. Having higher weight loss expectations and/or lower levels of initial weight loss appeared to predict dropout, as did practical issues such as financial difficulties and longer travel distances. More recently, Ponzo et al. (2021) found an increased likelihood of dropout from weight loss interventions for those with lower BMI, worse health status and higher depression scores. Early dropout was most probable in people with lower weight, smaller waist circumferences, worse mental health scores and who lived alone. One study qualitatively explored themes associated with nonadherence to women's PA interventions (Kinnafick et al., 2014). A lack of internalisation throughout the programme, a sense that basic psychological needs were not satisfied throughout the programme, not embracing the support available and inconvenience of the program to individual lifestyle contributed to attrition. Identifying patterns of attrition across diverse interventions and populations may however be inappropriate because different interventions targeting different behaviours will have differing relevance and appropriateness for different demographic subgroups.

This chapter implements and reports one-to-one exit interviews with women who signed up to the pilot, including all levels of participation, from none to full. Women with low or no participation have provided insight into the perceived reasons for this. Women with full participation shared their perceptions of the features of the intervention that enabled their commitment to the programme and of features they perceived might have contributed to dropout for others, or for themselves if the intervention were to run for longer. Findings are mapped onto appropriate frameworks (the COM-B, the TDF and the TFA) and recommendations for future development of this PA intervention are made.

8.2.1. Research questions

How did women who signed up for the 4-week pilot PA intervention for women from the East Midlands experience their participation and/or withdrawal/non-participation?

What were the most impactful barriers and facilitators to intervention adherence?

How feasible and acceptable did women perceive the intervention to be?

How did women explain intervention attrition?

What did women perceive might limit or prevent attrition in the future, if the intervention were to run at full scale?

8.3. Method

8.3.1. Participants

A purposive convenience sample of women who completed the intervention pre-participation questionnaire were interviewed. When completing the questionnaire, participants indicated whether they were happy to be contacted for interview once the 4-week pilot had ended. Seventeen women were interviewed, representing 68% of total sign-ups. Table 25 shows how many interviewees of each participation level contributed data, with definitions and percentages. To maintain participant anonymity, it was considered inappropriate to elaborate on the demographics of the women in this Chapter.

Table 25: Definitions for each level of participation within the programme, indicating how many and what percentage of interviewees were in each category

Participation level[8]	**How defined?**	**Participant N**	**% of interviewees from this group**
None	Signed up and completed the pre-participation questionnaire but did not contact the researcher after this point.	3	17.65%

[8] *All participants who were still engaging with the programme by Week 3 continued to Week 4 and so there is no participation level category for people who dropped out in Week 3. However, if needed, this category could be labelled 'Substantial' participation.*

Minimal	Attended Session 1 and perhaps again that week, but dropped out or did not get back in touch with the researcher at all in Week 2 or afterwards.	2	11.76%
Partial	Engaged with the programme in some way during Weeks 1 & 2.	4	23.53%
Full	Did not drop out of the programme, engaged with classes or the researcher via PA challenges in all four weeks of the programme.	8	47.06%

8.3.2. Design

Semi-structured, one-to-one, interviews were conducted face-to-face with participants who had given permission to be contacted for this phase of research, at pre-participation.

8.3.3. Interview protocol

A semi-structured interview guide was developed to explore women's experiences of the intervention, their perceptions of its efficacy or lack thereof and the reasons behind the same (see Appendix 26). Excluding filter questions, that were designed to determine appropriate follow-up questions, explanatory and/or open-ended questioning was implemented (See Figure 26).

Questions were primarily based around the features of the COM-B model (e.g. *"Were there any specific parts of the programme that made it enjoyable?"* was asked as part of the 'automatic motivation' line of questioning) and the TFA (e.g. *"How much effort did it take to be a part of the programme"* was asked to explore the burden of participation). Some questions (See Figure 26) aimed to explore dropout, the perceived reasons behind this phenomenon and proposed strategies to limit this, if the intervention was to be redeveloped and run at full-scale.

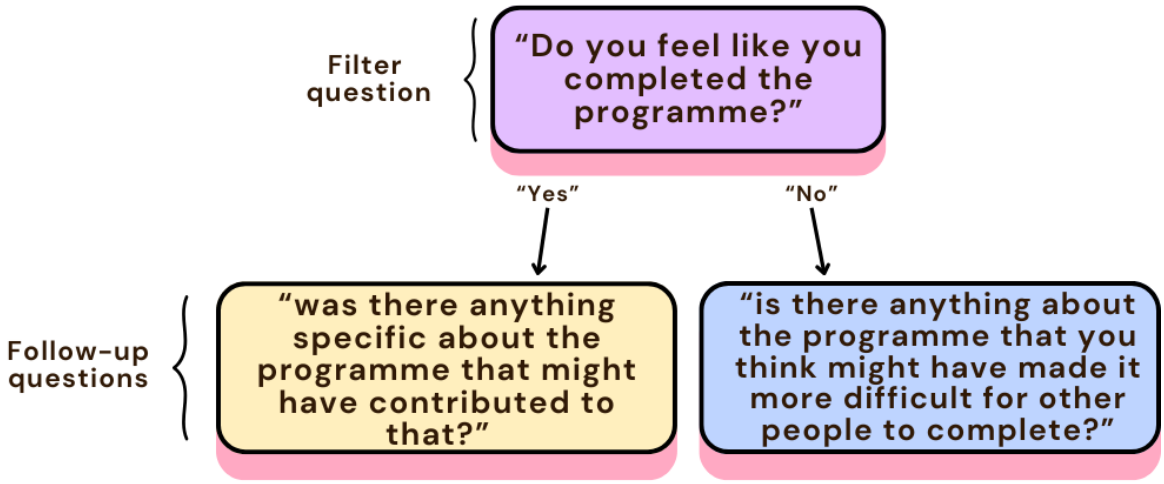


Figure 26: Shows how closed filter questions were used to determine open-ended follow-up questions during interview.

8.3.4. Interview procedure

All participants were interviewed by the Lead Researcher in community settings that were appropriately private and convenient for the participant. Most interviews lasted 40- 60 minutes. The shortest was 20 minutes and the longest was one hour, 20 minutes.

8.3.5. Ethics

This phase of research was conducted in line with the British Psychological Society's (2018) Code of Human Research Ethics and granted ethical approval by Sheffield Hallam University's Research Ethics Committee (Ethics Review ID: ER47741740). All participants provided informed consent (See Appendix 26 for informed consent and demographic questionnaire) and were made aware of their right to withdraw. Participants were informed that they could decline to answer any question and had one week to retract data. Participants were allocated a pseudonym and identifiable information was altered or removed. Care was taken to remind all participants that their contributions had value, regardless of the level of participation. All sign-ups received a debrief sheet (See Appendix 27) via email.

8.3.6. Analysis

Aligned with earlier phases of research (See Sections 4.3.6. & 5.3.5.), data was first inductively free-coded at the granular level, to identify specific barriers and facilitators to participation in the 4-week pilot intervention, including those that might not map onto the predefined theoretical frameworks. These barriers and facilitators were then thematically arranged, such that overlapping constructs that impacted PA via the same mechanisms were grouped together beneath one label (e.g. work commitments, educational timetables and childcare responsibilities were all considered 'competing priorities') before being deductively mapped to COM-B (Michie et al., 2011) and the TDF (Cane et al.., 2012). Uncertainties were clarified with support from the 'Educated Friend' (JKL) in the first instance. For further clarification, the Supervisory Team (MA & LK) was consulted. Data was then coded again, using

deductive framework analysis onto the TFA (Sekhon et al., 2017). A coding framework is available (Appendix 28). Reasons for withdrawal and non-participation were provided by women without full participation. All participants, regardless of level of participation were able to propose strategies that might reduce future intervention attrition. Reasons and remedies for attrition were then reviewed and thematically arranged.

8.4. Results

Participants identified 29 unique barriers and/or facilitators to programme participation, which were mapped onto the COM-B model (See Figure 27) and the TDF (See Table 26). Determinants of programme participation covered 11 of the 14 TDF domains (excluding optimism, social role/identity and physical skills) plus the proposed category, 'biomechanical capability'. Of the 29 relevant determinants, 16 were helpful (facilitators), 5 created obstacles (barriers) and 8 could impact PA differently for different women, at different times and/or in different contexts (divergent).

8.4.1. Physical capability

Women's physical capability to engage was variably impacted by their physical health, mainly regarding acute and chronic illness and injury. The way that poor physical health motivated some women to participate in an achievable programme of PA is encapsulated by Felicia, who explained:

“I do have a pre-existing injury. However, I have been medically advised to do exercise and I had spoken with yourself beforehand [...] so I could also join in”.

Around halfway through the pilot, a back injury that Brandy sustained outside of the programme terminated her engagement. She said simply:

“*because I hurt my back, I just lost it*”.

Eden was unique in acknowledging that her physical health facilitated her participation, although the achievability of the programme supported many women in this regard:

“I guess cause I'm just you know, I'm able bodied, pretty slim anyway and just, it worked for me in my body”.

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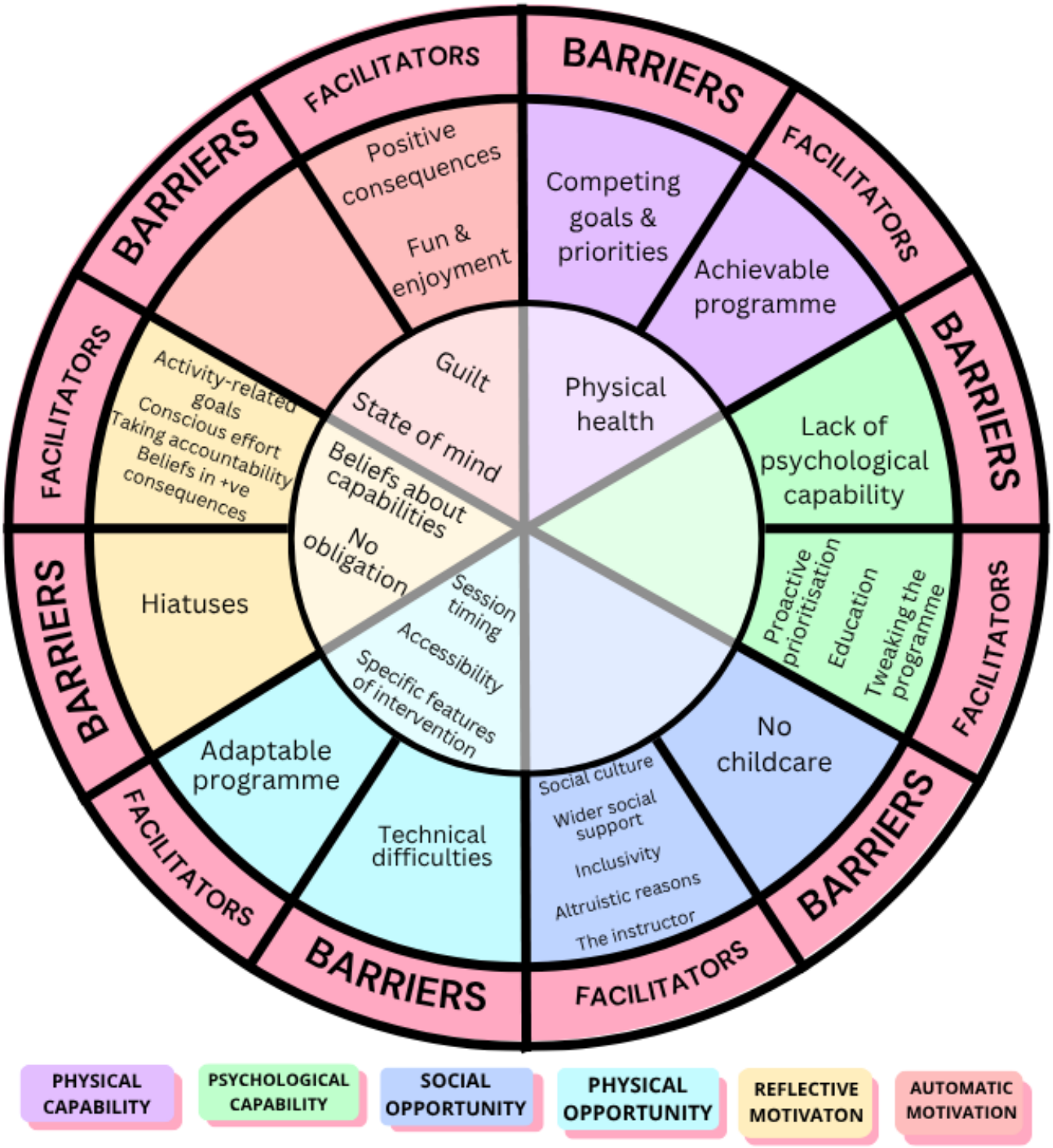


Figure 27: Barriers and facilitators to programme participation mapped onto the COM-B wheel

Table 26: Barriers and facilitators to programme participation mapped onto the COM-B model and the TDF with definitions and example quotes

COM-B	TDF	Category	Barrier, Facilitator or Divergent	Definition	Example quote
Physical capability	Biomechanical capability	Physical health	Divergent	A person's physical health status including ongoing health/ill-health, ability/disability and temporary illness/injury or lack thereof.	*"But since I've had that injury and I was off the foot for a while, like I can't not have pain in it so it's kind of working against me being like ohh yeah, I want to go and do stuff [...], but my foot will get really bad so it's really tough"* <B> *"I need to keep up with fitness for health reasons [because] I do have a pre-existing injury"* <F>
		Achievability of the programme	Facilitator	Having a programme of PA that is achievable in respect of the individual's fitness, ability and skill	*"It made me like working out again because, you know, cause it's stuff that I can do."*
Psychological capability	Mental skills	(Lack of) Psychological capability	Barrier	Lacking the mental skills needed to stay engaged in the programme of PA (e.g. losing focus and forgetting to complete the tasks)	*"I can't plan shit. Yeah, I'm literally, like, everything will get overwhelming. And then I'll go and then go bam bam bam [...] and then go to inactivity again,"*
	Knowledge	Educational elements of the programme	Facilitator	Gaining knowledge through the provision of education (e.g. how to implement SMART	*"I came to see if I can.... Maybe I can pick up like an exercise I*

				goal setting, complete a new exercise or adjust an exercise to suit limitations)	*hadn't done before or correct my form in some exercises"*
	Memory, attention & decision processes	Proactive prioritisation	Facilitator	The act of prioritising programme participation over other things	*"I did restructure things to fit the programme. So for example, I often used to have an evening riding lesson on a Wednesday and I changed it to a different time to accommodate the programme"*
	Behavioural regulation	Tweaking the programme to suit	Facilitator	Tweaking or changing the programme to suit your needs, preferences, circumstances and/or limitations	*"I started off kind of doing [the daily challenge exercises] more religiously and then as time went by I adapted them to fit in and I've probably just done a few repetitions of each one, for example, like the plank I didn't do 6, but I did 2 and I managed to beat my personal best, so I set my own little target, so I've adapted it really."*
Social opportunity	Social influences	The right social culture and atmosphere	Facilitator	Having a social culture within the programme, which is welcoming and non-judgemental	*"It's something about the culture and the atmosphere which was really positive and I think that was partly to do with the person who led the sessions and it was partly to do with, you know, a lovely group of women who were not precious or intimidating"*

		Wider social support	Facilitator	Social support that enables PA by helping women to fulfil the roles and responsibilities that typically act as a barrier (e.g. by providing childcare).	*"On the plank days, six planks. And I was like I can't do it [...] and then my son said to me mum, even if you only do it for a few seconds, at least you've done that" <F>*
		Inclusivity	Facilitator	Having a programme in which all women can be included, regardless of demographic characteristics or fitness ability/experience	*"In order to be physically active creating a space where you can engage in activity that feels achievable with other women, no matter what their ability level or age and in an environment that's fun, makes you very motivated"*
		Altruistic reasons	Facilitator	Engaging with the programme, for unselfish reasons (here, this primarily related to participants wanting to support the Lead Researcher to achieve a PhD)	*"I feel like if I still have that like 'Maddy needs me', then I'm doing this because[...] I want to support you, so I feel like if I keep that mindset where I'm supporting you and I'm doing it still, then that's more motivating for me to carry it on"*
		The specific instructor	Facilitator	The specific intervention lead who ran this programme and the impact that individual had on participants' engagement and commitment	*"I like the presenter. She was very funny and she made it work well for me. And she made me laugh as I was going along and you know, just having a bit of fun is important when you do something that's exhausting you".*

		No childcare	Barrier	Not having childcare for the time when PA participation is planned to (or would be) taking place	*"I couldn't then do the sessions because I didn't have any childcare"*
Physical opportunity	Environmental context and resources	Accessibility	Divergent	The extent to which the programme can be accessed by women (relates to location, proximity to in-person sessions, transport, online availability and the programme being free to access)	*"The half an hour walk from me personally, it was really good when I had the time and I was like, oh, I'm getting in my steps and I'm doing things. But then when I realized it was 6pm or 6:15 and I was like, oh, shit. I meant to be there. It was then a case of, I know I've missed it because I can't get there quickly"* <B & F>
		Adaptability of the programme	Facilitator	Having a programme of PA which can be adapted to suit an individual's fitness, ability and skill	*"You know, if I don't want to do a particular exercise [...]could swap that out and also [...] you would give suggestions for alternatives, which I think is good, having the flexibility and options is really, really good for this sort of thing"*
		Specific features of the intervention	Divergent	Specific features of the intervention that were purposefully included during design/co-design (e.g. daily challenges, explicit code of conduct, burpees, mirrors, alternative exercises, class structure, online availability etc.)	*"Some of the things I was like, I can't do that... like burpees. I really struggle with burpees"*<B> *"So I like that it was split into the three sections and you weren't expected to go for the whole time. You had your breaks in between, that was helpful."* <F>

		Timing of the sessions	Divergent	The timing of the session (during the day, week and year)	*"The timing just didn't work for me" <B>* *"I like that it's 6:30-7:30 Monday, Wednesday, Friday. That just really worked for me because it fit with everything else that I did" <F>*
		Technical difficulties	Barrier	Issues with technology (e.g. poor internet connection)	*"When we did it live online, honestly, I didn't like it as much. And one, technology wise I couldn't get down with the zoom. It took me a little while to get down with that and then having it live as well and other people you know, there was a few technical hiccups. You know you could, could hear other people and I wasn't interested in other people".*
		Competing goals and priorities	Barrier	Competing priorities that get in the way of PA and leave little available time or resources for PA (e.g. work, education, addressing adverse personal circumstances, childcare responsibilities)	*"You're like the classroom's small or whatever. But those weren't the main things, it was more about like for me... work just went a bit insane and it was too much to deal with on top of this. So small tweaks to the programme are less important than just my own shit that was going on I suppose."*

Reflective motivation	Goals	Activity-related goals	Facilitator	Having activity-related goals that are explicit, changeable, realistic and self-selected	*"The fact that it made me think more about what my real goals were is probably the most important thing in terms of impact for me."*
		No obligation	Divergent	Having a programme in which attendance is optional, this is reinforced by the group leader and participants feel secure that this is the case	*"But when I'm under pressure. I'm literally like the most productive that I can ever be... so it's like some warped sense of, you need to get me in a position where it's like loads and loads and loads of pressure [then] I actually do it, [otherwise] I'll just do a little bit and then leave it" <B>* *"I think the programme was like, designed to help motivate people and there was no pressure to do it every single day" <F>*
	Intentions	Conscious effort	Facilitator	Putting in deliberate and conscious effort to engage in the programme of PA	*"I make a cup of tea. I'm doing squats when I'm doing a cup of tea. Doing sit-ups randomly, you know, just those little times where you can just do a little bit extra. So when you were setting those little challenges, I was doing things like purposely leaving the car and taking a walk into town. It's only*

					across the road from me, however sometimes I have been known to drive, so just making that little bit extra effort of like oh, actually let's give that a go"
		Taking accountability	Facilitator	Accepting responsibility for health and for engagement in the programme of PA	*"at the end of the day, your kind of responsibility for your own health and fitness is yours."*
	Beliefs about capabilities	Beliefs about capabilities	Divergent	Beliefs in one's capability to participate in the programme of PA or not.	Interviewer: *"Do you have confidence that you're physically capable of being active on your own?"* Participant: *"Physically, yeah. Mentally, whether I can force myself to do it and, you know, be disciplined. No, I don't. Not at all" <B&F>*
	Beliefs in consequences	Beliefs in positive consequences	Facilitator	Expecting positive consequences from engaging in PA (e.g. appearance, sleep, skin, mental health, mood, physical health etc.)	*"I already know that being active really helps your mental health. I know that it helps you sleep. I know that it helps your confidence. I know that it helps your self-esteem. I know that it helps your mind, your body, everything. I know it does. I know how good physical activity is"*
		Hiatuses	Barrier	Experiencing some disruption to participation in the	*"Because I'd missed like 3 sessions by the time I would have come back, I felt like you would*

				programme (e.g. needing a week off for injury)	*have been into a like, a different stage or something and I've missed things off, so I felt like I would have been behind"*
Automatic motivation	Reinforcement	Fun & enjoyment	Facilitator	Intrinsic enjoyment of the activity itself or the context in which it is occurring.	*"I mean, like, I was motivated to do it because I liked doing it"*
		Positive consequences	Facilitator	Experiencing positive consequences from engaging in PA (e.g. improved self-esteem, sleep, stamina, performance in other sport, feeling stronger, overcoming injury etc.)	*"I've been climbing for years, mate and not getting any better and wondering why? Well since I did the programme, I'm getting better now so it's brilliant."*
	Emotion	Guilt	Divergent	A sense (accurate or not) that one has compromised a moral standard (often for personal gain).	*"I think I just felt so guilty that I wasn't coming. I was like ohh. I'll look at the messages like I will look at them and I will maybe do them, but I felt guilty. I felt like I let you down because I told you I'd come and stuff and then didn't come." <B>* *"I think because people who are there know it's for your PhD and know it's important to you, I think they would always feel accountable and therefore guilty if they didn't come." <F>*

		State of mind	Divergent	A person's mood or mental state (in general and regarding the programme)	*"For two or three of the sessions, there were phone calls from other people, which then changed my mood. And I didn't wanna be around people. And it's hard to snap out of that mindset. And not just want to be on your own" <B>* *"I think it was a frame of mind because it was so structured and I knew it was going to be a month. I thought, well, I can commit to this month and I was kind of hoping it would change the way I felt about doing exercise and it has." <F>*

8.4.2. Psychological capability

Forgetfulness, poor time management skills, neurodivergence, poor mental health and lack of self-discipline all impacted women's psychological capability to be active.

When asked if she had the capability to be active, Paris replied

"physically, yeah. Mentally, whether I can force myself to do it and, you know, be disciplined... no".

She explained that this was due to difficulty planning and organising herself, particularly when faced with unexpected events or challenges, due to the symptoms of her diagnosed ADHD.

For many participants, the ability to tweak features of the programme to suit their lifestyle, schedule, abilities or preferences facilitated engagement. Sadie did this for convenience, explaining

"like the daily challenges, I did them quite a lot, but I'm not sure I always got the right one on the right day. So for instance, I'd do the tricep dips and then a few days later I'd think 'Ohh, I can't remember what the challenge is' and rather than going to check. I just did tricep dips".

This flexible and adaptable thinking was also helpful for women in the face of things like limited physical opportunity, as it enabled them to restructure the programme to suit their physical environment.

8.4.3. Social opportunity

Women enjoyed having the opportunity to be a part of a programme of PA that was inclusive, particularly in respect of fitness level/ability. Jane liked that

"everybody was welcome", stating *"I think it was all inclusive from that point of view. I think everyone would have been able to do some part of it"*.

Poppy described how there was a sense of camaraderie that came from working hard together and laughed when she said

"we're all in it together innit and we could all just have a laugh. It was funny wasn't it. It was funny [..] I know you shouldn't. But, like, you know, like looking at someone who's equally as dying and you're just like (pants dramatically) 'are you good mate?' and they're just like 'no' (laughs). Yeah, that's enjoyable... To know that you're not the only one having a cardiac arrest"

The importance of the individual leading the intervention was key. Eva highlighted that the instructor could impact how fun the sessions were, the atmosphere in the space and that their expertise was helpful for both inspiring people to push themselves and ensuring this was done safely and in line with participants' abilities:

"I like the style of your training. I like how you keep the sessions fun. I like how you keep it upbeat for everyone. You pay attention to your trainees and you know, you know what the capabilities are. So you know how far they can go".

Without childcare, PA participation was simply not possible for mothers. Chloe shared that she had difficulty finding appropriate childcare, as her son has complex needs. This, in combination with her mother's declining health left Chloe with little wider social support to facilitate her programme participation. She explained

"My other half, he's amazing with [my son] but I feel like nobody else can look after him like me and mum. My mum, she's obviously got arthritis, so she can't help as much with him now. She's lost the feeling in her hands and no, so she can't do much with him. So yeah, no, I just felt like... I've not really had anybody to help".

Social support in the form of (preferably free) childcare was consistently identified as imperative for mothers, in their pursuit of PA.

8.4.4. Physical opportunity

Programme accessibility was generally considered higher for women who lived geographically close to the in-person exercise classes, which took place in Nottingham. The programme being free created the physical opportunity for more women to engage. Melanie was open in saying

"Honestly, if it cost money, I wouldn't do it [...] I don't pay for stuff. I can't afford it".

Despite specific features of the intervention variably impacting participation, women described 35 facilitating features and just two specific features of the intervention that acted as barriers. A full list of the 37 specific features of the intervention that women described impacting their participation is available (Appendix 29). Felicia liked that

"there was a code of conduct there, so everybody was very happy and agreed to it. And nobody, you know, nobody strayed away from anything".

This highlights the benefits of explicitly stating 'ground rules' that create a physical space in which women feel comfortable and safe being active.

Felicia also spoke of the facilitating impact that being able to do the sessions anywhere, without equipment, had for her and that this created the physical opportunity for her to develop her skills and expertise, which left her confident that she could continue being active in the future:

"with the tools that are available now, with the online videos and knowing that I don't need any equipment and stuff like that, this is something I now can do at home. It's something I feel I can just do for myself".

The online availability of sessions both live and in the online anytime library helped enhance the physical opportunity for many women, who might not otherwise have been able to participate. Sadie lives in a rural village around 50 miles from Nottingham and said

"with it being online it was so accessible to me because I wouldn't have been able to make the in-person so if I hadn't had the online access, I wouldn't have been able to do it".

Online availability was therefore key for promoting the physical opportunity for women to participate in the absence of physical proximity. This was also helpful for people with limited financial resources and/or limited transport options.

Soraya found the online anytime library helpful whilst caring for her children at home because the opportunity to pause the videos meant she could do the whole workout, even if she wasn't able to find the time to complete it uninterrupted

"it's good for me because like if the kids are messing around, I can just quickly pause it, go sort them out and come back to it".

Competing priorities including childcare responsibilities, work, education and addressing adverse personal circumstances negatively impacted women's physical opportunity to engage. Bobbi, a non-participant, explained:

"So I'm doing a uni degree and then I've also got obviously a full-time job and a child and then just life stresses like just you feel like when you've got a day off oh I'll just clean the house instead or do that like part of my uni work [instead of PA]".

8.4.5. Reflective Motivation

Women's reflective motivation to participate in the programme was positively impacted by having activity-related goals that were explicit, changeable, realistic and self-selected. Melanie shared

"I wasn't really down with the goal-setting as such because I'm not like your standard typical female and that's me stereotyping there, that wants to lose weight, that wants to have a bigger bum or anything like that. So I didn't have those goals in mind. I found it quite challenging, but with the support of yourself, I did

want to get more flexible, so we started measuring that and that was really helpful and that gave me then something to work towards and then helped me to then, you know, psychologically embed that into my day. Like, do that every day. Stretch that out every day and I should be doing that anyway. Should be doing that anyway, but just to have that conversation and set the goals and see the improvement that, yeah, was really something else".

Keeley, whose participation was considered minimal, described how she made a conscious effort to be more active throughout the programme despite not reporting back

"I was doing things like purposely leaving the car and taking a walk into town. It's only across the road from me, however sometimes I have been known to drive so just making that little bit extra effort of like oh, actually let's give that a go".

This conscious effort tied in with taking accountability for programme participation, for being more active and for taking control of one's health more generally.

Women's reflective motivation to participate was facilitated by their beliefs about the positive consequences of engagement in the pilot intervention and in PA more generally. Women believed the programme would improve their confidence, health and wellbeing, mental health, sleep, physique and pre-existing health concerns.

After a hiatus from the programme, women described reluctance to return based on a sense that they had missed a relatively large portion of a relatively short programme. When Brandy was asked why she didn't return for the final week once her back injury had subsided, she replied:

"because I would have just felt like it was pointless that I was not... I was only gonna do a week, and I wasn't gonna do like a long and meaningful stretch".

This is discussed in more detail in section 8.4.8..

Women's beliefs about their capabilities to be active and to commit to/participate in the programme divergently impacted their reflective motivation to engage. It wasn't always the case that having more belief in PA-related capabilities facilitated engagement. Eva, who regularly engages in strength training independently, was honest in sharing that the programme was

"Maybe not my first option because like I said, I'm an advanced exerciser".

She explained that for this reason, she only attended one of the in-person classes a week, as she felt they were not sufficiently intense, compared to what she could achieve in the gym, using weights.

Beliefs in capabilities that facilitated participation included having an awareness of limitations, belief that the programme was easy to fit into a schedule, belief that one is good at a particular exercise and belief that fitness had declined.

The lack of obligation to participate and the repeated reiteration of the non-obligatory nature of the programme variably impacted women's participation. Some women, considered the lack of obligation permission to withdraw. However, Cali explained how the programme's non-obligatory nature made her feel able to sign up to the programme, despite the possibility that she would not be able to achieve it, due to struggles with her mental health

"It was made clear from the get-go that, you know, if you really couldn't do it, it's totally OK. There was no like if you can't do it, come and talk to me and we'll talk about it. Or like there was no kind of blocker. If I wanted to step back, I could. If I wanted to stay, I could, no matter how much or how little of it I took part in. I think for me there was freedom in that and yeah, yeah, as for your approach, the way that you designed it, I think it did allow that freedom. And that kind of.... I want to say, like generosity of option".

Eden shared that the option not to participate helped create the opportunity to engage in the programme in a healthy way, and without pressure, which hadn't always been the case for her when trying to increase her PA previously. She said

"I mean, like you, you understand that everybody's different and if we needed to take a break, we could take a break and [...]It wasn't like super strict. It wasn't forced. If we needed a day off, we could take the day off kind of thing. So it didn't feel like there was this, like, overwhelming pressure, if you know what I mean, because, like, I've always got quite stressed with working out and I've always had a really, like, unhealthy relationship with fitness".

The tailoring of the programme to the women who contributed to its co-design therefore appears to have helped to create an intervention that enhanced women's reflective motivation to engage, based partly on their beliefs about their capabilities with respect to the programme.

8.4.6. Automatic motivation

Women's automatic motivation was promoted by fun/enjoyment and positive consequences of engagement but variably impacted by guilt and state of mind.

Positive reinforcement came in the form of improved psychological capability, better posture, feeling energised, feedback and praise from the instructor, the feeling of an increased heartrate and sweating, the ease with which the programme could fit into their lives, physical aches that meant women felt the programme was working, improved mood, improved health, improved mental health, improved other health-related behaviour, improved self-esteem, improved sleep, improved stamina, improved performance at other sports, a sense of achievement, overcoming injury, getting stronger, releasing energy and seeing perceived improvements in physical appearance. Delia summarised how getting feedback on her daily challenge performance was reinforcing:

"when you [are] getting feedback and little tasks throughout the week, it really reinforces you and makes you feel you're part of a process that is making you feel

much better about yourself and contributing something really positive towards your health and your mental health, I think".

Some women chose not to continue with the programme after missing some of the exercise classes.For women who signed up to the programme, guilt was almost entirely centred around a sense of obligation to the lead researcher. This was motivating for some, but the guilt of not committing prevented others from attending.

Women's state of mind impacted programme participation differently for different women at different times. There were eight mind states that women described as barriers (desire not to socialise, feeling 'out of the swing of things', feeling demotivated, feeling insecure about one's body whilst being active, feeling nervous or lacking self-confidence, not feeling in the mood, having poor mental health and feeling generally worn out) and two that acted as facilitators (positive mental attitude and the right frame of mind to commit to a programme of PA). Chloe explained how her state of mind was a barrier:

"I think it's just that I lack the motivation in myself because I know I could do it at any time. Because I do desperately want to get back into the gym and start being fit again. It's just I just don't see any point. That's what my mindset is at now".

Melanie explained how her state of mind had changed compared to a few years previously, leaving her in the perfect headspace to participate:

"honestly, two years ago, I wouldn't even have thought of saying yes, but it just fit in with where I am right now and what I'm trying to do for myself. And it's just been perfect, it's like I've asked for the universe to help me out and along came Maddy with her PhD".

This also highlights the importance of timing, in that the same woman will be differently motivated to be active (or not) at different times in her life.

8.4.7. Acceptability

The intervention was considered largely acceptable to participants, in line with the TFA (Sekhon et al., 2017), including for participants who withdrew or did not engage. Affective attitude towards the intervention was overwhelmingly positive. When asked what the most important thing she wanted me to know about her experience of participation, Felicia replied

"Well, I think it's just how I'm smiling as I'm talking through this and really my realisation that like actually that this has really built me up and. A lot. It's it's kind of supported me. It's been like a really good, good time for me, for this to come into my life and I feel so much better for it. So I'm just realising that, I'm hearing it come out my mouth. It's just nice. It's just good to hear".

The only negative emotions that were mentioned were nerves (beforehand and at the prospect of returning following a hiatus) and guilt for perceived lack of commitment. Meredith shared

"I felt guilty and the guilt of me not completing something. I felt bad".

There were mixed messages about the burden of participation, but general agreement that it was

"totally worth it".

Felicia described the programme as

"the most effort, but the most rewarding".

The intervention had good ethicality, fitting well with participants' personal value systems in terms of fairness, equality, feminism, togetherness, unity, inclusivity, empowerment, independence, health, confidence, freedom of choice, being social, engaging in self-care, being a strong woman, seeing all bodies as beautiful, supporting others and being non-judgemental. All women understood how to take part in the intervention and understood the components of the intervention. Some

women expressed confusion around the data collection techniques used within the programme. However, data collection occurred for research purposes and would not be included in any final intervention.

Very few women felt they had to give up things they enjoyed to participate and so the opportunity costs could be considered low. When explaining that the Monday session meant missing a University society event, Leilani stated:

"it wasn't much of a loss, it was just a mild inconvenience".

All participants, regardless of level of participation, perceived the intervention to effectively increase PA. Cali, didn't actively engage with the programme, but stated

"whilst I didn't actually do these exercises, there were days where I ended up doing deep stretching and some yoga and things like that, which I don't think I would have done if I hadn't have had the prompts".

This suggests that even in the absence of an increase in PA, the intervention may have still been successful at supporting inactive women to move from 'contemplation' to 'preparation' and potentially to take some small steps into 'action; in line with the Transtheoretical Model of behaviour change (Prochaska & Velicer, 1997).

There were mixed feelings about self-efficacy to undertake the intervention, but women described self-efficacy increasing over time through their participation. Delia explained

"I was both realistic and also probably a little bit negative about my own abilities and I think what I learned is that I'm actually... I was bit fitter and more capable than I expected to be and that I could achieve greater fitness without too much pain, really".

This aligns with the COM-B mapping, when the intervention was found to promoted beliefs in capabilities.

8.4.8. Reasons for withdrawal and non-participation

Participants who dropped out or did not participate in the programme did so for the following reasons:

i. Practical issues and adverse life circumstances (e.g. not having childcare, car breaking down, work hours impacting attendance, contact with the criminal justice system, becoming unemployed)
ii. Injury (none of which happened because of programme participation)
iii. Negative affect (e.g. guilt, shame, anxiety, embarrassment, depression)
iv. Pessimistic beliefs about programme participation (usually following a hiatus from the programme e.g. *"I felt like I would have been left behind")*

Total non-participation was usually explained by practical issues and adverse life circumstances (limited physical opportunity), whilst injury was the most common reason for withdrawal partway through (limited physical capability). Following recovery from injury however (increased physical capability), pessimistic beliefs about programme participation (reduced reflective motivation) prevented women from returning to the programme, whilst adverse life circumstances resulted in negative affect (reduced automatic motivation) and pessimistic beliefs about the consequences of returning to the programme (reduced reflective motivation). Temporary reductions in capability and/or opportunity therefore elicited permanent reductions in motivation.

8.4.6. Remedies for withdrawal and non-participation

All participants proposed numerous suggestions that might limit or prevent withdrawal and non-participation if the intervention were to run at full-scale. These can be viewed in Table 27 alongside the specific reason for withdrawal or non-participation this strategy was proposed to address, which COM-B components that strategy might enhance and any additional notes of importance regarding that strategy. As these strategies have not undergone APEASE analysis or been assessed in respect of acceptability and feasibility, numerous would likely be inappropriate for implementation within a full-scale PA intervention for women.

Table 27: Proposed remedies for attrition that participants' discussed during interview, mapped against the relevant reasons for attrition and the COM-B components, with additional comments

Proposed remedy	To address which reason for dropout/non-participation	COM-B components addressed	Additional comments
Introduce an app for data tracking and registering for sessions	Negative affect – guilt specifically	Automatic motivation	Reducing the personal element might reduce participants' sense of responsibility to the group leader, thereby preventing guilt regarding perceived poor engagement
Self-compassion coaching	Negative affect – guilt specifically	Automatic motivation, Reflective motivation	This idea was thought to have relevance for mothers in the context of leaving their children (to engage in PA) and to alleviate guilt associated with missing some of the programme
Introduce a WhatsApp community or Facebook group	Pessimistic beliefs about programme participation and negative affect – anxiety specifically	Reflective motivation, Automatic motivation, Social opportunity	Participants could choose to opt in or out of this, but it might increase social support and help online participants feel more socially connected
Create a buddy system	Pessimistic beliefs about programme participation and negative affect – anxiety specifically	Reflective motivation, Automatic motivation, Social opportunity	Pairing participants up might enhance social connectedness and increase social support

Mood tracking	Pessimistic beliefs about programme participation	Reflective motivation, Automatic motivation	Tracking mood before and after the session might be reinforcing as improvements in acute mood will be evidenced, which might enhance positive beliefs about the consequences of attending
Include more discussion of dropout during initial information provision	Pessimistic beliefs about programme participation	Reflective motivation	This could include strategies to reduce the likelihood of dropout and ways to limit/manage difficult feelings. This might limit negative expectations about returning to the programme following a hiatus and how others might react
Reduce emphasis on no. of sessions per week	Pessimistic beliefs about programme participation	Reflective motivation	This might help people to perceive the intervention as one complete programme, rather than a series of 12 sessions, some of which they might have missed
Encourage people to self-select how many sessions they aim to attend each week	Pessimistic beliefs about programme participation and negative affect – guilt specifically	Automatic motivation, Reflective motivation	Participants could have communication only about sessions they plan to attend – this could also reduce burden and the anticipated stigma associated with hiatuses.
Provide more detail about how the programme will progress and what will be included in each session	Pessimistic beliefs about programme participation, negative affect – specifically anxiety, injury	Reflective motivation, Automatic motivation, Physical capability	This might enable participants to manage their expectations, reduce anxiety, prioritise sessions that would suit them and not burn out by 'overdoing it' with the daily activity challenges early on, also preventing potential injury
Emphasise the importance of all research participants,	Pessimistic beliefs about programme	Reflective motivation, Automatic motivation	This should foster a sense of importance and self-esteem, reduce negative affect associated with not attending and alter beliefs about the consequences of attending (by reducing anxiety about the group leader's feelings regarding lack of participation.

regardless of level of participation	participation, Negative affect		
Remove PhD and research element (including requirement to complete measures)	N/A	N/A	Participants perceived this might reduce the burden of programme participation and intervention coherence, thereby improving full-scale intervention acceptability. However, although participants perceived these elements to be inherent within the intervention, they are actually part of the research process and would not be included in a final intervention.
Introduce a competitive element	Unclear	Automatic motivation, Reflective motivation	This idea was rejected during co-design and it is perhaps noteworthy that although competition goals and winning were identified as a facilitator in the 2015-2020 evidence synthesis from Chapter 3, women are less willing than men to engage in competition generally (Hauge et al., 2023) and are less competitive in athletic contexts (Cashdan, 1998).
Reduce emphasis on lack of obligation and right to withdraw	N/A	Automatic motivation, Reflective motivation	This would be inappropriate within a PhD programme of research as this would breach research ethics procedures and protocols according to the British Psychological Society's Code of Ethics (BPS, 2018).

8.5. Discussion

Exit interviews have enabled an in-depth exploration of women's barriers and facilitators to programme participation, perceptions of the acceptability of the programme, reasons for attrition and strategies that might prevent this if the intervention was redeveloped and run at full-scale. Inductively coded barriers and facilitators were deductively mapped onto the COM-B model (Michie et al., 2011) and the TDF (Michie et al., 20015; Michie et al., 2017). Data was next subject to further framework analysis (Sekhon et al., 2017), whereby it was deductively coded to the TFA. Reasons for withdrawal/non-participation were reviewed and thematically arranged, then proposed strategies to overcome this were mapped against the relevant reasons for dropout/non-participation and the associated COM-B components each strategy might address.

There were 29 unique determinants that women described as facilitating and/or inhibiting engagement in the 4-week pilot intervention. Around 50% of all discussed determinants were facilitators, compared to just less than 20% being barriers and around 30% having divergent effects. Positive elements of the programme might have been overstated due to socially desirable responding bias, to which women may be more susceptible than men (Bergen & Labonté, 2020). However, prolonged engagement with participants, reflexivity and triangulation were all implemented to enhance data credibility, in line with recommendations from Ahmed's (2024) strategies for enhancing trustworthiness in qualitative data. Determinants mapped onto all components of the COM-B model. Facilitators were identified for all of the COM-B domains, so the pilot intervention was considered at least somewhat effective at addressing women from the East Midland's capability, opportunity and motivation to engage in a targeted programme of PA. Determinants of participation could be mapped onto all but three components of the TDF (optimism, social role/identity and physical skills). The addition of 'biomechanical capability' as a TDF category, under the COM-B component of physical capability was useful during categorisation.

Women's participation in the programme appeared to be impacted by:

1) Individual factors

2) Interpersonal factors

3) Intervention factors

4) Practical strategies that could be implemented to enable participation

When viewed through a critical realist lens, women's accounts from the exit interviews represent their reported experiences of the programme (the empirical), which provide insight into how participation was shaped by the interaction between individual, interpersonal and intervention-related factors. The identified barriers and facilitators illustrate how features of the intervention and the circumstances of participation (the actual) interacted with wider contextual conditions and resources (the real), influencing women's capability, opportunity and motivation to engage. Whilst many factors facilitated PA, the presence of the divergent determinants suggests that the same programme features triggered different underlying processes or mechanisms depending on women's circumstances. Reasons for attrition and non-participation did therefore not appear to stem solely from individual capability, opportunity or motivation but from practical and interpersonal constraints that sometimes limited the activation of enabling mechanisms in certain contexts. Participation therefore appears to have been shaped by the interaction between individual agency and contextual conditions, which illuminates the importance of addressing real structural and practical factors alongside behavioural components, if a full-scale iteration of the intervention were to be developed.

8.5.1. Individual factors

Individual factors that impacted participation included characteristics of the individual, their responsibilities, their life circumstances and their state of mind/feelings/emotions

Considering the relationship between PA and health (See Section 1.2.2.) alongside the relevance of baseline PA level for intervention engagement (See Section 7.4.2.2.1.), the importance of physical health as a determinant of participation seems intuitive. However, patients living with a health condition prioritise different features of health-related quality of life compared to the general public, so may

have different preferences for health-related interventions (Goodwin et al., 2021). Sedentary participants, who likely have poorer physical health due to physical inactivity, were not effectively targeted by this pilot intervention. Future intervention research might therefore benefit from more holistic assessment of participants' physical health status (including assessment of baseline PA level), to enable PA interventions to be tailored in terms of the individual characteristics that most impact the extent to which women engage with PA interventions.

Reminiscent of the evidence base exploring the disproportionately female burden of care (e.g. Elmahdi et al., 2011; Cascella Carbó & García-Orellán, 2020) and women's propensity for undertaking dual roles/second shifts (Hochschild, 1989/2003; Craig, 2007), responsibilities that most impacted women's engagement were work, education, household chores and caregiving duties. The negative impact on women of fulfilling multiple roles has been found to further intersect with SES, ethnicity and culture (Brailey & Slatton, 2019), to further compound disadvantage and inequality. Consideration of these relevant characteristics would therefore be beneficial during participant selection, to ensure that interventions reduce, rather than exacerbate pre-existing inequality.

Life circumstances that impacted programme participation included the level of social support available, adverse personal circumstances and the impact of hiatuses. The most essential social support that women required was free childcare, which further speaks to the female burden of care. Working women are more likely than working men to take responsibility for unplanned urgent childcare (Maume, 2008). However, parents who resided with their children's grandparents experienced better gender equality, due to the additional division of labour, the impact of which was roughly equal to having a paid housekeeper (Albertini & Tosi, 2022). Social support in the form of free childcare therefore appears to be one of the most effective strategies for reducing one of women's most gendered barriers to PA.

Adverse personal circumstances including car troubles, financial difficulties, bereavement and contact with the criminal justice system created pragmatic and

emotional barriers to participation, despite evidence of the benefits of PA for psychological wellbeing (see section 1.2.2.). PA can support management of grief symptoms (Williams et al., 2021), but participants in this study deprioritised programme participation following bereavement due to low mood and changing schedules. This, and the importance of general state of mind as a predictor of participation, speaks to the bidirectional relationship between PA and mental health (e.g. Steinmo et al., 2014; Vella et al., 2017) and the vicious cycle of depression and physical inactivity that systematic review reveals (Roshanaei-Moghaddam et al., 2009). Adversity and human suffering are unfortunate but inevitable universal life experiences (Starck, 2024), so whilst some groups will be at greater risk of adversity and suffering, nobody is immune. Emotions that impacted women's programme participation included enjoyment and guilt. Enjoyment is an excellent predictor of behaviour change (Phillips & Chapman, 2012) - people do things they enjoy and avoid things they dislike. The role of guilt in behaviour change is highly prevalent for mothers, who experience significantly more work and family-related guilt than fathers (Borelli et al., 2017). From adolescence, females are more likely than males to experience ongoing, unalleviated feelings of guilt and to self-punish particularly harshly based on misbehaviour that counters sex-role stereotypes (Bybee, 1998). This is highly connected to women's 'shame-proneness' (Ferguson & Crowley, 1997) and may explain women's altruistic motivations for participation. Women are generally intuitively and consciously more altruistic than men (Simmons & Emmanuele, 2007; Rand et al., 2016), so the relationship between PA and guilt can be considered a gendered issue.

8.5.2. Interpersonal factors

Reminiscent of the importance of social influences on women's PA (See sections 1.3.3. and 1.3.4), the intervention created a social world that facilitated women's participation by having the right social culture and atmosphere, by being inclusive, because of the specific instructor and by acting as a form of social time whereby women could feel socially connected to one another. However, although care was taken to ensure credibility of data, situational factors may have enhanced the social desirability bias and an overly positive, perhaps inauthentic consensus might have

been reached (Bergen & Labonté, 2020). Women may be more prone to social desirability bias (Hebert et al,. 1997), which might have been further inflated by: the established relationship between participant(s) and instructor; the sense of obligation participants describe feeling towards the instructor; participants' feelings of warmth towards the instructor; participants' awareness of the instructor's multiple roles and investments in the intervention; and the sense of shared sisterhood that the intervention created.

8.5.3. Intervention factors

Features of the intervention that were impactful included the achievability and adaptability of the programme, the goal-setting and educational elements, the inclusivity in respect of fitness level, the programme's non-obligatory nature, the level of accessibility, the structure of the sessions, the timing of the sessions and the specific instructor. In line with findings highlighting the importance of social influences in predicting women's PA (e.g. Peng et al., 2023; Shah et al., 2020; van Uffelen et al., 2017), the instructor and the participant-instructor relationship enhanced women's commitment to the programme. If the intervention were delivered at full-scale however, the instructor might vary/change. The potential impact of this on intervention engagement and effectiveness is unclear. Despite hesitancy from researchers to define and measure accessibility (Ryan & Martens, 2023), the online availability of sessions was considered to promote this. Aligned with findings from Short et al. (2014), online availability was particularly important for participants from more distal, rural areas. However, whilst technology created the opportunity for people from further afield to attend in-person sessions, technical difficulties were a barrier for some women, particularly during the live online sessions. Despite evidence that older adults experience additional barriers to online exercise class participation including technical difficulties (Islam et al., 2024), one of the oldest participants in the group joined live online for all but two of the sessions without issue.

8.5.4. Practical strategies to support programme participation

Practical strategies that women implemented to facilitate participation included:

1) Making a conscious effort/proactive prioritisation of the programme, which evidence suggests people experiencing positive affect are more likely to do (Cameron et al., 2018).

2) Tweaking the programme to suit personal needs/preferences/circumstances and/or limitations despite RCTs identifying no significant benefits of individually tailored exercise programmes compared to more generic PA interventions (van Sluijs, 2005; Wanner et al., 2009).

3) Using activity-related goals which were explicit, changeable, realistic and self-selected. This aligns with previous evidence around the efficacy of SMART goal-setting within PA interventions (e.g. Bahrami et al., 2022 Lu et al., 2022) and was fulfilled through the goal-setting education and support sessions.

4) Taking accountability for programme engagement and general health. This strategy somewhat contradicts a public health perspective and placing responsibility for health-related behaviour change on individuals can be considered ethically inappropriate (Brown et al., 2019). However, using the alternative approach suggested by Brown and colleagues - placing emphasis on 'acting in one's interests' (p.1825) rather than assigning blame - might ameliorate these ethical implications.

8.5.5. Intervention acceptability

The pilot intervention was considered acceptable in respect of all seven components of Sekhon's (2017) TFA. For some participants, intervention participation required high effort levels, yet this was repeatedly described as 'worth it'. Thus, whilst the intervention was at times perceived to be a burden, the intervention was intrinsically rewarding enough to offset this. Participants described effort enhancing the sense of reward, because positive outcomes felt hard earned. This phenomenon validates Paynter et al.'s (2023) proposal that 'opportunity costs' might benefit from the inclusion of some duality, to include 'opportunity gains'. This phenomenon is akin to decisional balance (Janis & Mann,

1977), which states that decision-making takes a conflict approach whereby anticipated and actual gains or losses are weighed up against one another to enable better decision making. This has been found applicable for PA promotion (Prochaska et al., 1994) and states that individuals at different stages of health-related behaviour change, as outlined by Prochaska and Velicer's (1997) Transtheoretical Model, will weigh pros and cons of engaging in the behaviour differently. Prochaska et al. (1994) found people who were not yet engaging in positive health-related behaviour to perceive the cons to outweigh the pros of enacting that behaviour. However, alongside progression throughout the preparation, action and maintenance stages of change, a crossover occurred whereby perceived pros started to outweigh perceived cons. This may explain why the intervention was most effective at increasing PA for women who were 'fairly active', whilst inactive women were most likely to dropout or not participate.

8.5.6. Reasons for intervention attrition

Reasons for attrition could be thematically arranged into four categories:

1) Practical issues

2) Injuries

3) Negative affect (particularly guilt)

4) Pessimistic beliefs about the consequences of participating in, or returning to, the programme after a hiatus.

Participants provided reasons for dropout/non-participation that covered all the COM-B components. However, the interdependent relationship that motivation has with capability and opportunity, as outlined by Michie et al.'s (2011) COM-B model, became apparent when further exploring reasons for attrition. This thesis contributes to knowledge regarding withdrawal from PA, by understanding this in the context of the COM-B model and its component parts. Participants described temporary reductions in capability and/or opportunity to engage in the programme triggering permanent reductions in motivation. For some regularly exercising healthy asymptomatic adults, just one week of exercise cessation increased pain, fatigue and/or elicited mood changes (Glass et al., 2004). This may partly explain why PA hiatuses reduced motivation to the point of permanent withdrawal. Interview participants described this effect being enhanced by the programme's

relatively short four-week timeframe, so a longer, full-scale intervention might see better participant retention. Interestingly, no participants withdrew from the intervention past the halfway point. This may be explained by the 'goal gradient effect' (Hull, 1932), whereby motivation increases in line with goal proximity. If so however, a longer intervention would likely increase, not reduce, attrition.

8.5.7. Remedies for intervention attrition

Participants proposed 13 suggestions that might prevent withdrawal/non-participation. Whilst none of these have been formally assessed against APEASE (Michie et al., 2014), the appropriateness of suggestions clearly varied. For example, in the context of a PhD programme of research, reducing emphasis on the non-obligatory nature of programme participation and participants' right to withdraw would be inappropriate/unethical. The suggestion of introducing self-compassion coaching might however be more acceptable because this method promotes positive body image and self-esteem (Chadwick, 2023) and reduces feelings of guilt (e.g. Mosewich, 2011). Guilt was a common barrier to engagement and reason for withdrawal/nonparticipation. There were five overarching categories of strategies:

1) System depersonalisation (by introducing an app for data tracking and registering for sessions, to limit the personal element and reduce guilt associated with low engagement)

2) Emotion-focussed strategies (which were primarily to reduce guilt – e.g. self-compassion coaching, mood tracking and emphasising the importance of all participants for the research regardless of level of participation)

3) Expectation management and preparation (including more discussion of dropout during initial information provision; reducing emphasis on the number of sessions per week; encouraging people to self-select how many sessions they aim to attend that week; providing more detail about how the programme will progress and what will be included in each session; and reducing the emphasis on the non-obligatory nature of participation/right to withdraw).

4) Social dynamic enhancement/alteration (by introducing a social media community, creating a buddy system and/or introducing a competitive element)

5) Removing the PhD/research element of the programme (as it was considered this might reduce guilt for non-commitment and burden on participants via data collection procedures).

There was therefore a large focus on guilt reduction in women's proposed strategies for reducing dropout and non-participation. This finding is reminiscent of research showing that women experience more guilt than men (Else-Quest, 2012) and that guilt and self-compassion accounted for 16% of the variance in heath-related behaviour for mothers of young children (Miller & Strachan, 2020).

8.5.8. Strengths and limitations

These findings support the acceptability of this PA intervention for women from the East Midlands. This chapter has offered explanations for non-participation/withdrawal and proposed remedies for the same. Socially desirable responding bias may have led participants to overstate the positive elements of the programme and understate negative elements. Whilst discussion of reasons for dropout appears to have provided women with the opportunity to discuss elements of the programme that did not work for them, participants clearly felt a sense of responsibility towards the lead researcher in the context of her PhD. This, combined with women's vulnerability to guilt and propensity for altruism, is likely to have reduced how comfortable women felt discussing negative opinions or experiences of participation. Participants identified goals during the programme and provided reasons for withdrawal, but data was not gathered regarding their initial motivations for sign-up. When considering the importance of intrinsic reward and opportunity costs/gains alongside the burden of intervention participation, further insight into participants' motivations for signing up might have offered a better solution to predict and prevent attrition. Future research might therefore benefit from gathering data on participants' motivations for initial sign-up. The transferability of these findings is somewhat limited because of the research/PhD context. Running the intervention in a 'real-world' setting might reduce participant burden by removing

the time and energy required for data collection and by removing the guilt-inducing sense of responsibility to the Lead Researcher. In a real world context therefore, if run at full-scale, guilt may be less of a barrier, so withdrawal may be less prevalent. Although this might also reduce the facilitating effect of women's altruistic motivations. It would be useful to deliver the intervention for longer, following at least one further co-design workshop in which the proposed suggestions for limiting and preventing dropout/non-participation are assessed against the APEASE criteria.

8.5.9. Summary and conclusion

These findings offer support for the further co-development of this pilot PA intervention for women. Women were largely capable of engaging in the programme and the intervention provided ample opportunity to engage, yet short hiatuses in attendance, due to temporary limitations in respect of capability and/or opportunity (usually because of injuries, illnesses and practical issues such as broken-down cars), left women too demotivated to re-engage. This was mainly due to guilt and negative perceptions about what returning to the programme might be like/how others might respond. Self-compassion coaching is one promising intervention option that might limit or prevent dropout by tackling the characteristically female experience of guilt. Running the intervention at full-scale outside of a research context might also reduce barriers to participation.

The COM-B model and the BCW have facilitated development of a PA intervention that women from the East Midlands consider acceptable. All women who were interviewed identified features of the intervention that enhanced their capability and opportunity to participate, yet reduced motivation remained the biggest barrier that prevented women committing to the programme. Adverse life events are inevitable, so temporary reductions in capability and opportunity are unavoidable. Women might therefore benefit from specific motivational support following a hiatus from a programme of PA because whilst falling off the proverbial bandwagon is inevitable, withdrawal from PA might be greatly reduced if women were better supported to jump back on.

Chapter 9: Discussion and conclusions

9.1 Overview

In this chapter, the thesis aims and how they were achieved are recapped. Findings related to women's PA determinants are discussed, followed by findings regarding the pilot intervention. The overall approach to intervention development is evaluated and the strengths and limitations of this PhD research are considered. The original contributions to knowledge are highlighted and the remaining knowledge gaps are outlined alongside future directions for research. The real-world implications of the findings are explained, followed by the Author's personal reflections. The thesis closes with a summary and concluding statements.

9.2. Re-cap of thesis aims

This PhD programme of research aimed to achieve the following:

1. Evaluate the existing academic literature to establish what is currently known about determinants of PA for women
2. Understand determinants of PA for women locally, within the East Midlands
3. Identify strategies that enable women from the East Midlands to overcome barriers, capitalise on facilitators and manage divergent determinants of PA in ways that promote the behaviour
4. Co-design an efficacious evidence-based pilot PA intervention for and with women from the East Midlands, using appropriate theoretical frameworks and models of behaviour change
5. Evaluate the intervention considering its efficacy, its feasibility to be implemented in a local community context and its acceptability to the women who signed up to participate
6. Identify reasons for withdrawal/non-participation and remedies to alleviate these phenomena.

9.3. How thesis aims were achieved

This PhD thesis has documented the co-design of a pilot PA intervention for women from the East Midlands that was co-designed in line with the BCW approach (Michie et al., 2014). Using the COM-B model (Michie et al., 2011) and the TDF (Atkins et al.,

2017), comprehensive analysis of the academic literature exploring women's barriers and facilitators to PA was undertaken within two qualitative evidence syntheses. To understand women's barriers and facilitators to PA at the regional level, women from the East Midlands participated in focus groups and discussed their PA determinants. Findings were again mapped onto the COM-B model and the TDF, to allow this understanding to act as the first step in the BCW approach to health-related intervention design. Women from the East Midlands next took part in two co-design workshops. In Co-design Workshop 1, women prioritised the most impactful determinants of PA and proposed strategies to manage those determinants, to enable PA. Following APEASE analysis (see Michie et al., 2014), appropriate intervention options were identified and in Co-design Workshop 2, uncertain elements were clarified. The resulting intervention was piloted for 4-weeks and quantitatively evaluated in terms of its outcomes, efficacy and treatment fidelity, using a combination of descriptive and tentatively interpreted inferential statistics. Exit interviews enabled an understanding of women's experiences of participation, the acceptability of the pilot intervention to target end-users, reasons for attrition and proposed remedies that might prevent this in the future. The pilot intervention was considered to have potential for redevelopment into an efficacious full-scale intervention. Upon reflection and based on learning, there are however specific considerations that would need to be addressed (See Section 9.5.3.).

9.4. Findings: Women's physical activity

9.4.1. Demographic groups of women at risk of physical inactivity

For certain subgroups of women, the determinants of PA are especially pervasive and/or complex, increasing the risk of physical inactivity and the associated health issues (See Sections 1.2.3. and 1.2.4.). In Chapter 3, the qualitative evidence synthesis exploring women's determinants of PA between 2015 and 2020 identified women of low SES as being at high risk for physical inactivity. Women of lower SES seemed more likely to experience barriers to PA than more affluent women, particularly in respect of leisure-time PA and exercise (See Section 3.5.1.). Where PA was facilitated for this group it appeared most likely to pertain to occupational and domestic PA, which do not elicit equivalent health benefits to exercise or

recreational PA (e.g. Peeters et al., 2014; Kazemi et al., 2024) and which may in fact be harmful (Wang et al., 2011; Choi et al., 2022; Hollander & Bell, 2010; Jurakić et al., 2010). In Chapter 4, women of low SES were again identified to be at risk of inactivity and there appeared to be an enhanced focus on environmental safety compared to the five previous years (See Section 4.6.2.). Whether this was driven by participants or researchers is unclear. Perceived safety is frequently more pertinent for women (Bozogáňová, 2016) and lower for women who live in more deprived areas (Mouratidis, 2020). Women of low SES are therefore more likely to perceive safety as a barrier to PA. Chapter 4 also identified migrant women to be at risk of inactivity, partly because of an increased likelihood of being of low SES based on higher levels of unemployment and insecure employment (Uhlendorff & Zimmermann, 2014), but also due to the limited availability of culturally appropriate PA provision available within Westen society, particularly for Muslim women (See Sections 3.5.3. and 4.6.3). The challenges associated with engaging in PA as a migrant woman were more apparent in the 2020-2025 synthesis (Chapter 4), possibly due to increased migration over this time and/or because more focus is being placed on understanding the needs of this group. However, migration also facilitated some women's PA due to relocation to countries with infrastructure (i.e. cycle paths and green/blue spaces) and social norms that were supportive of PA (See Section 4.6.3.). For some women, adhering to active social norms in a new country of residence elicited social disapproval from the cultural in-group, who sometimes perceived active women negatively for defying typical cultural and gendered roles. One of the most pervasive gender roles that limits women's available time for PA relates to the female burden of care (e.g. Elmahdi et al., 2011; Cascella Carbó & García-Orellán, 2020), whereby mothers experience disproportionate barriers to PA, practically in terms of time and logistics, and emotionally in the form of maternal guilt (See Section 4.6.4.). Obese women and women who were active in male dominated spaces also appeared to experience additional barriers to PA because of anticipated and experienced stigma during PA (See Sections 4.5.3. & 4.5.5.). Intersectionality compounds disadvantage (Loets, 2024), so women who fall into more than one of these at-risk demographic groups are likely to experience the greatest inequalities in respect of their capability, opportunity and motivation to be active.

9.4.2. The gender-centric nature of women's barriers to PA

Women's physical inactivity is an inherently gendered problem. Females are consistently less physically active than men across the globe and the lifespan (See Section 1.3.1.) and more likely to report experiencing barriers to PA (Reichert et al., 2007; Rosselli et al., 2020). Throughout this thesis, women rarely described barriers to PA in respect of their capability but seemed to consistently experience barriers to PA in respect of their opportunity, particularly social opportunity (See Figures 10, 12, 13 & 27), suggesting women's PA is most challenged by their socially constructed gender. Gender is culturally governed (e.g. Best & Williams, 2001), so the impact of women's gendered barriers to PA will differ cross-nationally. However, based on the findings of this thesis, Mothers, Muslim women, women from gender-conservative cultures and migrant women appear to face the greatest barriers to PA in this regard.

Women's physical opportunity to be active is routinely limited by competing priorities and limited time/energy (See Section 1.3.2.), issues that frequently pertain to the 'second shifts' (Hochschild, 1989/2003; Craig, 2007) modern women are undertaking by fulfilling paid work alongside domestic responsibilities and the female burden of care (e.g. Elmahdi et al., 2011; Cascella Carbó & García-Orellán, 2020). For many women, prioritising their own health by dedicating time to PA was considered selfish and difficult to justify. This sense of responsibility to others was further perpetuated by the female propensity for guilt in the context of motherhood (Borelli et al., 2017) and when deviating from gender stereotypes (Bybee, 1998). This, alongside the female inclination for altruism (Simmons & Emmanuele, 2007; Rand et al., 2016) leaves women more susceptible to oppression (Blum et al., 1973) via formal and/or informal patriarchal power structures at the micro (e.g. familial) and macro (wider societal) levels. For active women who lived in gender-conservative cultures, achieving PA required ongoing acts of defiance against social disapproval for perceived violations of gender roles, often in terms of modesty and feminine delicateness (See Section 4.5.3., 4.5.5. and 4.6.4.). Women are more likely to perceive themselves as unsafe (Bozogáňová, 2016), but described fear of verbal abuse and mistreatment from motorists whilst out cycling, rather than fear of

collision or injury (Graystone et al., 2022), highlighting the impact of social influences on women's PA.

9.4.3. The social nature of women's facilitators to PA

The benefits of social interaction are particularly prominent for women, who both provide and rely on, more social support than men (Bedrov & Gable, 2023). Women's PA was regularly facilitated by health/fitness professionals (Section 3.5.5.) and other women who wanted to support one another to be active (Sections 3.5.3. & 3.5.5.). However, being active was unrealistic for mothers without childcare (See Sections 3.5.5., 4.5.3., 5.4.2. & 8.5.1.), which although helpful, did not alleviate the maternal guilt associated with taking time out for oneself to be active.

Women who participated in the co-design process, appeared most likely to participate in the programme. This may be due to a better tailored programme but considering women's propensity for altruism (Simmons & Emmanuele, 2007; Rand et al., 2016), engagement in the research process might also have enhanced the social relationship between participants and researcher, thereby facilitating engagement by creating/enhancing a sense of shared sisterhood and enhancing participants' sense of obligation. During the pilot intervention, women highlighted the facilitating effect of the specific instructor and of the social world the intervention created, where women felt a sense of shared sisterhood within a 'safe space' and 'judgement free zone'. Despite pervasive documentation of the facilitating effect of social influences on women's PA (e.g. Peng et al., 2023; Shah et al., 2020; van Uffelen et al., 2017), this prevalence may be somewhat explained by the tendency for PA intervention research to involve group exercise. In this pilot intervention for women from the East Midlands, group exercise classes were delivered, but participants could join online from home in real-time or in their own time. Although the in-person (group) classes were more popular, at exit interview online attendees still described a sense of shared sisterhood with the instructor and other participants (See Sections 8.4.3. & 8.5.2.). Evidence shows that shared sense of belonging to an online community that encourages personal expression in the face of oppression may enhance women's social bonds (Miño-Puigcercós et al., 2019). The right social world, in which women feel supported to be active, can

therefore be successfully created online, even in the absence of face-to-face interaction.

9.4.4. Women's capability to be active

Healthy women who are not prenatal, pregnant or postnatal appear largely capable of PA, yet rarely discuss determinants that align with this highly relevant COM-B component. Generally, women discussed psychological capability-related facilitators and physical capability-related barriers to PA, but not the inverse. Women are typically averse to immodesty (Mancuso et al., 2019), so their failure to discuss barriers in respect of psychological capability likely indicates that these absent psychological skills are 'unknown unknowns' (e.g. Rumsfeld, 2011; Hampton et al., 2012), rather than indicating an unwillingness to discuss psychological skills that women consciously know themselves not to possess. There was however only one instance across all the datasets analysed throughout this PhD research when a woman who was without illness, injury or disability acknowledged the facilitating effect of being able bodied for PA ('Eden' – See Section 8.4.1.). Reductions in physical capability therefore appear to enhance women's awareness, so exploration of the differential impact of each type of capability on beliefs about capabilities might provide an area for future research. Further, the COM-B component of capability would have increased relevance for people already experiencing additional barriers in this regard. Psychological capability would have increased salience for women with intellectual disabilities and/or neurodivergence, whilst physical capability would have increased salience for women living with physical illness, injury or disability. Capability as a COM-B component therefore has pertinence for promoting equality for these cohorts.

9.4.5. Women's motivation to be active

There were countless examples across the literature and throughout this PhD research of women being motivated to initiate PA, although this was frequently insufficient to support progression to maintenance, as outlined by the TTM (Prochaska & Velicer, 1997; See Section 2.2.2.). Many women were active based on a desire to change or manage their physique in line with Western beauty ideals

around slimness and this theme was most prominent in the 2015-2020 evidence synthesis (Chapter 3). Following migration to the Western world, migrant women reported social pressure to adhere to Western beauty standards, despite social disapproval from cultural in-groups who expressed a preference for women with larger bodies (see Section 3.5.3.). Women held numerous positive beliefs about the consequences of PA, which at times were somewhat overstated (See Section 3.4.2). These exaggerated expectations may have contributed to women feeling demotivated by what they perceived to be slow, little or no progress from PA participation (See Table 5), potentially indirectly contributing to women's difficulty maintaining PA long-term. Aligned with women's propensity for altruism (Simmons & Emmanuele, 2007; Rand et al., 2016) and the female burden of care (Hochschild, 1989/2003; Craig, 2007; See section 9.4.2.), some women's PA was motivated either by a sense of obligation to undertake PA in support of others (this was highly pertinent within the pilot intervention, when women described being altruistically motivated to be committed to the programme, to support the instructor in her role as a PhD student and researcher) and/or based on a desire to live a long and healthy life to enable fulfilment of caregiving roles. However, women's motivation to be active was frequently limited by negative emotions including nerves, fear, anxiety, apprehension and most consistently, guilt - the gendered nature of which has been discussed above (Section 9.4.2.). Since 2020 (See Chapter 4), the use of PA as a tool for mental health management, self-care and achieving me-time has increased in salience, although not without guilt. This may speak to the observed global decline in mental health since the Covid-19 pandemic (Leung et al., 2022; Robinson et al., 2020; Wu et al., 2021), but whether this increased salience is driven by the increased pertinence of this determinant for participants or researchers remains unclear.

9.4.6. Women's opportunity to be active

Despite being capable of and motivated to undertake PA, women face diverse and pervasive barriers in respect of their opportunity to be active. Unsurprisingly, women of low SES, who by definition have less resources, experience the greatest limitations in respect of physical opportunity. This is exacerbated by residing in

geographical locations that are generally less supportive of PA in terms of density/proximity of PA spaces/facilities (Hillsdon et al., 2007), accessibility of PA opportunities (Estabrooks et al., 2003) and neighbourhood safety (Mouratidis, 2020). Despite the facilitating impact of social influences on PA, women's social opportunity to be active was frequently limited by lack of social support in the form of childcare (See Section 9.4.3.). Male presence during PA was particularly problematic for Korean women, obese women, women who were active in male-dominated spaces (See section 4.5.3.) and women who attempted to be active in male-dominated spaces (Section 5.4.2.). Muslim women described having limited opportunity to be active in Western society, based on the lack of culturally appropriate provision that fulfilled their religious requirements in terms of single sex spaces and modest dress codes. Perhaps the most pervasive, consistent and wide-reaching barrier to women's opportunity to be active however, related to their roles and responsibilities that restricted available time to be active. This may be more prominent for women compared to men, based on the documented dual roles and second shifts that women are increasingly undertaking as they simultaneously adhere to and defy, the gendered expectations and stereotypes that are placed upon them (See Section 9.4.2.).

9.5. Findings: PA interventions for women

9.5.1. Intervention efficacy, outcomes and experiences

The 4-week pilot intervention effectively promoted PA for women from the East Midlands, albeit with differing levels of success for women with differing baseline PA levels. The intervention was less successful at eliciting behaviour change for the most inactive women, who were the least likely to engage after completing pre-participation questionnaires and who appeared most likely to return to baseline activity levels within 4-weeks of the programme ending. This may relate to the work of Janis and Mann (1977), who identified anticipated and actual gains and losses to differ according to stage of change within the TTM. Research has found PA intervention adherence to be lower for people who are less fit, more obese and/or who have lower PA-related self-efficacy (King et al., 2006). These underlying physical inactivity-associated factors may therefore compound for inactive women and reduce the likelihood of sustaining PA. Fitness, obesity and PA-related self-

efficacy are interdependent with PA (See Sections 1.2.2. and 1.2.3.), so less active people are less fit, more overweight and less confident in their ability to be active. These factors reduce the likelihood of being active, so the vicious cycle of inactivity, its health outcomes and the barrier effect those outcomes have in respect of PA perpetuates. The intervention appeared most efficacious for women who were 'fairly active' at baseline. These women appeared more likely to become 'active' and less likely to return to baseline activity levels at 4-weeks follow-up. Increases in PA for 'active' women could not be captured however, due to ceiling effects of the measure. This is considered a limitation, despite active women least requiring PA intervention.

The programme seemed to successfully improve all the measured facets of women's physical fitness, although the sample that contributed to fitness testing scores at both time points was small (N=9) and people who considered themselves to have achieved highly throughout the programme were likely overrepresented, because people are less likely to share failure than success (Eskreis-Winkler & Fishbach, 2020). De Winter (2013) states that t-tests can be meaningful with sample sizes as small as 2-5 if effect sizes are large however, so indications that this pilot could be redeveloped into an effective full-scale intervention that promotes physical fitness should not be dismissed. Despite what appeared to be a slight emerging trend towards improved wellbeing for participants, this did not approach the point of significance within the 4-week timeframe. Women described enjoying the programme and considered the intervention acceptable, in line with the components of the TFA (Sekhon, 2017). Participants described the burden of participation as relatively high, but perceived the benefits to offset this, supporting the notion of decisional balance (Janis & Mann, 1977) and the proposed relabelling of 'opportunity costs' to become 'opportunity costs and gains' (Paynter et al., 2022). Intervention participation appeared to be impacted by individual factors (e.g. physical health), interpersonal factors (e.g. the sense of shared sisterhood the intervention created), intervention factors (e.g. achievability and adaptability of the programme) and practical strategies that participants could implement to promote PA participation (e.g. tweaking the programme to suit personal needs and preferences).

9.5.2. Understanding and preventing withdrawal and attrition from PA

Engagement in the earlier research/co-design process appeared to facilitate women's programme engagement. Women with low baseline PA appeared least likely to engage past the point of sign-up. A systematic review of behaviour theories found behaviour change maintenance to be explained by enjoyment of the behaviour itself, self-regulatory efforts, habit development, ample resources and supportive social/environmental influences (Kwasnicka et al., 2016).

Women's non-participation and withdrawal from the pilot intervention was explained by one or a combination of: practical issues, injuries, negative affect (primarily guilt) and pessimistic beliefs about the consequences of returning to the programme following a hiatus (See Section 8.5.6.). Where women's capability and/or opportunity to participate was temporarily limited by injury or car troubles for example, this consistently sparked a longstanding reduction in motivation that women felt unable to overcome. The relatively short timeframe of the pilot intervention may have exacerbated this. Despite work using the COM-B model to explore exercise adherence (e.g. Yang et al., 2024), this appears to be the first time that this understanding of PA cessation has been contextualised within the COM-B model and explained in terms of this relationship between its component parts.

Strategies that might remedy intervention attrition could be categorised into five themes (See Section 8.5.7.): 1) System depersonalisation (through the use of technology), 2) Emotion-focussed strategies (to reduce guilt), 3) Expectation management and preparation (including discussion of dropout prior to sign-up), 4) Social dynamic enhancement and alteration (e.g. by creating a social media community) and 5) Removing the PhD/research element of the programme (to reduce burden, but which has less relevance as a final intervention would not include these elements). Intervention adherence promotion strategies primarily centred upon the removal of guilt as a barrier to PA, with self-compassion coaching being one promising proposed strategy, considering findings around the contribution of guilt and self-compassion to mothers' health-related behaviour

(Miller & Strachan, 2020). Indeed, addressing women's guilt to promote PA is complex. Whilst social support (i.e. childcare) enabled some mothers the time to be active (see Section 9.4.3.), maternal guilt remained problematic. Providing PA opportunities that include offspring or dependents might ameliorate maternal guilt and promote PA, but could deny women the chance to use PA as 'me-time'.

One overarching issue that contributes to PA cessation centres upon the unpredictable and unavoidable nature of adverse personal circumstances, alongside the debilitating effect these so frequently have on women's PA (See Section 8.5.1.). Adverse personal circumstances that women who signed up to the intervention experienced included car troubles, financial difficulties, bereavement, illness of a loved one, injury and contact with the criminal justice system. Despite the observed benefits of PA for psychological wellbeing (See Section 1.2.2.) and management of grief symptoms (Williams et al., 2021), adverse personal circumstances prevented intervention participation or prompted withdrawal. Participants who experienced adverse personal circumstances all stated that no PA intervention could have sufficiently addressed these issues, to promote PA during this time. All described guilt based on their non-participation or withdrawal from the programme. Guilt might therefore be considered an unintended negative side effect according to APEASE analysis (See Michie et al., 2014) or an adverse event from intervention engagement, that was not detected during screening.

9.5.3. Suggestions for intervention redevelopment

For the intervention to be delivered at full-scale, certain features would require attention during redevelopment. The intervention might have been more efficacious, with better participant retention were the baseline PA levels of participants considered more throughout recruitment, co-design, APEASE analysis and delivery. Practically, this might have involved recruiting only inactive participants into co-design workshops to enable best tailored solutions for the most in-need group, or weighting workshop findings (in respect of actual participants or personas), to prioritise the views, preferences and needs of the most sedentary women. Further, the burden of intervention provision upon the Lead Researcher

was extremely high and would be unrealistic for a longer duration. Technology, such as an App, to support intervention delivery and automate some aspects of communication would therefore be advantageous. The online anytime library would benefit from higher quality recordings, which could be prepared in advance of the intervention, to further reduce the burden on intervention providers. The inclusion of self-compassion coaching might ethically address the characteristically female experience of guilt, which variably impacts PA, usually to women's detriment. Further, the negative emotional impact of withdrawal from a programme of PA on participants' mental health and psychological wellbeing should also be addressed. All proposed redevelopment options and remedies for intervention should undergo APEASE analysis prior to inclusion in any final intervention design.

9.5.4. The ethics of promoting women's PA

The ethics of women's PA promotion is complex and potentially problematic. There are implications for participants who withdraw from PA, in terms of guilt (see Sections 9.5.2. & 9.5.3.). However, women who withdraw from research are inherently unlikely to have continued engagement with researchers so are less likely to engage with debrief, making it especially challenging for researchers to identify unintended negative side-effects for withdrawn participants. Despite guilt being a pervasive determinant of women's PA and coercion being a legitimate intervention function according to the BCW, leveraging women's guilt to promote PA is ethically questionable and might contribute to the stigmatisation of inactive women. Stigma independently exacerbates poor health by worsening, undermining or impeding social relationships, resource availability, stress, and psychological and behavioural responses (Hatzenbuehler et al., 2013). This relates to the impact of body image on women's PA (See Section 3.5.4.) and mental health cross-nationally (Rodgers et al., 2023; Gillien & Markey, 2023), as leveraging body dissatisfaction is arguably unethical and potentially harmful. Further, whilst participants considered taking accountability for programme engagement and health to be a key intervention adherence strategy, placing blame for undesirable health behaviour on individuals can be unethical (Brown et al., 2019). Brown and colleagues propose emphasising 'acting in one's best interests' to remedy this, but this might be

considered an inequitable solution that places too much responsibility on the individual, thereby minimising the impact of the wider determinants of health (e.g. education and unemployment; Dahlgren & Whitehead, 1991).

Inclusivity is clearly important for the promotion of women's PA, yet there is the potential for a problematic paradox of inclusivity whereby attempts at inclusivity are at odds with the exclusive requirements of certain communities of relevance (e.g. Moulin, 2023). Many women described single-sex spaces as a necessary prerequisite for PA and many Muslim women accessed Muslim-targeted programs of PA that accommodated this need. However, there might be ramifications of segregating the PA of certain subgroups of women, for integration and social norm development. Practically, in line with the Supreme Court Ruling around the definition of a woman (See Section 1.1.4), inclusivity of trans women into female PA spaces is causing issues based on their status as a woman pertaining to societally constructed gender, rather than biological sex. One trans woman participated in the pilot intervention, choosing to engage online and communicate only via typed text (not microphone). She privately explained to the lead researcher that this was to avoid 'detection' and the risk of having her transgender status exposed, as she anticipated this might elicit discomfort for other group members and spark stigma, disapproval or abuse. The negative emotional impact upon trans women of trying to enter female spaces for PA would therefore benefit from further attention, particularly following the 2025 Supreme Court Ruling, which allows the legal exclusion of trans women from women's spaces.

Transgender issues are one of the most polarising topics within feminism (Morgenroth et al., 2024). A 'gender critical' discourse denounces the notion that gender is societally and culturally constructed and governed (Bassi & LaFleur, 2022), thereby categorising trans women as biological men. Transphobia in the UK has been labelled 'a public health crisis' (Connolly et al., 2025) based on the 'moral panic' surrounding gender non-conforming people, which is incited by high level political and government actors. This 'trans panic' is exacerbated by misinformation and contributes to increasing interpersonal violence, social exclusion, structural and interpersonal discrimination, physical health problems

(including cardiovascular disease and HIV) and risk behaviours for trans and gender non-conforming people. Based on the heavily gender-centric nature of women's barriers to PA (See Section 9.4.2.), the limited focus on physical capability in determining women's PA (See Section 9.4.4.) and the inequalities faced by trans women, it is hereby proposed that trans women require both targeted interventions and to be included in women's PA interventions, which are likely to be effective for this group based on addressing women's gendered, rather than sexed, experiences of barriers to PA.

9.6. Evaluation

9.6.1. Evaluation of the overall approach to PA intervention development

The COM-B model, the BCW and the TDF have all been found useful for the co-design and development of an efficacious 4-week pilot PA intervention for women from the East Midlands, which could be redeveloped into a full-scale intervention. There are however elements of the overall approach that would benefit from refinement.

Co-design engagement appears to have somewhat increased the likelihood of intervention engagement (See Section 7.5.). However, practically the process was somewhat cumbersome and time-consuming. The initial qualitative evidence synthesis (Chapter 3) took two years to complete, before focus groups and then co-design workshops could commence. The changing nature of the political, economic and environmental context is described in Sections 4.3. and 4.6.3., so taking such a detailed approach to understanding the target behaviour and developing an applicable intervention is somewhat impractical for health-related behaviour change interventions aiming to address issues of social injustice, which frequently require time-sensitive responses that consider the immediate context (e.g. Chisholm-Burns et al., 2021). However, Artificial Intelligence (AI) and the development of an AI in public health toolkit (Wright et al., 2024) offer promise in terms of speeding up and streamlining the research process in the future (e.g. during screening of research articles for syntheses and reviews).

The TDF was useful for the categorisation of barriers and facilitators to PA, particularly where categories might be easily confused or conflated. For example, the TDF category of 'social role and identity' under reflective motivation within the COM-B model was useful, as these determinants might easily be incorrectly categorised under social opportunity, which pertains to 'social influences' under the TDF. Nonetheless, the TDF was considered incomplete. The proposed addition of 'biomechanical capability', to sit alongside 'physical skills' under the COM-B domain of 'physical capability' was considered important for accurate categorisation of PA determinants because someone could have exceptional physical skill, but limited physical capability due to injury or illness for example. An Olympic hurdler with a broken leg would have high physical capability in respect of physical skills, but would temporarily have low physical capability in respect of biomechanical capability. Biomechanical capability would be most relevant for understanding PA determinants for people with illness, injury and/or disability, who have limited physical capability, so are already experiencing health-related inequality. The current lack of consideration of biomechanical capability within the TDF can therefore be considered an ableist omission.

Women rarely consider their own physical capability to be active (See Section 9.4.4.), despite this being a highly relevant prerequisite for PA, albeit partially neglected by the TDF. Women's failure to discuss physical capability may however indicate that the methods by which PA behaviour change were understood within this thesis do not appropriately target capability. All the women in the pilot intervention completed the PAR-Q (See Section 7.3.2.), so could be considered physically capable of undertaking PA. However, this was limited by self-report and overall, a better picture was gained about women's beliefs about their capabilities, rather than their actual capabilities. Qualitative methods are useful for understanding attitudes, experiences and perceptions, but evidence shows that people consistently misevaluate their own abilities in various ways, depending upon differences in self-esteem and perceived task difficulty (Kim et al., 2016). This adds credence to arguments that scientific fields such as anthropology, in which physical and biological characteristics are considered, are frequently neglected within behavioural science, whilst psychological perspectives are

disproportionately implemented and represented (Davis et al., 2015). This could however relate to the relative ease with which interventions might address psychological determinants, compared to the complexity of changing society, culture and/or economics.

9.6.2 Strengths and limitations of this PhD research and thesis

The PhD thesis format has enabled the reporting of the co-design and development of a pilot intervention for women from the East Midlands with a level of detail that is rarely achievable within academic publications because of restrictions placed on article length. The intervention development process has involved systematic, empirically grounded and theoretically informed decision-making, which has centralised the views of target end-users.

The field of PA research generally and this PhD thesis specifically are restricted by the widespread use of self-report measures of PA and the associated limitations (e.g. Liu et al., 2016; Sallis & Saelens, 2000), alongside issues with how people differentially define or understand PA as exercise versus movement. Most variables measured within the thesis relied on self-report and some were not measured using valid or reliable questionnaires (adverse events and treatment fidelity). The Active Lives Survey, although valid and reliable, lacks the sensitivity to track increases in PA for people whose responses categorise them as 'active' at baseline so is limited by ceiling effects. The improved outcomes in respect of physical fitness and participants' own narratives indicate that the intervention was also successful at increasing PA for women who were active at baseline, but this was not captured due to the lack of control group and because of the ceiling effects of the Active Lives Survey. The Active Live Survey also ignores occupational or domestic/household PA and although these types of PA may fail to elicit the health benefits associated with recreational PA/exercise (See Section 9.4.1.), women of low SES are more likely to undertake physically demanding, 'typically female' jobs (Bäckman & Edling, 2000 as cited in Kjellsson, 2018; Charles, 2011). The Active Lives Survey is therefore more likely to underestimate PA levels for women of low SES compared to others. This could have implications for intervention design, outcomes and ethicality, as interventions might inadvertently aim to promote excessive PA and result in adverse

events/negative unintended side-effects, in the form of exhaustion or injury, also thereby contributing to dropout.

As mentioned in Section 9.5.3., the burden of intervention delivery was high, which may make running the intervention at full-scale unrealistic from a provider perspective. The final intervention design might have benefitted from the involvement of a wider range of key stakeholders during co-design. For example, advisors from Local Authority Public Health might have foreseen the challenges associated with the burden of delivery, based on their knowledge and experience of delivering health-related interventions within the region, increasing the likelihood of a final intervention with maximum feasibility for delivery in a local community context.

Across the literature exploring women's PA, there is rarely clarification on whether women whose gender deviates from the binary or that which they were assigned at birth are included for analysis. Gaining an in-depth understanding of the differential impact of sex and gender on women's PA is therefore challenging, so researchers should clarify whether the women participating in studies are exclusively cis gender.

It could be considered a limitation of the pilot intervention design that the practicability of implementing specific intervention options was somewhat dependent upon the skillset and expertise of the Lead Researcher/Instructor, particularly in terms of PA type. Whilst equitability was considered from a participant perspective during APEASE assessment of intervention components, perhaps more consideration of this in the context of intervention delivery might promote development of a final intervention design that could be delivered by providers with a less specific skillset. It does not however seem entirely obscure to propose a PA intervention be delivered by qualified fitness professionals, with training on SMARTER (Doran, 1981; MacLeod, 2012) goal-setting.

Women, including those who withdrew, described overwhelmingly positive experiences of pilot intervention participation. However, around 47% of

participants who signed up and around 37% of those who attended session 1 were not engaged by week 4, meaning attrition rates aligned with those seen for PA and exercise generally (25-50%; Dishman, 1981; Biddle & Mutrie,. 2007; Cramer et al., 2016). It may be the relationship that capability and opportunity have with motivation that explains this relapse from PA (See Section 9.5.2.). However, it is also likely, particularly considering women's tendency for altruism (See Section 9.4.2. and 9.4.5.) and their altruistic motivations for intervention participation (See Table 26 & Section 8.4.3.), that the positive elements of the programme were overstated based on socially desirable responding, to which women may be more susceptible (Herbert et al,. 1997). The intervention involved prolonged engagement between participants and researcher, which might be considered a double-edged sword. Prolonged engagement is generally considered to enhance the credibility of qualitative research (Guba, 1981), but also might have enhanced socially desirable responding by enhancing the relationship between participants and researcher. This might have been exacerbated further still, because group cohesion is found to be enhanced within smaller groups, in an exercise context (Carron & Spink, 1995). This might also have implications for intervention effectiveness if the intervention were to include larger group sizes during full-scale delivery, as group size may differ.

Muslim women, particularly those who have migrated, have been highlighted throughout this thesis as a group experiencing complex determinants of PA. However, these views may have been somewhat overrepresented, as one author who explored Muslim women's PA, had numerous publications included for synthesis at both time points, which appeared to re-use the same datasets (See Sections 3.5.6. and 4.6.6.). The specificity of Muslim women's requirements for PA promotion also renders them a pertinent and interesting group to research, which may contribute to their representation. Nonetheless, there were no Muslim participants in the intervention, which might be indicative of the barriers to PA for this group within Western society. Multiple intervention attendees were of mixed Black and White heritage, yet the determinants of PA for Black and mixed heritage women appear to be largely neglected across the literature, so therefore have limited representation within Chapters 3 and 4. Black women experience specific barriers to PA participation, such as practical issues associated with appropriate

hair maintenance whilst undertaking PA (Joseph et al.,. 2018). More research should therefore aim to elucidate the determinants of PA for Black and Mixed heritage women, in the interests of equity.

9.7. Knowledge contributions and remaining gaps

9.7.1. Original contributions to knowledge

Original contributions to knowledge that have been made throughout this thesis include:

1. The findings derived from qualitative evidence syntheses exploring healthy women's barriers and facilitators to PA (See Chapters 3 & 4), as this group is frequently neglected within the literature. The QES revealed that Women in Western society are most limited in terms of their opportunity to be active. This is a gendered (rather than a sexed) problem, compounded by socioeconomic status, cultural heritage, migration status, body image and motherhood status.

2. 'Biomechanical capability' (e.g. muscular strength) has been proposed as an addition to the TDF under the 'physical capability' domain of the COM-B model, to sit beside physical skills (e.g. balance). This addition better enables the accurate and holistic categorisation of barriers and facilitators to PA, with pertinence for understanding determinants of PA for people experiencing ill health, injury and/or disability, to promote health equity (Section 9.4.4.).

3. An identified knowledge gap has been filled through the detailed reporting of the co-design process (See Chapter 6). Small steps have been made towards supporting the efficacy of co-design in promoting intervention engagement because women who engaged in the co-design process appeared more likely to engage with the pilot intervention. Future research comparing PA intervention engagement between participants who did and did not contribute to co-design would further consolidate this knowledge.

4. Disengagement from PA occurs because temporary lapses in capability and/or opportunity elicit permanent reductions in motivation. Whilst evidence uses the COM-B model to explain intervention adherence and attrition (e.g. Yang et al., 2024), this appears to be the first formal recognition within the literature of how the components of the COM-B model interact with one another to elicit cessation from PA.

9.7.2. Remaining knowledge gaps and future direction for research

There are some knowledge gaps that were beyond the scope of this research, but which future investigation could tackle.

The importance of PA domain type in understanding women's PA and the associated health implications was illuminated within Chapter 3 (See Section 3.5.6.) and the relevance of this for health promotion for women of low SES was highlighted. However, further clarification is needed regarding the barriers and facilitators to different PA types for women and future work should explore women's determinants of exercise and recreational/leisure-time PA separately to occupational, domestic/household and caregiving PA. This would enable researchers to work towards health equity. Further, considering the importance of SES for determining women's PA (See Section 3.5.1. and 4.6.2.), comparing determinants of PA across the different domains according to women's SES may be useful.

Females appear to frequently lose access to, or withdraw from, shared spaces relating to PA during the transition to womanhood (e.g. Section 4.5.5.). Whilst it was beyond the scope of this thesis to explore this further, this intermediary time (when gender roles begin to compound and enhance women's gendered barriers to PA) requires particular attention. Considering findings about the impact of the menstrual cycle on PA (See Section 4.5.5.), the physical changes associated with puberty might further complexify determinants for young women, at a time of extreme vulnerability to PA relapse. In-depth exploration of the mechanisms

underpinning this could support more girls to become active healthy women with embedded healthy habits that improve public health and reduce the gender PA gap.

There remains a need for further clarification on women's actual, not perceived, capability to be active and how this might differentially impact different PA domains. The inclusion of anthropological and biomechanical approaches to understanding physical ability would enable a more comprehensive and unbiased view of women's PA determinants. This would address some identified limitations of the behavioural science field generally (See Section 1.4.3.), in which psychological perspectives take precedence. Clarification on the extent to which the menstrual cycle might, or might not, impact physical capability would be of value within the literature. Here, future stages of intervention development would benefit from objective measures of PA and physical fitness. Valid, reliable and preferably objective measures of psychological capability would also provide further insight.

Attempts at social inclusion sometimes create social fragmentation because of the inclusivity paradox (See Section 9.5.4.) but best ways to navigate this remain unclear. Practical strategies that would support PA providers to appropriately manage the paradox of inclusion would enable PA spaces to support diverse groups of women to be active. Future work should seek to better understand the complexities of the competing needs of different subgroups of women, to identify commonalities and to develop acceptable strategies to overcome these issues where possible, to limit social exclusion and prevent the PA of certain demographic subgroups of women from becoming clandestine.

Considering findings indicating an inverse relationship between physical capability and awareness of physical limitations (See Section 9.4.4.), further clarity around the interaction between physical capability and motivation would be useful. This may enable better understanding of disengagement from PA, considering the identified permanent motivational impact that temporary reductions in capability (and opportunity) can have. Future work should build upon these findings, to clarify these

phenomena and further examine the intricacies, to identify strategies that would promote PA maintenance and reduce PA cessation/intervention attrition.

Ultimately, PA intervention literature and its knowledge base will be inadequate until a holistic understanding of the barriers and facilitators to PA for sedentary women are understood and effectively addressed to the point of PA maintenance for this in-need group. Sedentary women were most likely to disengage immediately following sign-up and least likely to have maintained PA increases at 4-weeks follow-up. Thus, there remains a desperate need for PA interventions that effectively target PA for sedentary women

9.8. Real world implications

Women's preference for single sex spaces (e.g. Section 4.4.4.) alongside the paradox of inclusion (See Section 9.5.4.) makes inclusive PA spaces for women almost impossible to achieve, but there are potential ramifications associated with segregating the PA of certain subgroups of women. Nonetheless, PA interventions should target demographic groups of women who are most in-need, focussing upon the most sedentary within each group. Women who would benefit from attention in this regard include women of low SES, Muslim women, women from gender-conservative cultures, migrant women, mothers, obese women, women who are or who wish to be active in male dominated spaces and trans women. Black and mixed heritage women would likely be sensible additions to this list, but remain underserved within the current literature, so strong conclusions cannot be drawn here in this regard. The gendered nature of women's barriers to PA has led to the inclusion of trans women within PA research being considered applicable and appropriate (See Section 9.5.4.), although this contradicts a 'gender critical' ideology and the Supreme Court's recent clarification on the legal definition of a woman. Including trans women within PA would therefore likely receive negative pushback in some spaces, particularly as PA is semantically related to sport. Anti-trans rhetoric and action within sport is rife, as trans women's inclusion in women's sport is considered to leave cis women at a competitive biological disadvantage (Jakubowska, 2024). Women's PA is not however an exclusively competitive field in

which one woman flourishes whilst another flounders. Participants decided the pilot intervention should be non-competitive, so cis gendered participants were not competitively disadvantaged. The COM-B analysis has found male presence to challenge many women's sense of a safe space to be active (Sections 3.4.3. & 4.5.3.) and biological perspectives defend strict binary categorisations of gender/sex thereby categorising trans women as biological men. This, in combination with the stigma and social disapproval associated with being a trans woman, which is greater than the stigma associated with being a trans man (Verbeek et al., 2020; Rudin et al., 2023) mean that including trans women in women's spaces and research will have implications for practice and for (cis and trans) PA participants. The breadth, nature and ethics of this are too complex for this thesis to address.

Long-term reductions in motivation elicit permanent withdrawal from PA, yet motivational factors frequently appeared insufficient to keep women active. The ethics of leveraging some of women's most pertinent motivational determinants against them (mainly guilt and body dissatisfaction) is questionable (see Section 9.5.4.), whilst enhancing beliefs in positive consequences of PA may be counterproductive because women's overstated beliefs in the consequences of PA appeared to engender a sense of slow/little/no progress, thereby reducing motivation and contributing to PA cessation (See Section 9.4.5.). Emphasising the psychological benefits of PA might be a more ethical means of increasing the likelihood of adherence during times of adversity, but the potential emotional ramifications (e.g. guilt) for women who are unsuccessful at engaging in PA during an already emotionally vulnerable time must be considered. Further, where physical capability limitations exist (e.g. physical disability), effective solutions often involve enhancing the physical opportunity (e.g. via provision of a wheelchair and access ramps). Equality exists when policies compensate those experiencing disadvantage, so that outcomes depend only on factors for which people can be considered personally responsible (Roemer & Trannoy, 2015, p. 217). Creating the physical and social opportunity for diverse women to be active is therefore the responsibility of institutions, organisations and professionals. However, despite women agreeing during exit interviews that the PA intervention provided the

physical opportunity to be active, many still failed to initiate or maintain PA. Motivation therefore appeared to be the most impactful, yet ethically high risk and difficult to enhance, COM-B component in determining women's PA.

9.8.1. Recommendations for practice

When aiming to develop solutions for diverse women, personas can be helpful (See Sections 6.4.1. and 6.4.2.2.), but evidence suggests their use may perpetuate stereotypes, if not cautiously implemented (Turner & Turner, 2011). An alternative to personas is therefore proposed, which might somewhat ameliorate this ethical implication. Rather than outlining personas, another approach might be to provide participants with a list of characteristics, then ask them to think of a person they know who matches that description and answer questions on their behalf, rather than based on a stereotypical mental representation of a non-existent person. Further, weighting responses, to assign greater value to those that represent the most inactive participants (and/or personas) might ameliorate issues whereby inactive participants are less well targeted by the intervention, either due to being underrepresented within the sample or due to being overpowered during group discussions by more active participants.

To ensure an intervention has maximum feasibility for delivery in local community settings, it is recommended to include at least one key stakeholder with expertise in relevant intervention delivery during intervention co-design and APEASE analysis of intervention options. Other useful key stakeholders that might have added value include but are not limited to, community figures/leaders, community and voluntary sector workers, budget holders, Local Authority colleagues, public health professionals, healthcare professionals and health economists.

To enhance the validity of findings, research should incorporate objective methods of data collection regarding physical capability and PA levels. The development of valid and reliable measures of treatment fidelity and its component parts would also be useful.

Hybrid PA interventions with flexible options for engagement provide some women with the adaptability they need to overcome barriers associated with having limited available time, caregiving responsibilities, geographical limitations and financial limitations. However, intervention attrition remains unfortunately high and so oversubscribing to interventions, particularly online interventions where physical space is not limited, is advisable to promote cost-efficiency.

9.9 Reflections

Here, I wish to personally reflect on the past six years. I will consider the interrelationship between my research and my ever-evolving positionality, the learning that I have undertaken and the things I might have done differently were I to start this research again, knowing what I know now (if only!).

Perhaps the most salient changes relate to my own positionality. I began this thesis in October 2019, a Personal Trainer with an academic background in Psychology, but finish it a Public Health Manager within Local Authority, whose best friend - a woman experiencing deep inequality - sadly lost her life because of discriminatory and oppressive governmental policies and bureaucratic procedures that amounted to a social injustice for which a governmental organisation was held legally accountable at coroner's inquest. Throughout the undertaking of this research, through my own experience of personal tragedy and because of learning within my professional role in public health, I have increasingly developed a view that societal and systemic oppression are the primary drivers of inequality and that overemphasis upon personal agency undermines the responsibility that organisations, institutions and wider societal systems have for addressing the avoidable inequalities they contribute to. Undertaking this PhD research in this context has therefore compounded my intersectional feminism and through my engagement with the literature, I have especially enjoyed developing the vocabulary that enables me to articulate the intricacies of the female experience. Were I to begin again, with the knowledge that I now have, it would seem appropriate to view women's barriers and facilitators to health through a critical feminist psychology (e.g. Lafrance et al., 2019) lens.

Since working within Public Health and developing an understanding of the pragmatism of working within Local Authority, I believe my understanding of what a feasible community-embedded intervention looks like has changed and that this would have been impactful during intervention co-design, development and evaluation. I now believe that this intervention would be best suited to a private gym setting or would require grant-funding, based on the burden of delivery and the costs associated with the proposed use of technology to automate systems and processes. Grant funding would enable this intervention to reach women of low SES (who were identified as a key demographic group requiring attention) without cost to beneficiaries.

I reflect that there are decisions I made in the earlier stages of my PhD journey that I might not have made now. Never again would I consider manually screening over 36,000 research papers to be achievable alone (See Chapter 3). This was only made possible by the lonely Covid-19 lockdowns but would likely be supported and sped up by AI now and in the future. Further, the laborious and time-consuming deductive coding of research articles that yielded no additional findings compared to the previous round of inductive coding during Chapter 3 taught me that more is not always more. I was able to reap the benefits of this learning when refining the evidence synthesis methodology for Chapter 4, five years later. My use of 'active' personas (alongside inactive and slightly active ones) during the co-design workshops aimed to support the development of an intervention that was applicable across diverse groups of women. Retrospectively however, this may have contributed to the final pilot intervention design's failure to elicit successful PA maintenance for women who were sedentary at baseline.

Finally, I reflect upon my own naivety. I began this journey believing that anyone could become active with the right programme of PA, if appropriately tailored. However, my understanding of the complexity of the world and contexts within which health behaviours exist has cultivated and I now believe that despite the institutional, organisational and societal responsibility to promote PA, adverse circumstances that limit capability or opportunity to be active unavoidably impact

women and their PA. I further believe this highlights the increased responsibility that society should take for health promotion and the desperate need for PA interventions that target diverse women and which can be accessed at various life stages, particularly following long-term cessation of PA that is elicited by (sometimes momentary) adverse personal circumstances.

9.10 Summary and closing statements

Currently, limitations of the COM-B model and the TDF make achieving a complete understanding of the physiological and biological mechanisms that drive or inhibit women's PA unattainable using this approach. However, despite the physical nature of PA, findings from the current study suggest that much of the gender PA gap is explained by the socially constructed female experience. This is characterised by guilt, altruism, societal oppression and the female burden of care. Women's barriers to PA are perpetuated within modern society, as women increasingly undertake paid work, without being relieved from their domestic, household and caregiving responsibilities, leaving little available time and therefore opportunity, for PA. Women's physical inactivity therefore represents a social injustice that PA interventions should actively seek to address, both between and within groups. Sedentary women remain in desperate need of efficacious PA interventions. Capitalising upon women's social nature and alleviating women's guilt might provide the most ethical and effective means of achieving this. However, unavoidable adverse personal circumstances can limit women's capability and/or opportunity to be active, thereby triggering long-term reductions in motivation, which this intervention could not successfully overcome. Women are often motivated to be active to change their physique and for altruistic reasons but appreciate the value of PA as a form of mental health management and an act of self-care. Engaging in PA might be considered an act of defiance against the traditional female position as altruistic caregiver. However, women's barriers to PA remain highly gendered. Guilt is a frequent barrier, whilst women are often driven to be active by body dissatisfaction and the pursuit of societally approved beauty. Unfortunately, therefore, engagement in PA may be less an act of defiance and may instead indicate a post-feminist reframing of patriarchal pressures (c.f. McRobbie,

2015), wherein the pursuit of a conventionally attractive female body - packaged as women's leisure, pleasure, or self-care - is in fact an additional gendered responsibility, required for women to attain social acceptability and cultural value.

References

Abdoli, M., Scotto Rosato, M., Desousa, A., & Cotrufo, P. (2024). Cultural Differences in Body Image: A Systematic Review. *Social Sciences*, *13*(6), 305. https://doi.org/10.3390/socsci13060305

Abraham, C., & Michie, S. (2008). A taxonomy of behavior change techniques used in interventions. *Health Psychology*, *27*(3), 379–387. https://doi.org/10.1037/0278-6133.27.3.379

Adams, J., & White, M. (2003). Are activity promotion interventions based on the transtheoretical model effective? A critical review. *British Journal of Sports Medicine*, *37*(2), 106–114. https://doi.org/10.1136/bjsm.37.2.106

Adams, R. (1999). Revised Physical Activity Readiness Questionnaire. *Canadian Family Physician Medecin De Famille Canadien*, *45*, 992, 995, 1004–1005.

Adams, S. A., Matthews, C. E., Ebbeling, C. B., Moore, C. G., Cunningham, J. E., Fulton, J., & Hebert, J. R. (2005). The effect of social desirability and social approval on self-reports of physical activity. *American Journal of Epidemiology*, *161*(4), 389–398. https://doi.org/10.1093/aje/kwi054

Ahmed Laar, R., Perveen, S., & Ashraf, M. A. (2022). Young Women as Change Agents in Sports and Physical Activities in the Punjab (Southern) Province of Pakistan. *Frontiers in Psychology*, *13*. https://doi.org/10.3389/fpsyg.2022.857189

Ahmed, S. K. (2024). The pillars of trustworthiness in qualitative research. *Journal of Medicine, Surgery, and Public Health*, *2*, 100051. https://doi.org/10.1016/j.glmedi.2024.100051

Ahn, J., Kim, N.-S., Lee, B.-K., Park, J., & Kim, Y. (2019). Relationship of Occupational Category With Risk of Physical and Mental Health Problems. *Safety and Health at Work*, *10*(4), 504–511. https://doi.org/10.1016/j.shaw.2019.07.007

Ajzen, I. (1985). From Intentions to Actions: A Theory of Planned Behavior. In J. Kuhl & J. Beckmann (Eds), *Action Control: From Cognition to Behavior* (pp. 11–39). Springer. https://doi.org/10.1007/978-3-642-69746-3_2

Al Meslamani, A. Z. (2024). Challenges in health economics research: Insights from real-world examples. *Journal of Medical Economics*, *27*(1), 215–218. https://doi.org/10.1080/13696998.2024.2310466

Albertini, M., & Tosi, M. (2022). Grandparents, family solidarity and the division of housework: Evidence from the Italian case. *Genus*, *78*(1), 21. https://doi.org/10.1186/s41118-022-00168-4

Alhussein, G., & Hadjileontiadis, L. (2022). Digital Health Technologies for Long-term Self-management of Osteoporosis: Systematic Review and Meta-analysis. *JMIR mHealth and uHealth*, *10*(4), e32557. https://doi.org/10.2196/32557

Alsarve, D., & Tjønndal, A. (2020). 'The Nordic female fighter': Exploring women's participation in mixed martial arts in Norway and Sweden. *International Review for the Sociology of Sport*, *55*(4), 471–489. https://doi.org/10.1177/1012690218822307

Alyafei, A., & Albaker, W. (2020). Barriers and Facilitators for Regular Physical Exercise among Adult Females: Narrative Review 2020. *Journal of Community Medicine & Public Health*. https://www.gavinpublishers.com/article/view/barriers-and-facilitators-for-regular-physical-exercise-among-adult-females-narrative-review-2020

Amzat, J., & Razum, O. (2014). Sociology and Health. *Medical Sociology in Africa*, 1–19. https://doi.org/10.1007/978-3-319-03986-2_1

Anderson, K., Gall, A., Butler, T., Ngampromwongse, K., Hector, D., Turnbull, S., Lucas, K., Nehill, C., Boltong, A., Keefe, D., & Garvey, G. (2023). Development of Key Principles and Best Practices for Co-Design in Health with First Nations Australians. *International Journal of Environmental Research and Public Health*, *20*(1), 147. https://doi.org/10.3390/ijerph20010147

Andersson, N., Nava-Aguilera, E., Arosteguí, J., Morales-Perez, A., Suazo-Laguna, H., Legorreta-Soberanis, J., & Harris, E. (2015). Evidence based community mobilization for dengue prevention in Nicaragua and Mexico (Camino Verde, the Green Way): Cluster randomized controlled trial. *British Medical Journal*, *351*. https://pubmed.ncbi.nlm.nih.gov/26156323/

Andersson, N., Nava-Aguilera, E., Arosteguí, J., Morales-Perez, A., Suazo-Laguna, H., Legorreta-Soberanis, J., Hernandez-Alvarez, C., Fernandez-Salas, I., Paredes-Solís, S., Balmaseda, A., Cortés-Guzmán, A. J., Serrano De Los Santos, R., Coloma, J., Ledogar, R. J., & Harris, E. (2015). Evidence based community mobilization for dengue prevention in Nicaragua and Mexico (*Camino Verde,* the Green Way): Cluster randomized controlled trial. *BMJ*, h3267. https://doi.org/10.1136/bmj.h3267

Andreopoulou, G., Meharry, J. B., Jagadamma, K. C., & Van Der Linden, M. L. (2025). Physical activity and exercise interventions in adults with cerebral palsy: A systematic review of quantitative and qualitative studies. *Disability and Rehabilitation*, *47*(9), 2170–2184. https://doi.org/10.1080/09638288.2024.2391568

Andrew, S., & Halcomb, E. J. (2007). Mixed methods research is an effective method of enquiry for community health research. *Contemporary Nurse*, *23*(2), 145–153. https://doi.org/10.5172/conu.2006.23.2.145

Archer, M. S. (Ed.). (1998). *Critical realism: Essential readings*. Routledge.

Ascondo, J., Martín-López, A., Iturricastillo, A., Granados, C., Garate, I., Romaratezabala, E., Martínez-Aldama, I., Romero, S., & Yanci, J. (2023). Analysis of the Barriers and Motives for Practicing Physical Activity and Sport for People with a Disability: Differences According to Gender and Type of Disability. *International Journal of Environmental Research and Public Health*, *20*(2), 1320. https://doi.org/10.3390/ijerph20021320

Atkins, L., Francis, J., Islam, R., O'Connor, D., Patey, A., Ivers, N., Foy, R., Duncan, E. M., Colquhoun, H., Grimshaw, J. M., Lawton, R., & Michie, S. (2017). A guide to using the Theoretical Domains Framework of behaviour change to investigate implementation problems. *Implementation Science*, *12*(1), 77. https://doi.org/10.1186/s13012-017-0605-9

Avery, L., Flynn, D., Van Wersch, A., Sniehotta, F. F., & Trenell, M. I. (2012). Changing Physical Activity Behavior in Type 2 Diabetes. *Diabetes Care*, *35*(12), 2681–2689. https://doi.org/10.2337/dc11-2452

Awick, E. A., Ehlers, D. K., Aguiñaga, S., Daugherty, A. M., Kramer, A. F., & McAuley, E. (2017). Effects of a randomized exercise trial on physical activity, psychological distress and quality of life in older adults. *General Hospital Psychiatry*, *49*, 44–50. https://doi.org/10.1016/j.genhosppsych.2017.06.005

Bae, J.-W., Woo, S.-I., Lee, J., Park, S.-D., Kwon, S. W., Choi, S. H., Yoon, G.-S., Kim, M.-S., Hwang, S.-S., & Lee, W. K. (2021). mHealth Interventions for Lifestyle and Risk Factor Modification in Coronary Heart Disease: Randomized Controlled Trial. *JMIR mHealth and uHealth*, *9*(9), e29928. https://doi.org/10.2196/29928

Bagherniya, M., Taghipour, A., Sharma, M., Sahebkar, A., Contento, I. R., Keshavarz, S. A., Mostafavi Darani, F., & Safarian, M. (2018). Obesity intervention programs among adolescents using social cognitive theory: A systematic literature review. *Health Education Research*, *33*(1), 26–39. https://doi.org/10.1093/her/cyx079

Bahrami, Z., Heidari, A., & Cranney, J. (2022). Applying SMART Goal Intervention Leads to Greater Goal Attainment, Need Satisfaction and Positive Affect. *International Journal of Mental Health Promotion*, *24*(6), 869–882. https://doi.org/10.32604/ijmhp.2022.018954

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory* (pp. xiii, 617). Prentice-Hall, Inc.

Bantham, A., Taverno Ross, S. E., Sebastião, E., & Hall, G. (2021). Overcoming barriers to physical activity in underserved populations. *Progress in Cardiovascular Diseases*, *64*, 64–71. https://doi.org/10.1016/j.pcad.2020.11.002

Barakat, C., & Konstantinidis, T. (2023). A Review of the Relationship between Socioeconomic Status Change and Health. *International Journal of Environmental Research and Public Health*, *20*(13), 6249. https://doi.org/10.3390/ijerph20136249

Bassi, S., & LaFleur, G. (2022). Introduction: TERFs, Gender-Critical Movements, and Postfascist Feminisms. *Transgender Studies Quarterly*, *9*(3), 311–333. https://doi.org/10.1215/23289252-9836008

Beaman, A. L., Cole, C. M., Preston, M., Klentz, B., & Steblay, N. M. (1983). Fifteen years of foot-in-the-door research: A meta-analysis. *Personality and Social Psychology Bulletin*, *9*(2), 181–196. https://doi.org/10.1177/0146167283092002

Beauchamp, M. R., Crawford, K. L., & Jackson, B. (2019). Social cognitive theory and physical activity: Mechanisms of behavior change, critique, and legacy. *Psychology of Sport and Exercise*, *42*, 110–117. https://doi.org/10.1016/j.psychsport.2018.11.009

Bedrov, A., & Gable, S. L. (2023). Thriving together: The benefits of women's social ties for physical, psychological and relationship health. *Philosophical Transactions of the Royal Society of London. Series B, Biological Sciences*, *378*(1868), 20210441. https://doi.org/10.1098/rstb.2021.0441

Bell, M. L., Whitehead, A. L., & Julious, S. A. (2018). Guidance for using pilot studies to inform the design of intervention trials with continuous outcomes. *Clinical Epidemiology*, *10*, 153–157. https://doi.org/10.2147/CLEP.S146397

Bellg, A. J., Borrelli, B., Resnick, B., Hecht, J., Minicucci, D. S., Ory, M., Ogedegbe, G., Orwig, D., Ernst, D., & Czajkowski, S. (2004). Enhancing Treatment Fidelity in Health Behavior Change Studies: Best Practices and Recommendations From the NIH Behavior Change Consortium. *Health Psychology*, *23*(5), 443–451. https://doi.org/10.1037/0278-6133.23.5.443

Beltran-Valls, M. R., Cabanas-Sánchez, V., Sadarangani, K. P., Rodríguez-Artalejo, F., Moliner-Urdiales, D., & Martínez-Gómez, D. (2023). Physical activity and diabetes mortality in people with type 2 diabetes: A prospective cohort study of 0.5 million US people. *Diabetes & Metabolism*, *49*(1), 101410. https://doi.org/10.1016/j.diabet.2022.101410

Berg, M. van den, Schoones, J., & Vlieland, T. V. (2007). Internet-Based Physical Activity Interventions: A Systematic Review of the Literature. *Journal of Medical Internet Research*, *9*(3), e629. https://doi.org/10.2196/jmir.9.3.e26

Bergen, N., & Labonté, R. (2020). 'Everything Is Perfect, and We Have No Problems': Detecting and Limiting Social Desirability Bias in Qualitative Research. *Qualitative Health Research*, *30*(5), 783–792. https://doi.org/10.1177/1049732319889354

Bhaskar, R. (2013). *A Realist Theory of Science*. Routledge. https://doi.org/10.4324/9780203090732

Biddle, S., Cavill, N., Ekeland, U., Gorely, T., Griffiths, M., Jago, R., Oppert, J.-M., Raats, M., Salmon, J., Stratton, G., Nicente-Rodriguez, G., Butland, B., Prosser, L., & Richardson, D. (2010). *Sedentary Behaviour and Obesity: Review of the Current Scientific Evidence*.

Biddle, S., & Mutrie, N. (2007). *Psychology of Physical Activity: Determinants, Well-Being and Interventions* (2nd edn). Routledge. https://doi.org/10.4324/9780203019320

Bifolco, G., Cardinali, L., Mocini, E., Duradoni, M., Baldari, C., Ciampi, M., & Cianferotti, L. (2024). Long-term effects of COVID-19 pandemic on physical activity and eating behaviour of the Italian population: A longitudinal study. *Endocrine*, *86*(3), 1003–1013.

Blackstone, S. R., Reeves, D., Lizzo, R., & Graber, K. C. (2017). A Qualitative Inquiry of Motivations to Participate in Group Exercise Among Women. *American Journal of Health Studies*, *32*(2). https://doi.org/10.47779/ajhs.2017.89

Blair, S. (2009). Physical Inactivity: The Biggest Public Health Problem of the 21st Century. *British Journal of Sports Medicine*, *43*(1), 1–2.

Bleidorn, W., Arslan, R. C., Denissen, J. J. A., Rentfrow, P. J., Gebauer, J. E., Potter, J., & Gosling, S. D. (2016). Age and gender differences in self-esteem-A cross-cultural window. *Journal of Personality and Social Psychology*, *111*(3), 396–410. https://doi.org/10.1037/pspp0000078

Blum, L., Homiak, M., Housman, J., & Scheman, N. (1976). Altruism and women's oppression. *Women and ...*. https://www.academia.edu/1827707/Altruism_and_womens_oppression

Blumenthal, J. A., Smith, P. J., & Hoffman, B. M. (2012). Is Exercise a Viable Treatment for Depression? *ACSM's Health & Fitness Journal*, *16*(4), 14–21. https://doi.org/10.1249/01.FIT.0000416000.09526.eb

Bollen, K. A. (1989). *Structural Equations with Latent Variables*. John Wiley & Sons.

Booth, A., Clarke, M., Dooley, G., Ghersi, D., Moher, D., Petticrew, M., & Stewart, L. (2012). The nuts and bolts of PROSPERO: An international prospective register of systematic reviews. *Systematic Reviews*, *1*(1), 1–9. https://doi.org/10.1186/2046-4053-1-2

Borrelli, B. (2011). The Assessment, Monitoring, and Enhancement of Treatment Fidelity In Public Health Clinical Trials. *Journal of Public Health Dentistry*, *71*(s1), S52–S63. https://doi.org/10.1111/j.1752-7325.2011.00233.x

Borrelli, B., Sepinwall, D., Ernst, D., Bellg, A. J., Czajkowski, S., Breger, R., DeFrancesco, C., Levesque, C., Sharp, D. L., Ogedegbe, G., Resnick, B., & Orwig, D. (2005). A new tool to assess treatment fidelity and evaluation of treatment fidelity across 10 years of health behavior research. *Journal of Consulting and Clinical Psychology*, *73*(5), 852–860. https://doi.org/10.1037/0022-006X.73.5.852

Bostean, G, & Gillespie, B. J. (2018). Acculturation, acculturative stressors, and family relationships among Latina/o immigrants. *Cultural Diversity & Ethnic Minority Psychology, 24*(1), 126–138. https://doi.org/10.1037/cdp0000169

Bottorff, J. L., Oliffe, J. L., Sarbit, G., Caperchione, C., Clark, M., Anand, A., & Howay, K. (2017). Assessing the feasibility, acceptability and potential effectiveness of an integrated approach to smoking cessation for new and expectant fathers: The Dads in Gear study protocol. *Contemporary Clinical Trials*, *54*, 77–83. https://doi.org/10.1016/j.cct.2017.01.002

Bozogáňová, M. (2015). Gender and gender roles in the context of the perceived safety. *Sociální Procesy a Osobnost*, 49–55.

Brailey, C. D., & Slatton, B. C. (2019). Women, Work, and Inequality in the U.S.: Revising the Second Shift. *JOURNAL OF SOCIOLOGY AND SOCIAL WORK*. https://doi.org/10.15640/jssw.v7n1a4

Bramer, W. M., de Jonge, G. B., Rethlefsen, M. L., Mast, F., & Kleijnen, J. (2018). A systematic approach to searching: An efficient and complete method to develop literature searches. *Journal of the Medical Library Association : JMLA*, *106*(4), 531–541. https://doi.org/10.5195/jmla.2018.283

Bramer, W. M., Giustini, D., & Kramer, B. M. R. (2016). Comparing the coverage, recall, and precision of searches for 120 systematic reviews in Embase, MEDLINE, and Google Scholar: A prospective study. *Systematic Reviews*, *5*, 39. https://doi.org/10.1186/s13643-016-0215-7

Brennan, M. A., Lalonde, C. E., & Bain, J. L. (2010). Body Image Perceptions: Do Gender Differences Exist? *Psi Chi Journal of Psychological Research*, *15*(3), 130–138. https://doi.org/10.24839/1089-4136.JN15.3.130

British Psychological Society. (2018). *Code of ethics and conduct: Guidance published by the Ethics Committee of the British Psychological Society*. https://www.bps.org.uk/guideline/code-ethics-and-conduct

Brown, M. C., Araújo-Soares, V., Skinner, R., Glaser, A. W., Sarwar, N., Saxton, J. M., Montague, K., Hall, J., Burns, O., & Sharp, L. (2020). Using qualitative and co-design methods to inform the development of an intervention to support and improve physical activity in childhood cancer survivors: A study protocol for BEing Active after ChildhOod caNcer (BEACON). *BMJ Open*, *10*(12), e041073. https://doi.org/10.1136/bmjopen-2020-041073

Brown, R. C. H., Maslen, H., & Savulescu, J. (2019). Responsibility, prudence and health promotion. *Journal of Public Health (Oxford, England)*, *41*(3), 561–565. https://doi.org/10.1093/pubmed/fdy113

Burgess, E., Hassmén, P., & Pumpa, K. L. (2017). Determinants of adherence to lifestyle intervention in adults with obesity: A systematic review. *Clinical Obesity*, *7*(3), 123–135. https://doi.org/10.1111/cob.12183

Burton, N. W., Barber, B. L., & Khan, A. (2021). A Qualitative Study of Barriers and Enablers of Physical Activity among Female Emirati University Students. *International Journal of Environmental Research and Public Health*, *18*(7), 3380. https://doi.org/10.3390/ijerph18073380

Business in the Community. (2023). *Regional Insights on Race: West Midlands Factsheet*. Business in the Community

Buunk, A. P., Dijkstra, P. D., & Bosma, H. A. (2020). Changes in Social Comparison Orientation over the Life-span. *Journal of Clinical & Developmental Psychology*, *2*(2). https://doi.org/10.6092/2612-4033/0110-2359

Bybee, J. (1998). Chapter 5—The Emergence of Gender Differences in Guilt during Adolescence. In J. Bybee (Ed.), *Guilt and Children* (pp. 113–125). Academic Press. https://doi.org/10.1016/B978-012148610-5/50006-0

Cadogan, C. A., Ryan, C., Francis, J. J., Gormley, G. J., Passmore, P., Kerse, N., & Hughes, C. M. (2015). Improving appropriate polypharmacy for older people in primary care: Selecting components of an evidence-based intervention to target prescribing and dispensing. *Implementation Science*, *10*(1), 161. https://doi.org/10.1186/s13012-015-0349-3

Cameron, D. S., Bertenshaw, E. J., & Sheeran, P. (2018). Positive affect and physical activity: Testing effects on goal setting, activation, prioritisation, and attainment. *Psychology & Health*, *33*(2), 258–274. https://doi.org/10.1080/08870446.2017.1314477

Cane, J., O'Connor, D., & Michie, S. (2012). Validation of the theoretical domains framework for use in behaviour change and implementation research. *Implementation science : IS*, *7*, 37. https://doi.org/10.1186/1748-5908-7-37

Carr-Nangle, R. E., Johnson, W. G., Bergeron, K. C., & Nangle, D. W. (1994). Body image changes over the menstrual cycle in normal women. *The International Journal of Eating Disorders*, *16*(3), 267–273. https://doi.org/10.1002/1098-108x(199411)16:3%253C267::aid-eat2260160307%253E3.0.co;2-y

Carroll, C., Patterson, M., Wood, S., Booth, A., Rick, J., & Balain, S. (2007). A conceptual framework for implementation fidelity. *Implementation Science*, *2*(1), 40. https://doi.org/10.1186/1748-5908-2-40

Carron, A. V., & Spink, K. S. (1995). The group size-cohesion relationship in minimal groups. *Small Group Research*, *26*(1), 86–105. https://doi.org/10.1177/1046496495261005

Cascella Carbó, G. F., & García-Orellán, R. (2020). Burden and Gender inequalities around Informal Care. *Investigacion Y Educacion En Enfermeria*, *38*(1), e10. https://doi.org/10.17533/udea.iee.v38n1e10

Cashdan, E. (1998). Are men more competitive than women? *British Journal of Social Psychology*, *37*(2), 213–229. https://doi.org/10.1111/j.2044-8309.1998.tb01166.x

Caspersen, C. J., Powell, K. E., & Christenson, G. M. (1985). Physical Activity, Exercise, and Physical Fitness: Definitions and Distinctions for Health-Related Research. *Public Health Rep*, *100*(2), 126–131.

Chadwick, O. (2023). *The Transformative Power of Self-Compassion for Women Exercisers* [Master of Social Science, University of Saskathcewan]. https://harvest.usask.ca/server/api/core/bitstreams/fe3fc1f9-77d7-4f5c-ba33-09714b24cd0d/content

Chakraborty, D., Bailey, B. A., Seidler, A. L., Yoong, S., Hunter, K. E., Hodder, R. K., Webster, A. C., & Johnson, B. J. (2022). Exploring the application of behaviour change technique taxonomies in childhood obesity prevention interventions: A systematic scoping review. *Preventive Medicine Reports*, *29*, 101928. https://doi.org/10.1016/j.pmedr.2022.101928

Charles, M. (2011). A World of Difference: International Trends in Women's Economic Status. *Annual Review of Sociology*, *37*(1), 355–371. https://doi.org/10.1146/annurev.soc.012809.102548

Chen, Z. E. (n.d.). Physical activity during the preconception period: How much and why it matters—IJBPE. *International Journal of Birth and Parent Education*. Retrieved 21 September 2025, from https://ijbpe.com/journals/volume-11/72-vol-11-issue-1/769-physical-activity-during-the-preconception-period-how-much-and-why-it-matters

Cheney, A. M. (2011). "Most Girls Want to be Skinny": Body (Dis)Satisfaction Among Ethnically Diverse Women. *Qualitative Health Research*, *21*(10), 1347–1359. https://doi.org/10.1177/1049732310392592

Chisholm-Burns, M., Imhoff, L., Johnson, L., Spivey, C., & Welage, L. S. (2021). Call to Action for Promoting Social Justice. *American Journal of Pharmaceutical Education*, *85*(9), 8889. https://doi.org/10.5688/ajpe8889

Choi, E., Kim, S.-G., Zahodne, L. B., & Albert, S. M. (2022). Older Workers with Physically Demanding Jobs and their Cognitive Functioning. *Ageing International*, *47*(1), 55–71. https://doi.org/10.1007/s12126-020-09404-8

Chokshi, D. A. (2018). Income, Poverty, and Health Inequality. *JAMA*, *319*(13), 1312–1313. https://doi.org/10.1001/jama.2018.2521

Clark, A. (2019). Exploring Women's Experiences: Embodied Pathways and Influences for Exercise Participation. *Societies*, *9*(1), 16. https://doi.org/10.3390/soc9010016

Clavel San Emeterio, I., Iglesias-Soler, E., Garcia-Unanue, J., Gallardo, L., & Mayo, X. (2020). A model for predicting dropouts from physical activity interventions in leisure centres. *Sport Sci Health*, *16*, 465–472. https://doi.org/10.1007/s11332-020-00626-6

Cleland, C. L., Tully, M. A., Kee, F., & Cupples, M. E. (2012). The effectiveness of physical activity interventions in socio-economically disadvantaged communities: A systematic review. *Preventive Medicine*, *54*(6), 371–380. https://doi.org/10.1016/j.ypmed.2012.04.004

Clune, S. J., & Lockrey, S. (2014). Developing environmental sustainability strategies, the *Double Diamond* method of LCA and design thinking: A case study from aged care. *Journal of Cleaner Production*, *85*, 67–82. https://doi.org/10.1016/j.jclepro.2014.02.003

Collins, C. (2025). Is Maternal Guilt a Cross-National Experience? *ResearchGate*. https://doi.org/10.1007/s11133-020-09451-2

Conner, M., & Norman, P. (2015). *Predicting and Changing Health Behaviour: Research and Practice with Social Cognition Models*. McGraw-Hill Education (UK).

Connolly, D. J., Meads, C., Wurm, A., Brown, C., Bayliss, J., Oakes-Monger, T. C., & Berner, A. M. (2025). Transphobia in the United Kingdom: A public health crisis. *International Journal for Equity in Health*, *24*(1), 155. https://doi.org/10.1186/s12939-025-02509-z

Connor-Greene, P. A. (1988). Gender differences in body weight perception and weight-loss strategies of college students. *Women & Health*, *14*(2), 27–42. https://doi.org/10.1300/J013v14n02_03

Constantin, N., Edward, H., Ng, H., Radisic, A., Yule, A., D'Asti, A., D'Amore, C., Reid, J. C., & Beauchamp, M. (2022). The use of co-design in developing physical activity interventions for older adults: A scoping review. *BMC Geriatrics*, *22*(1), 647. https://doi.org/10.1186/s12877-022-03345-4

Constantinou, G., Varela, S., & Buckby, B. (2021). Reviewing the experiences of maternal guilt—The 'Motherhood Myth' influence. *Health Care for Women International*, *42*(4–6), 852–876. https://doi.org/10.1080/07399332.2020.1835917

Coull, A., & Pugh, G. (2021). Maintaining physical activity following myocardial infarction: A qualitative study. *BMC Cardiovascular Disorders*, *21*(1), 105. https://doi.org/10.1186/s12872-021-01898-7

Coulson, N. S., Ferguson, M. A., Henshaw, H., & Heffernan, E. (2016). Applying theories of health behaviour and change to hearing health research: Time for a new approach. *International Journal of Audiology*, *55*(sup3), S99–S104. https://doi.org/10.3109/14992027.2016.1161851

Cowdell, F., & Dyson, J. (2019). How is the theoretical domains framework applied to developing health behaviour interventions? A systematic search and narrative synthesis. *BMC Public Health*, *19*(1), 1180. https://doi.org/10.1186/s12889-019-7442-5

Craig, L. (2007). Is there really a second shift, and if so, who does it? A time-diary investigation. *Feminist Review*, *86*(1), 149–170.
Craig, L. (2007). Is There Really a Second Shift, and If so, Who Does It? A Time-Diary Investigation. *Feminist Review*, *86*, 149–170.
Cramer, H., Haller, H., Dobos, G., & Lauche, R. (2016). A Systematic Review and Meta-Analysis Estimating the Expected Dropout Rates in Randomized Controlled Trials on Yoga Interventions. *Evidence-Based Complementary and Alternative Medicine*, *2016*(1), 5859729. https://doi.org/10.1155/2016/5859729
Cusatis, R., & Garbarski, D. (2019). Different domains of physical activity: The role of leisure, housework/care work, and paid work in socioeconomic differences in reported physical activity. *SSM - Population Health*, *7*, 100387. https://doi.org/10.1016/j.ssmph.2019.100387
Cuschieri, S. (2019). The CONSORT statement. *Saudi Journal of Anaesthesia*, *13*(Suppl 1), S27–S30. https://doi.org/10.4103/sja.SJA_559_18
Dahlgren, G., & Whitehead, M. (2021). The Dahlgren-Whitehead model of health determinants: 30 years on and still chasing rainbows. *Public Health*, *199*, 20–24. https://doi.org/10.1016/j.puhe.2021.08.009
Dai, H., Milkman, K. L., & Riis, J. (2013). *The Fresh Start Effect: Temporal Landmarks Motivate Aspirational Behavior* (SSRN Scholarly Paper No. 2204126). Social Science Research Network. https://doi.org/10.2139/ssrn.2204126
Daly-Smith, A., Quarmby, T., Archbold, V. S. J., Corrigan, N., Wilson, D., Resaland, G. K., Bartholomew, J. B., Singh, A., Tjomsland, H. E., Sherar, L. B., Chalkley, A., Routen, A. C., Shickle, D., Bingham, D. D., Barber, S. E., van Sluijs, E., Fairclough, S. J., & McKenna, J. (2020). Using a multi-stakeholder experience-based design process to co-develop the Creating Active Schools Framework. *International Journal of Behavioral Nutrition and Physical Activity*, *17*(1), 13. https://doi.org/10.1186/s12966-020-0917-z
Daniel, M., Abendroth, M., & Erlen, J. A. (2018). Barriers and Motives to PA in South Asian Indian Immigrant Women. *Western Journal of Nursing Research*, *40*(9), 1339–1356. https://doi.org/10.1177/0193945917697218
Davies, A., & Thomson, M. (2010). *Known unknowns*. Australian Strategic Policy Institute; JSTOR. http://www.jstor.org/stable/resrep03967
Davis, M. E., Cunningham, C., Blake, C., & O'Donoghue, G. (2024). Exploring the acceptability of three time-matched exercise interventions for increasing fitness in women living with obesity: A mixed-methods evaluation of the EXOFFIT study. *Obesity Science & Practice*, *10*(4), e70003. https://doi.org/10.1002/osp4.70003
Davis, M. G., Fox, K. R., Hillsdon, M., Sharp, D. J., Coulson, J. C., & Thompson, J. L. (2011). Objectively Measured Physical Activity in a Diverse Sample of Older Urban UK Adults. *Medicine & Science in Sports & Exercise*, *43*(4), 647–654. https://doi.org/10.1249/MSS.0b013e3181f36196
Davis, R., Campbell, R., Hildon, Z., Hobbs, L., & Michie, S. (2015). Theories of behaviour and behaviour change across the social and behavioural sciences: A scoping review. *Health Psychology Review*, *9*(3), 323–344. https://doi.org/10.1080/17437199.2014.941722
Dawes, J., Sanders, C., & Allen, R. (2019). "A Mile in Her Shoes": A qualitative exploration of the perceived benefits of volunteer led running groups for homeless women. *Health & Social Care in the Community*, *27*(5), 1232–1240. https://doi.org/10.1111/hsc.12755

de Freitas, P. P., de Menezes, M. C., dos Santos, L. C., Pimenta, A. M., Ferreira, A. V. M., & Lopes, A. C. S. (2020). The transtheoretical model is an effective weight management intervention: A randomized controlled trial. *BMC Public Health*, *20*(1), 652. https://doi.org/10.1186/s12889-020-08796-1

De la Fuente, F., Saldías, M. A., Cubillos, C., Mery, G., Carvajal, D., Bowen, M., & Bertoglia, M. P. (2021). Green Space Exposure Association with Type 2 Diabetes Mellitus, Physical Activity, and Obesity: A Systematic Review. *International Journal of Environmental Research and Public Health*, *18*(1), 97. https://doi.org/10.3390/ijerph18010097

de Vaus, J. (1992). *Mothers Growing Up: Understanding the Heartaches of Motherhood*. Allen & Unwin.

Deichakivska, O., Moroz, M., Koliada, A., Hetmanenko, L., & Butenko, V. (2024). Utilising digital education to enhance learning accessibility in isolated areas. *Salud, Ciencia y Tecnología - Serie de Conferencias*, *3*. https://doi.org/10.56294/sctconf2024.1238

Demarest, J., & Allen, R. (2000). Body image: Gender, ethnic, and age differences. *The Journal of Social Psychology*, *140*(4), 465–472. https://doi.org/10.1080/00224540009600485

Demetriou, Y., & Höner, O. (2012). Physical activity interventions in the school setting: A systematic review. *Psychology of Sport and Exercise*, *13*(2), 186–196. https://doi.org/10.1016/j.psychsport.2011.11.006

Department for Environment, Food & Rural Affairs. (2022). *Statistical Digest of Rural England*. GOV.UK

Design Council U.K. (2005). *A study of the design process–The Double Diamond*. https://www.designcouncil.org.uk/our-resources/the-double-diamond/

Dharwada, P., Greenstein, J. S., Gramopadhye, A. K., & Davis, S. J. (2007). A Case Study on Use of Personas in Design and Development of an Audit Management System. *Proceedings of the Human Factors and Ergonomics Society Annual Meeting*, *51*(5), 469–473. https://doi.org/10.1177/154193120705100509

Dibben, G., Faulkner, J., Oldridge, N., Rees, K., Thompson, D. R., Zwisler, A.-D., & Taylor, R. S. (2021). Exercise-based cardiac rehabilitation for coronary heart disease. *Cochrane Database of Systematic Reviews*, *11*. https://doi.org/10.1002/14651858.CD001800.pub4

Dishman, R. K. (1986). Exercise Compliance: A New View for Public Health. *The Physician and Sportsmedicine*, *14*(5), 127–145. https://doi.org/10.1080/00913847.1986.11709075

Dlugonski, D., & Motl, R. W. (2016). Physical Activity Experiences and Beliefs Among Single Mothers: A Qualitative Study. *Research Quarterly for Exercise and Sport*, *87*(3), 311–317. https://doi.org/10.1080/02701367.2016.1187705

Donnelly, T. T., Al-Thani, A.-A. B. M., Benjamin, K., Al-Khater, A.-H., Fung, T. S., Ahmedna, M., & Welch, A. (2018). Arab female and male perceptions of factors facilitating and inhibiting their physical activity: Findings from a qualitative study in the Middle East. *PLOS ONE*, *13*(7), e0199336. https://doi.org/10.1371/journal.pone.0199336

Doran, G. T. (1981a). 1. There's a S.M.A.R.T. Way to Write Management's Goals and Objectives. *Management Review, 70*(11), 35–36.

Doran, G. T. (1981b). There's a SMART Way to Write Management's Goals and Objectives. *Journal of Management Review*, *70*, 5–36.

Dorwart, C. E., Cornelous, S. S., & Patterson, A. F. (2019). “Just More Comfortable in the Gym”: An Exploration of the Constraints That Contribute to Adult African American Females’ Lack of Participation in Outdoor Recreation Activities. *Journal of Outdoor Recreation, Education, and Leadership*, *11*(3). https://doi.org/10.18666/JOREL-2019-V11-I3-8878

Durand, M.-A., Carpenter, L., Dolan, H., Bravo, P., Mann, M., Bunn, F., & Elwyn, G. (2014). Do Interventions Designed to Support Shared Decision-Making Reduce Health Inequalities? A Systematic Review and Meta-Analysis. *PLoS ONE*, *9*(4), e94670. https://doi.org/10.1371/journal.pone.0094670

Eisele, A., Schagg, D., Krämer, L. V., Bengel, J., & Göhner, W. (2019). Behaviour change techniques applied in interventions to enhance physical activity adherence in patients with chronic musculoskeletal conditions: A systematic review and meta-analysis. *Patient Education and Counseling*, *102*(1), 25–36. https://doi.org/10.1016/j.pec.2018.09.018

El Masri, A., Kolt, G. S., & George, E. S. (2021). The perceptions, barriers and enablers to physical activity and minimising sedentary behaviour among Arab-Australian adults aged 35-64 years. *Health Promotion Journal of Australia*, *32*(2), 312–321. https://doi.org/10.1002/hpja.345

Elbers, S., Gessel, C. van, Renes, R. J., Lugt, R. van der, Wittink, H., & Hermsen, S. (2021). Innovation in Pain Rehabilitation Using Co-Design Methods During the Development of a Relapse Prevention Intervention: Case Study. *Journal of Medical Internet Research*, *23*(1), e18462. https://doi.org/10.2196/18462

Eldridge, S. M., Lancaster, G. A., Campbell, M. J., Thabane, L., Hopewell, S., Coleman, C. L., & Bond, C. M. (2016). Defining Feasibility and Pilot Studies in Preparation for Randomised Controlled Trials: Development of a Conceptual Framework. *PLOS ONE*, *11*(3), e0150205. https://doi.org/10.1371/journal.pone.0150205

Ellingson, M. K., Dudley, M. Z., Limaye, R. J., Salmon, D. A., O’Leary, S. T., & Omer, S. B. (2019). Enhancing uptake of influenza maternal vaccine. *Expert Review of Vaccines*, *18*(2), 191–204. https://doi.org/10.1080/14760584.2019.1562907

Elmahdi, M., Kamel, F., Esmael, A., Lotfi, M., Kamel, A., & Elhosini, A. (2011). Burden of care on female caregivers and its relation to psychiatric morbidity. *Middle East Current Psychiatry*, *18*. https://doi.org/10.1097/01.XME.0000395557.32827.b4

Else-Quest, N. M., Higgins, A., Allison, C., & Morton, L. C. (2012). Gender differences in self-conscious emotional experience: A meta-analysis. *Psychological Bulletin*, *138*(5), 947–981. https://doi.org/10.1037/a0027930

Emberson, M. A., Lalande, A., Wang, D., McDonough, D. J., Liu, W., & Gao, Z. (2021). Effectiveness of Smartphone-Based Physical Activity Interventions on Individuals’ Health Outcomes: A Systematic Review. *BioMed Research International*, *2021*(1), 6296896. https://doi.org/10.1155/2021/6296896

Enderle, S. (2024). ‘Everything is different here…’: The effects of mismatched mobility cultures and differential capacities on the urban vélomobility practices of refugee and asylum seeking women in Germany. *Travel Behaviour and Society*, *36*, 100771. https://doi.org/10.1016/j.tbs.2024.100771

Eskreis-Winkler, L., & Fishbach, A. (2020). Hidden failures. *Organizational Behavior and Human Decision Processes*, *157*, 57–67. https://doi.org/10.1016/j.obhdp.2019.11.007

Eskreis-Winkler, L., & Fishbach, A. (2022). You Think Failure Is Hard? So Is Learning From It. *Perspectives on Psychological Science: A Journal of the Association for*

Psychological Science, *17*(6), 1511–1524. https://doi.org/10.1177/17456916211059817

Estabrooks, P. A., Lee, R. E., & Gyurcsik, N. C. (2003). Resources for physical activity participation: Does availability and accessibility differ by neighborhood socioeconomic status? *Annals of Behavioral Medicine*, *25*(2), 100–104. https://doi.org/10.1207/S15324796ABM2502_05

Evans, B. C., Coon, D. W., & Ume, E. (2011). Use of Theoretical Frameworks as a Pragmatic Guide for Mixed Methods Studies: A Methodological Necessity? *Journal of Mixed Methods Research*, *5*(4), 276–292. https://doi.org/10.1177/1558689811412972

Everson-Hock, E. S., Johnson, M., Jones, R., Woods, H. B., Goyder, E., Payne, N., & Chilcott, J. (2013). Community-based dietary and physical activity interventions in low socioeconomic groups in the UK: A mixed methods systematic review. *Preventive Medicine*, *56*(5), 265–272. https://doi.org/10.1016/j.ypmed.2013.02.023

Farooq, A., Martin, A., Janssen, X., Wilson, M. G., Gibson, A.-M., Hughes, A., & Reilly, J. J. (2020). Longitudinal changes in moderate-to-vigorous-intensity physical activity in children and adolescents: A systematic review and meta-analysis. *Obesity Reviews*, *21*(1), e12953. https://doi.org/10.1111/obr.12953

Farr, M. (2018). Power dynamics and collaborative mechanisms in co-production and co-design processes. *Critical Social Policy*, *38*(4), 623–644. https://doi.org/10.1177/0261018317747444

Feeley, N., Cossette, S., Côté, J., Héon, M., Stremler, R., Martorella, G., & Purden, M. (2009). The importance of piloting an RCT intervention. *The Canadian Journal of Nursing Research = Revue Canadienne De Recherche En Sciences Infirmieres*, *41*(2), 85–99.

Ferguson, T. J., & Crowley, S. L. (1997). Gender differences in the organization of guilt and shame. *Sex Roles*, *37*, 19–44.

Ferguson, T. J., & Crowley, S. L. (1997). Gender differences in the organization of guilt and shame. *Sex Roles: A Journal of Research*, *37*(1–2), 19–44. https://doi.org/10.1023/A:1025684502616

Ferlie, E., Crilly, T., Jashapara, A., & Peckham, A. (2012). Knowledge mobilisation in healthcare: A critical review of health sector and generic management literature. *Social Science & Medicine*, *74*(8), 1297–1304. https://doi.org/10.1016/j.socscimed.2011.11.042

Ferrari, G. L. D. M., Kovalskys, I., Fisberg, M., Gómez, G., Rigotti, A., Sanabria, L. Y. C., García, M. C. Y., Torres, R. G. P., Herrera-Cuenca, M., Zimberg, I. Z., Guajardo, V., Pratt, M., Cristi-Montero, C., Rodríguez-Rodríguez, F., Scholes, S., Celis-Morales, C. A., Chaput, J., Solé, D., & ELANS Study Group. (2020). Socio-demographic patterning of objectively measured physical activity and sedentary behaviours in eight Latin American countries: Findings from the ELANS study. *European Journal of Sport Science*, *20*(5), 670–681. https://doi.org/10.1080/17461391.2019.1678671

Fishbein, M., Hennessy, M., Yzer, M., & Douglas, J. (2003). Can we explain why some people do and some people do not act on their intentions? *Psychology, Health & Medicine*, *8*(1), 3–18. https://doi.org/10.1080/1354850021000059223

Flannery, C., McHugh, S., Anaba, A. E., Clifford, E., O'Riordan, M., Kenny, L. C., McAuliffe, F. M., Kearney, P. M., & Byrne, M. (2018). Enablers and barriers to physical activity in overweight and obese pregnant women: An analysis informed

by the theoretical domains framework and COM-B model. *BMC Pregnancy and Childbirth*, *18*(1), 178. https://doi.org/10.1186/s12884-018-1816-z

Forbes, G. B., Collinsworth, L. L., Jobe, R. L., Braun, K. D., & Wise, L. M. (2007). Sexism, hostility toward women, and endorsement of beauty ideals and practices: Are beauty ideals associated with oppressive beliefs? *Sex Roles: A Journal of Research*, *56*(5–6), 265–273. https://doi.org/10.1007/s11199-006-9161-5

Fox, S., Brown, L. J. E., Antrobus, S., Brough, D., Drake, R. J., Jury, F., Leroi, I., Parry-Jones, A. R., & Machin, M. (2022). Co-design of a Smartphone App for People Living With Dementia by Applying Agile, Iterative Co-design Principles: Development and Usability Study. *JMIR mHealth and uHealth*, *10*(1), e24483. https://doi.org/10.2196/24483

Francis, J. J., O'Connor, D., & Curran, J. (2012). Theories of behaviour change synthesised into a set of theoretical groupings: Introducing a thematic series on the theoretical domains framework. *Implementation Science*, *7*(1), 35. https://doi.org/10.1186/1748-5908-7-35

Freedman, J. L, & Fraser, S. C. (1996). Compliance without pressure: The foot-in-the-door technique. *Journal of Personality and Social Psychology*, *4*(2), 195.

Friberg, J. H., & Jahanlu, D. (2024). Navigating new gender roles: Impacts of cultural origins, context of settlement, and religious beliefs on gender attitudes among immigrant origin youth across five European countries. *Journal of Ethnic and Migration Studies*, *50*(8), 2023–2043.

Furber, C. (2010). Framework analysis: A method for analysing qualitative data. *African Journal of Midwifery and Women's Health*, *4*(2), 97–100. https://doi.org/10.12968/ajmw.2010.4.2.47612

Füzéki, E., Engeroff, T., & Banzer, W. (2017). Health Benefits of Light-Intensity Physical Activity: A Systematic Review of Accelerometer Data of the National Health and Nutrition Examination Survey (NHANES) - ProQuest. *Sports Medicine*, *47*(9), 1769.

Fylan, B., Tomlinson, J., Raynor, D. K., & Silcock, J. (2021). Using experience-based co-design with patients, carers and healthcare professionals to develop theory-based interventions for safer medicines use. *Research in Social and Administrative Pharmacy*, *17*(12), 2127–2135. https://doi.org/10.1016/j.sapharm.2021.06.004

Gadke, D. L., Kratochwill, T. R., & Gettinger, M. (2021). Incorporating feasibility protocols in intervention research. *Journal of School Psychology*, *84*, 1–18. https://doi.org/10.1016/j.jsp.2020.11.004

Gale, N. K., Heath, G., Cameron, E., Rashid, S., & Redwood, S. (2003). Qualitative research practice: A guide for social science students and researchers. *Choice Reviews Online*, *41*(03), 41-1319-41–1319. https://doi.org/10.5860/CHOICE.41-1319

Gardner, B., Lally, P., & Rebar, A. L. (2020). Does habit weaken the relationship between intention and behaviour? Revisiting the habit-intention interaction hypothesis. *Social and Personality Psychology Compass*, *14*(8), e12553. https://doi.org/10.1111/spc3.12553

Garvey, C. M., & Jones, R. (2021). Is There a Place for Theoretical Frameworks in Qualitative Research? *International Journal of Qualitative Methods*, *20*, 1609406920987959. https://doi.org/10.1177/1609406920987959

Gates, S., Gogescu, F., Grollman, C., Cooper, E., & Khambhaita, P. (2019). Transport and inequality: An evidence review for the Department for Transport. *NatCen Social Research*.

https://assets.publishing.service.gov.uk/media/60080f728fa8f50d8f210fbe/Transport_and_inequality_report_document.pdf
Gc, V., Wilson, E. C., Suhrcke, M., Hardeman, W., & Sutton, S. (2016). Are brief interventions to increase physical activity cost-effective? A systematic review. *British Journal of Sports Medicine*, *50*(7), 408–417. https://doi.org/10.1136/bjsports-2015-094655
Geneva: World Health Organisation. (2021). *Saving lives, spending less: The case for investing in noncommunicable diseases*. https://www.who.int/publications/i/item/9789240041059
Gerards, M. H. G., Sieben, J., Marcellis, R., De Bie, R. A., Meijer, K., & Lenssen, A. F. (2022). Acceptability of a perturbation-based balance training programme for falls prevention in older adults: A qualitative study. *BMJ Open*, *12*(2), e056623. https://doi.org/10.1136/bmjopen-2021-056623
Gillen, M. M., & Markey, C. H. (2023). Body image and mental health. In *Encyclopedia of Mental Health, Third Edition* (Vol. 1, pp. V1-246-V1-256). Elsevier. https://doi.org/10.1016/B978-0-323-91497-0.00004-7
Glass, J. M., Lyden, A. K., Petzke, F., Stein, P., Whalen, G., Ambrose, K., Chrousos, G., & Clauw, D. J. (2004). The effect of brief exercise cessation on pain, fatigue, and mood symptom development in healthy, fit individuals. *Journal of Psychosomatic Research*, *57*(4), 391–398. https://doi.org/10.1016/j.jpsychores.2004.04.002
Glowacki, K., Duncan, M. J., Gainforth, H., & Faulkner, G. (2017). Barriers and facilitators to physical activity and exercise among adults with depression: A scoping review. *Mental Health and Physical Activity*, *13*, 108–119. https://doi.org/10.1016/j.mhpa.2017.10.001
Godin, G., Bélanger-Gravel, A., Eccles, M., & Grimshaw, J. (2008). Healthcare professionals' intentions and behaviours: A systematic review of studies based on social cognitive theories. *Implementation Science*, *3*(1), 36. https://doi.org/10.1186/1748-5908-3-36
Goodwin, E., Davey, A., Green, C., & Hawton, A. (2021). What drives differences in preferences for health states between patients and the public? A qualitative investigation of respondents' thought processes. *Social Science & Medicine*, *282*, 114150. https://doi.org/10.1016/j.socscimed.2021.114150
Goodwin, E., Davey, A., Green, C, & Hawton, A. (2021). What drives differences in preferences for health states between patients and the public? A qualitative investigation of respondents' thought processes. , 282, 114150. - Google Search. *Social Science & Medicine*, *282*, 114–150.
Gould, G. S., Bar-Zeev, Y., Bovill, M., Atkins, L., Gruppetta, M., Clarke, M. J., & Bonevski, B. (2017). Designing an implementation intervention with the Behaviour Change Wheel for health provider smoking cessation care for Australian Indigenous pregnant women. *Implementation Science*, *12*(1), 114. https://doi.org/10.1186/s13012-017-0645-1
Gourlan, M., Bernard, P., Bortolon, C., Romain, A. J., Lareyre, O., Carayol, M., Ninot, G., & Boiché, J. (2016). Efficacy of theory-based interventions to promote physical activity. A meta-analysis of randomised controlled trials. *Health Psychology Review*, *10*(1), 50–66. https://doi.org/10.1080/17437199.2014.981777
Graystone, M., Mitra, R., & Hess, P. (2025). Gendered perceptions of cycling safety and on-street bicycle infrastructure: Bridging the gap | Request PDF. *ResearchGate*. https://doi.org/10.1016/j.trd.2022.103237

Greaves, S., Beck, M., Cobbold, A., Standen, C., Rissel, C., & Crane, M. (2024). Working from home, active travel, health and wellbeing: Legacies of a pandemic. *Travel Behaviour and Society*, *34*, 100707. https://doi.org/10.1016/j.tbs.2023.100707

Green, L. W., O'Neill, M., Westphal, M., & Morisky, D. (1996). The challenges of participatory action research for health promotion. *Promotion & Education*, *3*(4), 3–5. https://doi.org/10.1177/102538239600300401

Greene, E. M., O'Brien, E. C., Kennelly, M. A., O'Brien, O. A., Lindsay, K. L., & McAuliffe, F. M. (2021). Acceptability of the Pregnancy, Exercise, and Nutrition Research Study With Smartphone App Support (PEARS) and the Use of Mobile Health in a Mixed Lifestyle Intervention by Pregnant Obese and Overweight Women: Secondary Analysis of a Randomized Controlled Trial. *JMIR mHealth and uHealth*, *9*(5), e17189. https://doi.org/10.2196/17189

Griffiths, S. E., Naughton, F., & Brown, K. E. (2022). Accessing specialist support to stop smoking in pregnancy: A qualitative study exploring engagement with UK-based stop smoking services. *British Journal of Health Psychology*, *27*(3), 802–821. https://doi.org/10.1111/bjhp.12574

Grindell, C., Coates, E., Croot, L., & O'Cathain, A. (2022). The use of co-production, co-design and co-creation to mobilise knowledge in the management of health conditions: A systematic review. *BMC Health Services Research*, *22*(1), 877. https://doi.org/10.1186/s12913-022-08079-y

Grogan, S., Siddique, M. A., Gill, S., Brownbridge, K., Storey, E., & Armitage, C. J. (2017). 'I think a little bit of a kick is sometimes what you need': Women's accounts of whole-body scanning and likely impact on health-related behaviours. *Psychology & Health*, *32*(9), 1037–1054. https://doi.org/10.1080/08870446.2017.1329933

Guba, E. G. (1981a). Criteria for assessing the trustworthiness of naturalistic inquiries. *ECTJ*, *29*(2), 75–91. https://doi.org/10.1007/BF02766777

Guba, E. G. (1981b). Criteria for assessing the trustworthiness of naturalistic inquiries. *ECTJ*, *29*(2), 75–91. https://doi.org/10.1007/BF02766777

Guillaumie, L., Godin, G., & Vézina-Im, L.-A. (2010). Psychosocial determinants of fruit and vegetable intake in adult population: A systematic review. *International Journal of Behavioral Nutrition and Physical Activity*, *7*(1), 12. https://doi.org/10.1186/1479-5868-7-12

Guimond, S., Branscombe, N. R., Brunot, S., Buunk, A. P., Chatard, A., Désert, M., Garcia, D. M., Haque, S., Martinot, D., & Yzerbyt, V. (2007). Culture, gender, and the self: Variations and impact of social comparison processes. *Journal of Personality and Social Psychology*, *92*(6), 1118–1134. https://doi.org/10.1037/0022-3514.92.6.1118

Guntzviller, L. M., King, A. J., Jensen, J. D., & Davis, L. A. (2017). Self-Efficacy, Health Literacy, and Nutrition and Exercise Behaviors in a Low-Income, Hispanic Population. *Journal of Immigrant and Minority Health*, *19*(2), 489–493. https://doi.org/10.1007/s10903-016-0384-4

Gusenbauer, M. (2024). Beyond Google Scholar, Scopus, and Web of Science: An evaluation of the backward and forward citation coverage of 59 databases' citation indices. *Research Synthesis Methods*, *15*(5), 802–817. https://doi.org/10.1002/jrsm.1729

Guthold, R., Stevens, G. A., Riley, L. M., & Bull, F. C. (2018). Worldwide trends in insufficient physical activity from 2001 to 2016: A pooled analysis of 358 population-based surveys with 1·9 million participants. *The Lancet Global Health*, *6*(10), e1077–e1086. https://doi.org/10.1016/S2214-109X(18)30357-7

Haddaway, N. R., Grainger, M. J., & Gray, C. T. (2022). Citationchaser: A tool for transparent and efficient forward and backward citation chasing in systematic searching. *Research Synthesis Methods*, *13*(4), 533–545.

Haggis, C., Sims-Gould, J., Winters, M., Gutteridge, K., & McKay, H. A. (2013). Sustained impact of community-based physical activity interventions: Key elements for success. *BMC Public Health*, *13*(1), 892. https://doi.org/10.1186/1471-2458-13-892

Haith-Cooper, M., Waskett, C., Montague, J., & Horne, M. (2018). Exercise and physical activity in asylum seekers in Northern England; using the theoretical domains framework to identify barriers and facilitators. *BMC Public Health*, *18*(1), 762. https://doi.org/10.1186/s12889-018-5692-2

Halvorsrud, K., Kucharska, J., Adlington, K., Rüdell, K., Brown Hajdukova, E., Nazroo, J., Haarmans, M., Rhodes, J., & Bhui, K. (2021). Identifying evidence of effectiveness in the co-creation of research: A systematic review and meta-analysis of the international healthcare literature. *Journal of Public Health (Oxford, England)*, *43*(1), 197–208. https://doi.org/10.1093/pubmed/fdz126

Hampton, J. A., Aina, B., Andersson, J. M., Mirza, H. Z., & Parmar, S. (2012). The Rumsfeld effect: The unknown unknown. *Journal of Experimental Psychology. Learning, Memory, and Cognition*, *38*(2), 340–355. https://doi.org/10.1037/a0025376

Hardeman, W., Johnston, M., Johnston, D., Bonetti, D., Wareham, N., & Kinmonth, A. L. (2002). Application of the Theory of Planned Behaviour in Behaviour Change Interventions: A Systematic Review. *Psychology & Health*, *17*(2), 123–158. https://doi.org/10.1080/08870440290013644a

Harden, S. M., McEwan, D., Sylvester, B. D., Kaulius, M., Ruissen, G., Burke, S. M., Estabrooks, P. A., & Beauchamp, M. R. (2015). Understanding for whom, under what conditions, and how group-based physical activity interventions are successful: A realist review. *BMC Public Health*, *15*(1), 958. https://doi.org/10.1186/s12889-015-2270-8

Hardy, A., Wojdecka, A., West, J., Matthews, E., Golby, C., Ward, T., Lopez, N. D., Freeman, D., Waller, H., Kuipers, E., Bebbington, P., Fowler, D., Emsley, R., Dunn, G., & Garety, P. (2018). How Inclusive, User-Centered Design Research Can Improve Psychological Therapies for Psychosis: Development of SlowMo. *JMIR Mental Health*, *5*(4), e11222. https://doi.org/10.2196/11222

Harrington, C. N., Wilcox, L., Connelly, K., Rogers, W., & Sanford, J. (2018). *Designing health and fitness apps with older adults: Examining the value of experience-based co-design*. 15–24. https://www.researchgate.net/publication/327523251_Designing_Health_and_Fitness_Apps_with_Older_Adults_Examining_the_Value_of_Experience-Based_Co-Design

Harrison, C. L., Brown, W. J., Hayman, M., Moran, L. J., & Redman, L. M. (2016). The Role of Physical Activity in Preconception, Pregnancy and Postpartum Health. *Seminars in Reproductive Medicine*, *34*(2), e28–e37. https://doi.org/10.1055/s-0036-1583530

Hasell, J., Rohenkohl, B., Arriagada, P., Ortiz-Ospina, E., & Roser, M. (2022). Poverty. *Our World in Data*. https://ourworldindata.org/poverty

Hatzenbuehler, M. L., Phelan, J. C., & Link, B. G. (2013). Stigma as a fundamental cause of population health inequalities. *American Journal of Public Health*, *103*(5), 813–821. https://doi.org/10.2105/AJPH.2012.301069

Hauge, K. E., Kotsadam, A., & Riege, A. (2023). Culture and Gender Differences in Willingness to Compete. *The Economic Journal*, *133*(654), 2403–2426. https://doi.org/10.1093/ej/uead033

Hayba, N., Shi, Y., & Allman-Farinelli, M. (2021). Enabling Better Physical Activity and Screen Time Behaviours for Adolescents from Middle Eastern Backgrounds: Semi-Structured Interviews with Parents. *International Journal of Environmental Research and Public Health*, *18*(23), 12787. https://doi.org/10.3390/ijerph182312787

Hebert, J. R., Ma, Y., Clemow, L., Ockene, I. S., Saperia, G., Stanek, E. J., Merriam, P. A., & Ockene, J. K. (1997). Gender differences in social desirability and social approval bias in dietary self-report. *American Journal of Epidemiology*, *146*(12), 1046–1055. https://doi.org/10.1093/oxfordjournals.aje.a009233

Heisig, J. P. (2011). Who does more housework: Rich or poor? A comparison of 33 countries. *American Sociological Review*, *76*(1), 74–99. https://doi.org/10.1177/0003122410396194

Henriksson, M., Wall, A., Nyberg, J., Adiels, M., Lundin, K., Bergh, Y., Eggertsen, R., Danielsson, L., Kuhn, H. G., Westerlund, M., David Åberg, N., Waern, M., & Åberg, M. (2022). Effects of exercise on symptoms of anxiety in primary care patients: A randomized controlled trial. *Journal of Affective Disorders*, *297*, 26–34. https://doi.org/10.1016/j.jad.2021.10.006

Herazo-Beltrán, Y., Pinillos, Y., Vidarte, J., Crissien, E., Suarez, D., & García, R. (2017). Predictors of perceived barriers to physical activity in the general adult population: A cross-sectional study. *Brazilian Journal of Physical Therapy*, *21*(1), 44–50. https://doi.org/10.1016/j.bjpt.2016.04.003

Higgins, E. T. (1996). Knowledge Activation: Accessibility, Applicability, and Salience, V in E. Tory Higgins and Arie W. Kruglanski, Eds. *Social Psychology: Handbook of Basic Principles*. https://psycnet.apa.org/record/1996-98402-005

Hildebrandt, B. A., Racine, S. E., Keel, P. K., Burt, S. A., Neale, M., Boker, S., Sisk, C. L., & Klump, K. L. (2015). The effects of ovarian hormones and emotional eating on changes in weight preoccupation across the menstrual cycle. *The International Journal of Eating Disorders*, *48*(5), 477–486. https://doi.org/10.1002/eat.22326

Hiles, S. A., Lamers, F., Milaneschi, Y., & Penninx, B. W. J. H. (2017). Sit, step, sweat: Longitudinal associations between physical activity patterns, anxiety and depression. *Psychological Medicine*, *47*(8), 1466–1477. https://doi.org/10.1017/S0033291716003548

Hillsdon, M., Panter, J., Foster, C., & Jones, A. (2007). Equitable Access to Exercise Facilities. *American Journal of Preventive Medicine*, *32*(6), 506–508. https://doi.org/10.1016/j.amepre.2007.02.018

Hinde, S., & Spackman, E. (2014). Bidirectional Citation Searching to Completion: An Exploration of Literature Searching Methods. *PharmacoEconomics*, *33*, 5–11. https://doi.org/10.1007/s40273-014-0205-3

Hoare, E., Stavreski, B., Jennings, G., & Kingwell, B. (2017). Exploring Motivation and Barriers to Physical Activity among Active and Inactive Australian Adults. *Sports*, *5*(3), 47. https://doi.org/10.3390/sports5030047

Hochschild, A. R., & Machung, A. (2012). *The second shift*. Penguin.

Hoffman, J. A., Schmidt, E. M., Castaneda-Sceppa, C., & Hillman, C. H. (2019). The theoretical foundation, fidelity, feasibility, and acceptability of a teacher training to promote physical activity among preschoolers in child care: A pilot study.

Preventive Medicine Reports, *13*, 214–217. https://doi.org/10.1016/j.pmedr.2019.01.003

Hoffmann, T. C., Glasziou, P. P., Boutron, I., Milne, R., Perera, R., Moher, D., Altman, D. G., Barbour, V., Macdonald, H., Johnston, M., Kadoorie, S. E. L., Dixon-Woods, M., McCulloch, P., Wyatt, J. C., Chan, A.-W., & Michie, S. (2014). Better reporting of interventions: Template for intervention description and replication (TIDieR) checklist and guide. *BMJ: British Medical Journal*, *348*. https://www.jstor.org/stable/26514215

Hollander, I. E., & Bell, N. S. (2010). Physically demanding jobs and occupational injury and disability in the U.S. Army. *Military Medicine*, *175*(10), 705–712. https://doi.org/10.7205/milmed-d-09-00214

Howlett, N., Schulz, J., Trivedi, D., Troop, N., & Chater, A. (2019). A prospective study exploring the construct and predictive validity of the COM-B model for physical activity. *Journal of Health Psychology*, *24*(10), 1378–1391. https://doi.org/10.1177/1359105317739098

Howlett, N., Schulz, J., Trivedi, D., Troop, N., & Chater, A. (2021). Determinants of weekly sitting time: Construct validation of an initial COM-B model and comparison of its predictive validity with the Theory of Planned Behaviour. *Psychology & Health*, *36*(1), 96–114. https://doi.org/10.1080/08870446.2020.1763994

Howlett, N., Trivedi, D., Troop, N. A., & Chater, A. M. (2019). Are physical activity interventions for healthy inactive adults effective in promoting behavior change and maintenance, and which behavior change techniques are effective? A systematic review and meta-analysis. *Translational Behavioral Medicine*, *9*(1), 147–157. https://doi.org/10.1093/tbm/iby010

Hull, C. L. (1932). The goal-gradient hypothesis and maze learning. *Psychological Review*, *39*(1), 25–43. https://doi.org/10.1037/h0072640

Hutchison, A. J., Breckon, J. D., & Johnston, L. H. (2009). Physical Activity Behavior Change Interventions Based on the Transtheoretical Model: A Systematic Review. *Health Education & Behavior*, *36*(5), 829–845. https://doi.org/10.1177/1090198108318491

Ickes, M. J., & Sharma, M. (2012). A Systematic Review of Physical Activity Interventions in Hispanic Adults. *Journal of Environmental and Public Health*, *2012*(1), 156435. https://doi.org/10.1155/2012/156435

Indices of Deprivation (2019)—Nottingham Insight. (n.d.). Retrieved 14 September 2025, from https://www.nottinghaminsight.org.uk/themes/deprivation-and-poverty/indices-of-deprivation-2019/

Islam, S., Frazier, M. C., Harden, S. M., Lim, S., Hall, W., & Street, P. (n.d.). *Title: Barriers and Benefits of Online Group Exercise Programs for Older Adults*.

Jackson, C., Eliasson, Â. L., Barber, N., & Weinman, J. (2014). Applying COM-B to medication adherence: A suggested framework for research and interventions. *European Health Psychologist*, *16*(1), 7–17.

Jakubowska, H. (2024). Who counts as a woman? A critical discourse analysis of petitions against the participation of transgender athletes in women's sport. *International Review for the Sociology of Sport*, *59*(2), 203–221.

Janis, I. L., & Mann, L. (1977). Emergency decision making: A theoretical analysis of responses to disaster warnings. *Journal of Human Stress*, *3*(2), 35–48. https://doi.org/10.1080/0097840X.1977.9936085

Jetté, M. (1978). The standardized test of fitness in occupational health: A pilot project. *Canadian Journal of Public Health = Revue Canadienne De Sante Publique*, *69*(6), 431–438.

Ji, H., Gulati, M., Huang, T. Y., Kwan, A. C., Ouyang, D., Ebinger, J. E., Casaletto, K., Moreau, K. L., Skali, H., & Cheng, S. (2024). Sex Differences in Association of Physical Activity With All-Cause and Cardiovascular Mortality. *Journal of the American College of Cardiology*, *83*(8), 783–793. https://doi.org/10.1016/j.jacc.2023.12.019

Jochem, C., & Leitzmann, M. (2022). Physical Activity and Sedentary Behavior in Relation to Cancer Survival: A Narrative Review. *Cancers*, *14*(7), 1720. https://doi.org/10.3390/cancers14071720

Johansson, L., Lundh, L.-G., & Andersson, G. (2005). Attentional bias for negative self-words in young women The role of thin ideal priming and body shape dissatisfaction. *Personality and Individual Differences*, *38*(3), 723–733. https://doi.org/10.1016/j.paid.2004.05.026

Johnson, G. U., Towell-Barnard, A., McLean, C., Robert, G., & Ewens, B. (2024). Co-designing a digital family-led intervention for delirium prevention and management in adult critically ill patients: An application of the double diamond design process. *International Journal of Nursing Studies*, *160*, 104888. https://doi.org/10.1016/j.ijnurstu.2024.104888

Joseph, R. P., Coe, K., Ainsworth, B. E., Hooker, S. P., Mathis, L., & Keller, C. (2018). Hair As a Barrier to Physical Activity among African American Women: A Qualitative Exploration. *Frontiers in Public Health*, *5*, 367. https://doi.org/10.3389/fpubh.2017.00367

Joseph, R. P., Durant, N. H., Benitez, T. J., & Pekmezi, D. W. (2014). Internet-Based Physical Activity Interventions. *American Journal of Lifestyle Medicine*, *8*(1), 42–67. https://doi.org/10.1177/1559827613498059

Jurakić, D., Pedišić, Z., & Greblo, Z. (2010). Physical activity in different domains and health-related quality of life: A population-based study. *Quality of Life Research: An International Journal of Quality of Life Aspects of Treatment, Care and Rehabilitation*, *19*(9), 1303–1309. https://doi.org/10.1007/s11136-010-9705-6

Kalani, Z., Pourmovahed, Z., Farajkhoda, T., & Bagheri, I. (2018). A Qualitative Approach to Women's Perspectives on Exercise in Iran. *International Journal of Community Based Nursing and Midwifery*, *6*(2), 156–166.

Kandel, P., Lim, S., Pirotta, S., Skouteris, H., Moran, L. J., & Hill, B. (2021). Enablers and barriers to women's lifestyle behavior change during the preconception period: A systematic review. *Obesity Reviews: An Official Journal of the International Association for the Study of Obesity*, *22*(7), e13235. https://doi.org/10.1111/obr.13235

Kandola, A., Ashdown-Franks, G., Hendrikse, J., Sabiston, C. M., & Stubbs, B. (2019). Physical activity and depression: Towards understanding the antidepressant mechanisms of physical activity. *Neuroscience & Biobehavioral Reviews*, *107*, 525–539. https://doi.org/10.1016/j.neubiorev.2019.09.040

Karppanen, A.-K., Ahonen, S.-M., Tammelin, T., Vanhala, M., & Korpelainen, R. (2012). Physical activity and fitness in 8-year-old overweight and normal weight children and their parents. *International Journal of Circumpolar Health*, *71*(1), 17621. https://doi.org/10.3402/ijch.v71i0.17621

Kaseva, K., Hintsa, T., Lipsanen, J., Pulkki-Råback, L., Hintsanen, M., Yang, X., Hirvensalo, M., Hutri-Kähönen, N., Raitakari, O., Keltikangas-Järvinen, L., &

Tammelin, T. (2017). Parental Physical Activity Associates With Offspring's Physical Activity Until Middle Age: A 30-Year Study. *Journal of Physical Activity and Health*, *14*(7), 520–531. https://doi.org/10.1123/jpah.2016-0466

Kazemi, A., Soltani, S., Aune, D., Hosseini, E., Mokhtari, Z., Hassanzadeh, Z., Jayedi, A., Pitanga, F., & Akhlaghi, M. (2024). Leisure-time and occupational physical activity and risk of cardiovascular disease incidence: A systematic-review and dose-response meta-analysis of prospective cohort studies. *The International Journal of Behavioral Nutrition and Physical Activity*, *21*(1), 45. https://doi.org/10.1186/s12966-024-01593-8

Kersey, K., Hutton, F., & Lyons, A. C. (2023). Women, alcohol consumption and health promotion: The value of a critical realist approach. *Health Promotion International*, *38*(1), daac177. https://doi.org/10.1093/heapro/daac177

Kim, Y., & Kwon, S.-Y. (2025). 'Keeping up with the Korean Yeojas': The paradox of Korean women's participation of aesthetic exercise in contemporary Korea. *Sport in Society*, *28*(1), 41–56. https://doi.org/10.1080/17430437.2024.2341047

Kim, Y.-H., Kwon, H., Lee, J., & Chiu, C.-Y. (2016). Why Do People Overestimate or Underestimate Their Abilities? A Cross-Culturally Valid Model of Cognitive and Motivational Processes in Self-Assessment Biases. *Journal of Cross-Cultural Psychology*, *47*(9), 1201–1216. https://doi.org/10.1177/0022022116661243

King, A. C., Marcus, B., Ahn, D., Dunn, A. L., Rejeski, W. J., Sallis, J. F., Coday, M., & Activity Counseling Trial Research Group. (2006). Identifying subgroups that succeed or fail with three levels of physical activity intervention: The Activity Counseling Trial. *Health Psychology: Official Journal of the Division of Health Psychology, American Psychological Association*, *25*(3), 336–347. https://doi.org/10.1037/0278-6133.25.3.336

Kinnafick, F.-E., Thøgersen-Ntoumani, C., & Duda, J. L. (2014). Physical activity adoption to adherence, lapse, and dropout: A self-determination theory perspective. *Qualitative Health Research*, *24*(5), 706–718. https://doi.org/10.1177/1049732314528811

Kjellsson, S. (n.d.). *Class-specific gender gaps in musculoskeletal pain: Sweden 1974-2010.Have gender differences in pain changed over time and equally in all social classes?* Retrieved 21 September 2025, from https://swopec.hhs.se/sofiwp/abs/sofiwp2018_003.htm

Koopmans, E., & Schiller, Dr. C. (2022). Understanding Causation in Healthcare: An Introduction to Critical Realism. *Qualitative Health Research*, *32*(8–9), 1207–1214. https://doi.org/10.1177/10497323221105737

Koyanagi, A., Stubbs, B., & Vancampfort, D. (2018). Correlates of sedentary behavior in the general population: A cross-sectional study using nationally representative data from six low- and middle-income countries. *PLOS ONE*, *13*(8), e0202222. https://doi.org/10.1371/journal.pone.0202222

Kraus, M. W., Park, J. W., & Tan, J. J. (2017). Signs of social class: The experience of economic inequality in everyday life.,. *Perspectives on Psychological Science*, *12*(3), 422–435.

Krause, N., Hill, P. C., Emmons, R., Pargament, K. I., & Ironson, G. (2017). Assessing the Relationship Between Religious Involvement and Health Behaviors. *Health Education & Behavior: The Official Publication of the Society for Public Health Education*, *44*(2), 278–284. https://doi.org/10.1177/1090198116655314

Kwasnicka, D., Dombrowski, S. U., White, M., & Sniehotta, F. (2016). Theoretical explanations for maintenance of behaviour change: A systematic review of

behaviour theories. *Health Psychology Review*, *10*(3), 277–296. https://doi.org/10.1080/17437199.2016.1151372
Lafrance, M. N., & Wigginton, B. (2019). Doing critical feminist research: A Feminism & Psychology reader. *Feminism & Psychology*, *29*(4), 534–552. https://doi.org/10.1177/0959353519863075
Lambert, C., Beck, B. R., Watson, S. L., Harding, A. T., & Weeks, B. K. (2020). Enjoyment and acceptability of different exercise modalities to improve bone health in young adult women. *Health Promotion Journal of Australia*, *31*(3), 369–380. https://doi.org/10.1002/hpja.321
Lambert, H., & McKevitt, C. (2002). Anthropology in health research: From qualitative methods to multidisciplinarity. *BMJ : British Medical Journal*, *325*(7357), 210–213. https://doi.org/10.1136/bmj.325.7357.210
Lambert, J. D., Greaves, C. J., Farrand, P., Cross, R., Haase, A. M., & Taylor, A. H. (2017). Assessment of fidelity in individual level behaviour change interventions promoting physical activity among adults: A systematic review. *BMC Public Health*, *17*(1), 765. https://doi.org/10.1186/s12889-017-4778-6
Larson, H. K., McFadden, K., McHugh, T.-L. F., Berry, T. R., & Rodgers, W. M. (2017). You can't always get what you want: Expectations, outcomes, and adherence of new exercisers. *Qualitative Research in Sport, Exercise and Health*, *9*(3), 389–402. https://doi.org/10.1080/2159676X.2017.1294103
Lawani, A. (2020). Critical realism: What you should know and how to apply it. *Qualitative Research Journal*, *21*(3), 320–333. https://doi.org/10.1108/QRJ-08-2020-0101
LeBeau, C. S. (2017). Ontological and ethical guilt: Phenomenological perspectives on becoming a mother. *The Humanistic Psychologist*, *45*(4), 333–347. https://doi.org/10.1037/hum0000070
Lee, K. S., Quintiliani, L., Heinz, A., Johnson, N. L., Xuan, Z., Truong, V., & Lasser, K. E. (2020). A financial incentive program to improve appointment attendance at a safety-net hospital-based primary care hepatitis C treatment program. *PLOS ONE*, *15*(2), e0228767. https://doi.org/10.1371/journal.pone.0228767
Lenneis, V., Agergaard, S., & Evans. (2020). Women-only swimming as a space of belonging. *Qualitative Research in Sport, Exercise and Health*, *14*(1), 37–52. https://doi.org/10.1080/2159676X.2020.1844790
Lenneis, V., Evans, A. B., & Agergaard, S. (2022). Swimming as self-care – A Foucauldian analysis of swimming for Danish Muslim women. *International Review for the Sociology of Sport*, *57*(3), 401–420. https://doi.org/10.1177/10126902211016843
Lenneis, V., & Pfister, G. (2016a). Health, physical activity and the body: An inquiry into the lives of female migrant cleaners in Denmark. *International Journal of Sport Policy and Politics*, *8*(4), 647–662. https://doi.org/10.1080/19406940.2016.1220408
Lenneis, V., & Pfister, G. (2017). When girls have no opportunities and women have neither time nor energy: The participation of Muslim female cleaners in recreational physical activity. *Sport in Society*, *20*(9), 1203–1222. https://doi.org/10.1080/17430437.2016.1269085
Lenneis, V., & Pfister, G. U. (2016b). Playing after work? Opportunities and challenges of a physical activity programme for female cleaners. *International Sports Studies*, *38*(1), 5–23.

Leon, A. C., Davis, L. L., & Kraemer, H. C. (2011). The role and interpretation of pilot studies in clinical research. *Journal of Psychiatric Research*, *45*(5), 626–629. https://doi.org/10.1016/j.jpsychires.2010.10.008

Leslie-Walker, A., Mulvenna, C., & Bramble, O. (2023). Exploring the motivations and challenges West African female students experience engaging in university sport. *Curriculum Studies in Health and Physical Education*, *14*(2), 190–206. https://doi.org/10.1080/25742981.2022.2073458

Leung, C. M. C., Ho, M. K., Bharwani, A. A., Cogo-Moreira, H., Wang, Y., Chow, M. S. C., Fan, X., Galea, S., Leung, G. M., & Ni, M. Y. (2022). Mental disorders following COVID-19 and other epidemics: A systematic review and meta-analysis. *Translational Psychiatry*, *12*(1), 205. https://doi.org/10.1038/s41398-022-01946-6

Leviton, L. C. (2017). Generalizing about Public Health Interventions: A Mixed-Methods Approach to External Validity. *Annual Review of Public Health*, *38*(Volume 38, 2017), 371–391. https://doi.org/10.1146/annurev-publhealth-031816-044509

Lewis, B. A., Williams, D. M., Frayeh, A., & Marcus, B. H. (2016). Self-efficacy versus perceived enjoyment as predictors of physical activity behaviour. *Psychology & Health*, *31*(4), 456–469. https://doi.org/10.1080/08870446.2015.1111372

Linke, S. E., Robinson, C. J., & Pekmezi, D. (2014). Applying Psychological Theories to Promote Healthy Lifestyles. *American Journal of Lifestyle Medicine*, *8*(1), 4–14. https://doi.org/10.1177/1559827613487496

Liu, S.-H., Eaton, C. B., Driban, J. B., McAlindon, T. E., & Lapane, K. L. (2016). Comparison of self-report and objective measures of physical activity in US adults with osteoarthritis. *Rheumatology International*, *36*(10), 1355–1364. https://doi.org/10.1007/s00296-016-3537-9

Liu, X., Wang, G., & Cao, Y. (2022). Physical exercise interventions for perinatal depression symptoms in women: A systematic review and meta-analysis. *Frontiers in Psychology*, *13*, 1022402. https://doi.org/10.3389/fpsyg.2022.1022402

Liu, Y. (2019). *Exploring the application of Inclusive Design to the improvement of healthcare services* [Doctor of Philosophy, University of Cambridge]. https://www.repository.cam.ac.uk/handle/1810/289422

Loets, A. (2025). Intersectional Disadvantage. *ResearchGate*. https://www.researchgate.net/publication/380899827_Intersectional_Disadvantage

Long, F. (2009). Real or imaginary: The effectiveness of using personas in product design. *Proceedings of the Irish Ergonomics Society Annual Conference*, *14*, 1–10. https://www.frontend.com/thinking/using-personas-in-product-design/

López-Benavente, Y., Arnau-Sánchez, J., Ros-Sánchez, T., Lidón-Cerezuela, M. B., Serrano-Noguera, A., & Medina-Abellán, M. D. (2018). Difficulties and motivations for physical exercise in women older than 65 years. A qualitative study. *Revista Latino-Americana De Enfermagem*, *26*, e2989. https://doi.org/10.1590/1518-8345.2392.2989

Lovell, G. P., El Ansari, W., & Parker, J. K. (2010). Perceived Exercise Benefits and Barriers of Non-Exercising Female University Students in the United Kingdom. *International Journal of Environmental Research and Public Health*, *7*(3), 784–798. https://doi.org/10.3390/ijerph7030784

Lu, Y., Yu, K., & Gan, X. (2022). Effects of a SMART Goal Setting and 12-Week Core Strength Training Intervention on Physical Fitness and Exercise Attitudes in Adolescents: A Randomized Controlled Trial. *International Journal of*

Environmental Research and Public Health, *19*(13), 7715. https://doi.org/10.3390/ijerph19137715

Lyons, A. C. (2011). Advancing and extending qualitative research in health psychology. *Health Psychology Review, 5*(1), 1–8. https://doi.org/10.1080/17437199.2010.544638

Lyu, F. F., Ramoo, V., Chui, P. L., & Ng, C. G. (2024). Perceptions Toward Exercise or Mindful Exercise Participation Among Patients With Primary Osteoporosis: A Qualitative Study. *Clinical Nursing Research*, *33*(1), 40–50. https://doi.org/10.1177/10547738231198561

Madden, S. K., Cordon, E. L., Bailey, C., Skouteris, H., Ahuja, K., Hills, A. P., & Hill, B. (2020). The effect of workplace lifestyle programmes on diet, physical activity, and weight-related outcomes for working women: A systematic review using the TIDieR checklist. *Obesity Reviews*, *21*(10), e13027. https://doi.org/10.1111/obr.13027

Mancuso, J., Neelim, A., & Vecci, J. (n.d.). *Gender differences in self-promotion: Understanding the female modesty constraint*.

Marini, S., Parma, D., Masini, A., Bertini, V., Leccese, V., Caravita, I., & Dallolio, L. (2021). Design and Evaluation of the Feasibility and the Efficacy of a Multiple-Targeted Adapted Physical Activity Intervention to Promote Quality of Life, Well-Being and Physical Activity Levels in Pregnant Women: The "WELL-DONE!" Study Protocol. *Sustainability*, *13*(21), 12285.

Marini, S., Parma, D., Masini, A., Bertini, V., Leccese, V., Caravita, I., Gori, D., Messina, R., & Dallolio, L. (2021). Co-Design and Evaluation of the Feasibility and the Efficacy of a Multiple-Targeted Adapted Physical Activity Intervention to Promote Quality of Life, Well-Being and Physical Activity Levels in Pregnant Women: The "WELL-DONE!" Study Protocol. *Sustainability*, *13*(21), 12285. https://doi.org/10.3390/su132112285

Martins, J., Costa, J., Sarmento, H., Marques, A., Farias, C., Onofre, M., & Valeiro, M. G. (2021). Adolescents' perspectives on the barriers and facilitators of physical activity: An updated systematic review of qualitative studies. *International Journal of Environmental Research and Public Health, 18*(9), 4954. https://doi.org/10.3390/ijerph18094954

Masterson, D., Areskoug Josefsson, K., Robert, G., Nylander, E., & Kjellström, S. (2022). Mapping definitions of co-production and co-design in health and social care: A systematic scoping review providing lessons for the future. *Health Expectations*, *25*(3), 902–913. https://doi.org/10.1111/hex.13470

Mathews, E., Lakshmi, J. K., Ravindran, T. K. S., Pratt, M., & Thankappan, K. R. (2016). Perceptions of barriers and facilitators in physical activity participation among women in Thiruvananthapuram City, India. *Global Health Promotion*, *23*(4), 27–36. https://doi.org/10.1177/1757975915573878

Matsumoto, D., & Hwang, H. C. (2019). *The Handbook of Culture and Psychology*. Oxford University Press.

Matthews, E., Cowman, M., Brannigan, M., Sloan, D., Ward, P. B., & Denieffe, S. (2018). Examining the barriers to physical activity between active and inactive people with severe mental illness in Ireland. *Mental Health and Physical Activity*, *15*, 139–144. https://doi.org/10.1016/j.mhpa.2018.10.003

Maume, D. J. (2009). Gender differences in providing urgent childcare among dual-earner parents. *Social Forces*, *87*(1), 273–297. https://doi.org/10.1353/sof.0.0101

Mayor, S. (2017). Socioeconomic disadvantage is linked to obesity across generations, UK study finds. *BMJ*, *356*, j163. https://doi.org/10.1136/bmj.j163

Mayorga-Vega, D., Merino-Marban, R., & Viciana, J. (2014). Criterion-Related Validity of Sit-and-Reach Tests for Estimating Hamstring and Lumbar Extensibility: A Meta-Analysis. *Journal of Sports Science & Medicine*, *13*(1), 1–14.

Mbabazi, J., Kanmodi, K. K., Kunonga, E., Tolchard, B., & Nnyanzi, L. A. (2023). Barriers and Facilitators of Physical Activity. *Journal of Health and Allied Sciences NU*, *13*(1), 19–27. https://doi.org/10.1055/s-0042-1753561

McCambridge, A. B., Nasser, A. M., Mehta, P., Stubbs, P. W., & Verhagen, A. P. (2021). Has Reporting on Physical Therapy Interventions Improved in 2 Decades? An Analysis of 140 Trials Reporting on 225 Interventions. *Journal of Orthopaedic & Sports Physical Therapy*, *51*(10), 503–509. https://doi.org/10.2519/jospt.2021.10642

McDowell, C. P., Dishman, R. K., Gordon, B. R., & Herring, M. P. (2019). Physical Activity and Anxiety: A Systematic Review and Meta-analysis of Prospective Cohort Studies. *American Journal of Preventive Medicine*, *57*(4), 545–556. https://doi.org/10.1016/j.amepre.2019.05.012

McDowell, C. P., Dishman, R. K., Hallgren, M., MacDonncha, C., & Herring, M. P. (2018). Associations of physical activity and depression: Results from the Irish Longitudinal Study on Ageing. *Experimental Gerontology*, *112*, 68–75. https://doi.org/10.1016/j.exger.2018.09.004

McEwan, D., Beauchamp, M. R., Kouvousis, C., Ray, C. M., Wyrough, A., & Rhodes, R. E. (2019). Examining the active ingredients of physical activity interventions underpinned by theory versus no stated theory: A meta-analysis. *Health Psychology Review*, *13*(1), 1–17. https://doi.org/10.1080/17437199.2018.1547120

McEwan, D., Harden, S. M., Zumbo, B. D., Sylvester, B. D., Kaulius, M., Ruissen, G. R., Dowd, A. J., & Beauchamp, M. R. (2016). The effectiveness of multi-component goal setting interventions for changing physical activity behaviour: A systematic review and meta-analysis. *Health Psychology Review*, *10*(1), 67–88. https://doi.org/10.1080/17437199.2015.1104258

McGlory, C., & Phillips, S. M. (2015). Chapter Seven—Exercise and the Regulation of Skeletal Muscle Hypertrophy. In C. Bouchard (Ed.), *Progress in Molecular Biology and Translational Science* (Vol. 135, pp. 153–173). Academic Press. https://doi.org/10.1016/bs.pmbts.2015.06.018

McGowan, J., Sampson, M., Salzwedel, D. M., Cogo, E., Foerster, V., & Lefebvre, C. (2016). PRESS Peer Review of Electronic Search Strategies: 2015 Guideline Statement. *Journal of Clinical Epidemiology*, *75*, 40–46. https://doi.org/10.1016/j.jclinepi.2016.01.021

Mckay, A., Moore, S., & Kubik, W. (2018). Western Beauty Pressures and Their Impact on Young University Women. *INTERNATIONAL JOURNAL OF GENDER & WOMEN'S STUDIES*, *6*(2). https://doi.org/10.15640/ijgws.v6n2a1

McLeod, L. (2012). Making SMART Goals Smarte. *Physician Executive*, *38*(2), 68–70.

McRobbie, A. (2015). Notes on the Perfect: Competitive Femininity in Neoliberal Times. *Australian Feminist Studies*, *30*(83), 3–20. https://doi.org/10.1080/08164649.2015.1011485

McTiernan, A., Friedenreich, C. M., Katzmarzyk, P. T., Powell, K. E., Macko, R., Buchner, D., Pescatello, L. S., Bloodgood, B., Tennant, B., Vaux-Bjerke, A., George, S. M., Troiano, R. P., & Piercy, K. L. (2019). Physical Activity in Cancer Prevention and Survival: A Systematic Review. *Medicine and Science in Sports and Exercise*, *51*(6), 1252–1261. https://doi.org/10.1249/MSS.0000000000001937

Mendoza-Vasconez, A. S., Linke, S., Muñoz, M., Pekmezi, D., Ainsworth, C., Cano, M., Williams, V., Marcus, B. H., & Larsen, B. A. (2016). Promoting Physical Activity among Underserved Populations. *Current Sports Medicine Reports*, *15*(4), 290–297. https://doi.org/10.1249/JSR.0000000000000276

Menezes, M. C. de, Bedeschi, L. B., Santos, L. C. D., & Lopes, A. C. S. (2016). *Interventions directed at eating habits and physical activity using the transtheoretical model: A systematic review*. https://doi.org/10.20960/nh.586

Michie, S., Atkins, L., & West, R. (2014). *The Behaviour Change Wheel. A Guide To Designing Interventions*. (1st edn). Silverback publishing. https://www.behaviourchangewheel.com/online-book#1

Michie, S., Jochelson, K., Markham, W. A., & Bridle, C. (2009). Low-income groups and behaviour change interventions: A review of intervention content, effectiveness and theoretical frameworks. *Journal of Epidemiology & Community Health*, *63*(8), 610–622. https://doi.org/10.1136/jech.2008.078725

Michie, S., Johnston, M., Abraham, C., Lawton, R., Parker, D., & Walker, A. (2005). Making psychological theory useful for implementing evidence based practice: A consensus approach. *BMJ Quality & Safety*, *14*(1), 26–33. https://doi.org/10.1136/qshc.2004.011155

Michie, S., & Prestwich, A. (2010). Are interventions theory-based? Development of a theory coding scheme. *Health Psychology*, *29*(1), 1–8. https://doi.org/10.1037/a0016939

Michie, S., Richardson, M., Johnston, M., Abraham, C., Francis, J., Hardeman, W., Eccles, M. P., Cane, J., & Wood, C. E. (2013). The Behavior Change Technique Taxonomy (v1) of 93 Hierarchically Clustered Techniques: Building an International Consensus for the Reporting of Behavior Change Interventions. *Annals of Behavioral Medicine*, *46*(1), 81–95. https://doi.org/10.1007/s12160-013-9486-6

Michie, S., Van Stralen, M. M., & West, R. (2011). The behaviour change wheel: A new method for characterising and designing behaviour change interventions. *Implementation Science*, *6*(1), 42. https://doi.org/10.1186/1748-5908-6-42

Miles, C., & Benn, T. (2016). A case study on the experiences of university-based Muslim women in physical activity during their studies at one UK higher education institution. *Sport, Education and Society*, *21*(5), 723–740. https://doi.org/10.1080/13573322.2014.942623

Miller, B. M. L., & Brennan, L. (2015). Measuring and reporting attrition from obesity treatment programs: A call to action! *Obesity Research & Clinical Practice*, *9*(3), 187–202. https://doi.org/10.1016/j.orcp.2014.08.007

Miller, C. L., & Strachan, S. M. (2020). Understanding the role of mother guilt and self-compassion in health behaviors in mothers with young children. *Women & Health*, *60*(7), 763–775. https://doi.org/10.1080/03630242.2020.1713966

Miller, Z. D. (2017). The Enduring Use of the Theory of Planned Behavior. *Human Dimensions of Wildlife*, *22*(6), 583–590. https://doi.org/10.1080/10871209.2017.1347967

Miyamoto, T., Nagao, A., Okumura, N., & Hosaka, M. (2022). Effect of Post-diagnosis Physical Activity on Breast Cancer Recurrence: A Systematic Review and Meta-analysis. *Current Oncology Reports*, *24*(11), 1645–1659. https://doi.org/10.1007/s11912-022-01287-z

Moll, S., Wyndham-West, M., Mulvale, G., Park, S., Buettgen, A., Phoenix, M., Fleisig, R., & Bruce, E. (2020). Are you really doing 'codesign'? Critical reflections when

working with vulnerable populations. *BMJ Open*, *10*(11), e038339. https://doi.org/10.1136/bmjopen-2020-038339

Moore, A. P., Rivas, C. A., Stanton-Fay, S., Harding, S., & Goff, L. M. (2019). Designing the Healthy Eating and Active Lifestyles for Diabetes (HEAL-D) self-management and support programme for UK African and Caribbean communities: A culturally tailored, complex intervention under-pinned by behaviour change theory. *BMC Public Health*, *19*(1), 1146. https://doi.org/10.1186/s12889-019-7411-z

Moore, J. E., Mascarenhas, A., Marquez, C., Almaawiy, U., Chan, W.-H., D'Souza, J., Liu, B., Straus, S. E., & The MOVE ON Team. (2014). Mapping barriers and intervention activities to behaviour change theory for Mobilization of Vulnerable Elders in Ontario (MOVE ON), a multi-site implementation intervention in acute care hospitals. *Implementation Science*, *9*(1), 160. https://doi.org/10.1186/s13012-014-0160-6

Moreno-Llamas, A., García-Mayor, J., & la Cruz-Sánchez, D. (2020). Physical activity barriers according to social stratification in Europe.,. *International Journal of Public Health*, *65*(8), 1477–1484.

Morgenroth, T., Kirby, T. A., Zehnter, M. K., & Ryan, M. K. (2024). Sex Wars and TERF Wars: The Divisiveness of Who is Included in Feminism. *Sex Roles*, *90*(6), 676–705. https://doi.org/10.1007/s11199-024-01473-2

Moroshko, I., Brennan, L., & O'Brien, P. (2011). Predictors of dropout in weight loss interventions: A systematic review of the literature. *Obesity Reviews: An Official Journal of the International Association for the Study of Obesity*, *12*(11), 912–934. https://doi.org/10.1111/j.1467-789X.2011.00915.x

Morton, S. (2018). Using qualitative methodology to better understand why females experience barriers to regular participation in adventure sport in Scotland. *Sport in Society*, *2*(12), 185–200. https://doi.org/10.1080/17430437.2017.1284808

Mosewich, A. D., Kowalski, K. C., Sabiston, C. M., Sedgwick, W. A., & Tracy, J. L. (2011). Self-compassion: A potential resource for young women athletes. *Journal of Sport & Exercise Psychology*, *33*(1), 103–123. https://doi.org/10.1123/jsep.33.1.103

Moulin, D. (2023). *Religion and worldviews education and the paradox of inclusivity*. https://doi.org/10.1007/s40839-023-00212-1

Mouratidis, K. (2020). Neighborhood characteristics, neighborhood satisfaction, and well-being: The links with neighborhood deprivation. *Land Use Policy*, *99*(C). https://doi.org/10.1016/j.landusepol.2020.104886

Mukherjee, K. (n.d.). Poverty as a cause and consequence of Ill health. *International Journal of Epidemiologic Research*.

Mullen, S. P., Wójcicki, T. R., Mailey, E. L., Szabo, A. N., Gothe, N. P., Olson, E. A., Fanning, J., Kramer, A., & McAuley, E. (2013). A profile for predicting attrition from exercise in older adults. *Prevention Science: The Official Journal of the Society for Prevention Research*, *14*(5), 489–496. https://doi.org/10.1007/s11121-012-0325-y

Müller-Riemenschneider, F., Reinhold, T., Nocon, M., & Willich, S. N. (2008). Long-term effectiveness of interventions promoting physical activity: A systematic review. *Preventive Medicine*, *47*(4), 354–368. https://doi.org/10.1016/j.ypmed.2008.07.006

Munce, S. E., Gray, C. S., Pomeroy, B. C., Bayley, M., Kokorelias, K. M., Luong, D., Biddiss, E., Cave, T., Bragge, P., Chew-Graham, C. A., Colquhoun, H., Dadich, A., Dainty, K. N., Elliott, M., Feng, P., Goldhar, J., Hamilton, C. B., Harvey, G., Kastner, M., … Kuluski, K. (2023). Development of the Preferred Components for Co-Design in Research Guideline and Checklist: Protocol for a Scoping Review and a Modified

Delphi Process. *JMIR Research Protocols*, *12*(1), e50463. https://doi.org/10.2196/50463

Murad, M. H., Asi, N., Alsawas, M., & Alahdab, F. (2016). New evidence pyramid. *Evidence Based Medicine*, *21*(4), 125–127. https://doi.org/10.1136/ebmed-2016-110401

Murphy, M. H., Donnelly, P., Breslin, G., Shibli, S., & Nevill, A. M. (2013). *Does doing housework keep you healthy? The contribution of domestic physical activity to meeting current recommendations for health*. BMC Public Health, 13, 966. https://doi.org/10.1186/1471-2458-13-966

Murtagh, E. M., Barnes, A. T., McMullen, J., & Morgan, P. J. (2018). Mothers and teenage daughters walking to health: Using the behaviour change wheel to develop an intervention to improve adolescent girls' physical activity. *Public Health*, *158*, 37–46. https://doi.org/10.1016/j.puhe.2018.01.012

Musiimenta, A., Atukunda, E. C., Tumuhimbise, W., Pisarski, E. E., Tam, M., Wyatt, M. A., Ware, N. C., & Haberer, J. E. (2018). Acceptability and Feasibility of Real-Time Antiretroviral Therapy Adherence Interventions in Rural Uganda: Mixed-Method Pilot Randomized Controlled Trial. *JMIR mHealth and uHealth*, *6*(5), e122. https://doi.org/10.2196/mhealth.9031

Naigaga, D. A., Jahanlu, D., Claudius, H. M., Gjerlaug, A. K., Barikmo, I., & Henjum, S. (2018). Body size perceptions and preferences favor overweight in adult Saharawi refugees. *Nutrition Journal*, *17*(1), 17. https://doi.org/10.1186/s12937-018-0330-5

Nationally representative survey of 1000 adult Americans. (2019). Data Decisions Group.

Ndupu, L. B., Staples, V., Lipka, S., Faghy, M., Bessadet, N., & Bussell, C. (2023). Application of theoretical domains framework to explore the enablers and barriers to physical activity among university staff and students: A qualitative study. *BMC Public Health*, *23*(1), 670. https://doi.org/10.1186/s12889-023-15588-w

Neculăesei (onea), A.-N. (2015). Culture And Gender Role Differences. *CrossCultural Management Journal*, *1*, 31–35.

Norris, P., & Inglehart, R. F. (2012). Muslim Integration into Western Cultures: Between Origins and Destinations. *Political Studies*, *60*(2), 228–251. https://doi.org/10.1111/j.1467-9248.2012.00951.x

Nyenhuis, S. M., Shah, N., Ma, J., Marquez, D. X., Wilbur, J., Cattamanchi, A., & Sharp, L. K. (2019). Identifying barriers to physical activity among African American women with asthma. *Cogent Medicine*, *6*(1), 1582399. https://doi.org/10.1080/2331205X.2019.1582399

O'Brien, N., McDonald, S., Araújo-Soares, V., Lara, J., Errington, L., Godfrey, A., Meyer, T. D., Rochester, L., Mathers, J. C., White, M., & Sniehotta, F. F. (2015). The features of interventions associated with long-term effectiveness of physical activity interventions in adults aged 55–70 years: A systematic review and meta-analysis. *Health Psychology Review*, *9*(4), 417–433. https://doi.org/10.1080/17437199.2015.1012177

O'Cathain, A., Croot, L., Sworn, K., Duncan, E., Rousseau, N., Turner, K., Yardley, L., & Hoddinott, P. (2019). Taxonomy of approaches to developing interventions to improve health: A systematic methods overview. *Pilot and Feasibility Studies*, *5*(1), 41. https://doi.org/10.1186/s40814-019-0425-6

Leask, C. F., Sandlund, M., Skelton, D. A., Altenburg, T. M., Cardon, G., Chinapaw, M. J. M., De Bourdeaudhuij, I., Verloigne, M., & Chastin, S. F. M. (2019). Framework, principles and recommendations for utilising participatory methodologies in the

co-creation and evaluation of public health interventions. *Research Involvement and Engagement*, *5*(1), 2. https://doi.org/10.1186/s40900-018-0136-9

Miño-Puigcercós, R., Rivera-Vargas, P., Cobo Romaní, C. (2019). Virtual Communities as Safe Spaces Created by Young Feminists: Identity, Mobility and Sense of Belonging. In: Habib, S., Ward, M.R.M. (eds) Identities, Youth and Belonging. Studies in Childhood and Youth. Palgrave Macmillan, Cham. https://doi.org/10.1007/978-3-319-96113-2_8

NICE. (2012, November 30). The guidelines manual: Assessing cost effectiveness (PMG6, chapter 7). Retrieved from https://www.nice.org.uk/process/pmg6/chapter/assessing-cost-effectiveness

Office for Health Improvement and Disparities (OHID) (2025) Physical Activity: Percentage of physically active adults (19+ yrs) 2022/2023. https://fingertips.phe.org.uk/profile/physical-activity/data#page/3/gid/1938132899/pat/15/par/E92000001/ati/6/are/E12000004/iid/93014/age/298/sex/4/cat/-1/ctp/-1/yrr/1/cid/4/tbm/1 (Accessed: 31 Jan 2025)

Office for Health Improvement and Disparities (OHID) (2025a) Mortality Profile: Mortality rate from all causes, all ages (Persons, 1 year range) 2023. Available at: https://fingertips.phe.org.uk/profile/mortality-profile/data#page/1/gid/1938133009/ati/6/iid/93823/age/1/sex/4/cat/-1/ctp/-1/yrr/1/cid/4/tbm/1 (Accessed: 17 Jan 2025).

Office for Health Improvement and Disparities (OHID) (2025b) Mortality Profile: Mortality rate from cancer, all ages (Persons, 1 year range) 2023. Available at: https://fingertips.phe.org.uk/profile/mortality-profile/data#page/1/gid/1938133009/ati/6/iid/93823/age/1/sex/4/cat/-1/ctp/-1/yrr/1/cid/4/tbm/1 (Accessed: 17 Jan 2025).

Office for Health Improvement and Disparities (OHID) (2025c) Mortality Profile: Mortality rate from cardiovascular disease, all ages (Persons, 1 year range) 2023. Available at: https://fingertips.phe.org.uk/profile/mortality-profile/data#page/1/gid/1938133009/ati/6/iid/93823/age/1/sex/4/cat/-1/ctp/-1/yrr/1/cid/4/tbm/1 (Accessed: 17 Jan 2025).

Office for Health Improvement and Disparities (OHID) (2025d) Mortality Profile: Under 75 mortality rate from causes considered preventable (Persons, 1 year range) 2023. https://fingertips.phe.org.uk/profile/mortality-profile/data#page/1/gid/1938133425/pat/15/par/E92000001/ati/6/are/E12000004/yrr/1/cid/4/tbm/1 (Accessed: 17 Jan 2025).

Office for Health Improvement and Disparities (OHID) (2025e) Physical Activity: Percentage of physically active adults (19+ yrs) 2022/2023. https://fingertips.phe.org.uk/profile/physical-activity/data#page/1/gid/1938132899/ati/6/iid/93014/age/298/sex/4/cat/-1/ctp/-1/yrr/1/cid/4/tbm/1 (Accessed: 17 Jan 2025).

Ortner, S. B. (2022). Patriarchy. *Feminist Anthropology*, *3*(2), 307–314. https://doi.org/10.1002/fea2.12081

O'Shea, O., McCormick, R., Bradley, J. M., & O'Neill, B. (2016). Fidelity review: A scoping review of the methods used to evaluate treatment fidelity in behavioural change interventions. *Physical Therapy Reviews*, *21*(3–6), 207–214. https://doi.org/10.1080/10833196.2016.1261237

Östlund, U., Kidd, L., Wengström, Y., & Rowa-Dewar, N. (2011). Combining qualitative and quantitative research within mixed method research designs: A

methodological review. *International Journal of Nursing Studies*, *48*(3), 369–383. https://doi.org/10.1016/j.ijnurstu.2010.10.005

Othman, M. S., Ludin, A. F. M., Chen, L. L., Hossain, H., Halim, I. I. A., Sameeha, M. J., & Tahir, A. R. M. (2022). Motivations, barriers and exercise preferences among female undergraduates: A need assessment analysis. *PLOS ONE*, *17*(2), e0264158. https://doi.org/10.1371/journal.pone.0264158

Öztürk, P., & Koca, C. (2017). Women's Exercise Experiences in Women-Only Gyms in Turkey: An Examination Within the Framework of Self-Determination Theory. *Women in Sport and Physical Activity Journal*, *25*(2), 118–124. https://doi.org/10.1123/wspaj.2016-0015

Pahkala, K., Heinonen, O. J., Lagström, H., Hakala, P., Sillanmäki, L., & Simell, O. (2007). Leisure-time physical activity of 13-year-old adolescents. *Scandinavian Journal of Medicine & Science in Sports*, *17*(4), 324–330. https://doi.org/10.1111/j.1600-0838.2006.00581.x

Palermi, S., Iacono, O., Sirico, F., Modestino, M., Ruosi, C., Spera, R., & Luca, M. D. (2022). The complex relationship between physical activity and diabetes: An overview. *Journal of Basic and Clinical Physiology and Pharmacology*, *33*(5), 535–547. https://doi.org/10.1515/jbcpp-2021-0279

Palmer, W., Okonya, O., Jellison, S., Horn, J., Harter, Z., Wilkett, M., & Vassar, M. (2021). Intervention reporting of clinical trials published in high-impact cardiology journals: Effect of the TIDieR checklist and guide. *BMJ Evidence-Based Medicine*, *26*(3), 91–97. https://doi.org/10.1136/bmjebm-2019-111309

Parkinson, J., David, P., & Rundle-Thiele, S. (2017). Self-efficacy or perceived behavioural control: Which influences consumers' physical activity and healthful eating behaviour maintenance? *Journal of Consumer Behaviour*, *16*(5), 413–423. https://doi.org/10.1002/cb.1641

Parks, S. E., Housemann, R. A., & Brownson, R. C. (2003). Differential correlates of physical activity in urban and rural adults of various socioeconomic backgrounds in the United States. *Journal of Epidemiology and Community Health*, *57*(1), 29–35. https://doi.org/10.1136/jech.57.1.29

Paulhus, D. L., & Vazire, S. (2007). The self-report method. In *Handbook of research methods in personality psychology* (pp. 224–239). The Guilford Press.

Pavlova, N., Teychenne, M., & Olander, E. K. (2020). The Concurrent Acceptability of a Postnatal Walking Group: A Qualitative Study Using the Theoretical Framework of Acceptability. *International Journal of Environmental Research and Public Health*, *17*(14), 5027. https://doi.org/10.3390/ijerph17145027

Paynter, C., McDonald, C., Story, D., & Francis, J. J. (2023). Application of the theoretical framework of acceptability in a surgical setting: Theoretical and methodological insights. *British Journal of Health Psychology*, *28*(4), 1153–1168. https://doi.org/10.1111/bjhp.12677

Pearce, M., Garcia, L., Abbas, A., Strain, T., Schuch, F. B., Golubic, R., Kelly, P., Khan, S., Utukuri, M., Laird, Y., Mok, A., Smith, A., Tainio, M., Brage, S., & Woodcock, J. (2022). Association Between Physical Activity and Risk of Depression: A Systematic Review and Meta-analysis. *JAMA Psychiatry*, *79*(6), 550. https://doi.org/10.1001/jamapsychiatry.2022.0609

Peeters, G., van Gellecum, Y. R., van Uffelen, J. G. Z., Burton, N. W., & Brown, W. J. (2014). Contribution of house and garden work to the association between physical activity and well-being in young, mid-aged and older women. *British*

Journal of Sports Medicine, *48*(12), 996–1001. https://doi.org/10.1136/bjsports-2012-091103

Peng, B., Ng, J. Y. Y., & Ha, A. S. (2023). Barriers and facilitators to physical activity for young adult women: A systematic review and thematic synthesis of qualitative literature. *International Journal of Behavioral Nutrition and Physical Activity*, *20*(1), 23. https://doi.org/10.1186/s12966-023-01411-7

Phillips, L. A., & Chapman, G. B. (n.d.). *Enjoyment and success: Reciprocal factors in behavior change. - Google Search*. Retrieved 14 September 2025, from https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1559-1816.2011.00849.x

Ponce, A. (2017). Gender and Anti-immigrant Attitudes in Europe. *Socius*, *3*, 2378023117729970. https://doi.org/10.1177/2378023117729970

Pond, M. A. (1961). Interrelationship of poverty and disease. *Public Health Reports (Washington, D.C.: 1896)*, *76*(11), 967–974.

Ponzo, V., Scumaci, E., Goitre, I., Beccuti, G., Benso, A., Belcastro, S., Crespi, C., De Michieli, F., Pellegrini, M., Scuntero, P., Marzola, E., Abbate-Daga, G., Ghigo, E., Broglio, F., & Bo, S. (2021). Predictors of attrition from a weight loss program. A study of adult patients with obesity in a community setting. *Eating and Weight Disorders: EWD*, *26*(6), 1729–1736. https://doi.org/10.1007/s40519-020-00990-9

Povey, R., Conner, M., Sparks, P., James, R., & Shepherd, R. (2000). Application of the Theory of Planned Behaviour to two dietary behaviours: Roles of perceived control and self-efficacy,. *British Journal of Health Psychology*, *5*(2), 121–139.

Pratt, M., Varela, A. R., Salvo, D., Iii, H. W. K., & Ding, D. (2020). Attacking the pandemic of physical inactivity: What is holding us back? *British Journal of Sports Medicine*, *54*(13), 760–762. https://doi.org/10.1136/bjsports-2019-101392

Prince, S. A., Adamo, K. B., Hamel, M. E., Hardt, J., Connor Gorber, S., & Tremblay, M. (2008). A comparison of direct versus self-report measures for assessing physical activity in adults: A systematic review. *The International Journal of Behavioral Nutrition and Physical Activity*, *5*, 56. https://doi.org/10.1186/1479-5868-5-56

PRISMA 2020 checklist. (n.d.). *PRISMA Statement*. Retrieved 13 September 2025, from https://www.prisma-statement.org/prisma-2020-checklist

Prochaska, J. O., & Velicer, W. F. (1997). The Transtheoretical Model of Health Behavior Change. *American Journal of Health Promotion*, *12*(1), 38–48. https://doi.org/10.4278/0890-1171-12.1.38

Prochaska, J. O., Velicer, W. F., Rossi, J. S., Goldstein, M. G., Marcus, B. H., Rakowski, W., Fiore, C., Harlow, L. L., Redding, C. A., & Rosenbloom, D. (1994). Stages of change and decisional balance for 12 problem behaviors. *Health Psychology: Official Journal of the Division of Health Psychology, American Psychological Association*, *13*(1), 39–46. https://doi.org/10.1037//0278-6133.13.1.39

Prochaska, J. O., Redding, C. A., & Evers, K. E. (2008). The transtheoretical model and stages of change. In K. Glanz, B. K. Rimer, & K. Viswanath (Eds.), Health behavior and health education: Theory, research, and practice (4th ed., pp. 97–121). Jossey-Bass/Wiley.

Rahbari, L., & Mahmudabadi, Z. (2022). Women's (non) participation in sports: Gendered attitudes, biopolitics, and women's perceptions of body and sports in Iran. *DiGeSt - Journal of Diversity and Gender Studies*, *9*(1), 89–105. https://doi.org/10.21825/digest.81846

Ramage, E. R., Burke, M., Galloway, M., Graham, I. D., Janssen, H., Marsden, D. L., Patterson, A. J., Pollack, M., Said, C. M., Lynch, E. A., & English, C. (2022). Fit for purpose. Co-production of complex behavioural interventions. A practical guide

and exemplar of co-producing a telehealth-delivered exercise intervention for people with stroke. *Health Research Policy and Systems*, *20*(1), 2. https://doi.org/10.1186/s12961-021-00790-2

Ramakrishnan, R., He, J.-R., Ponsonby, A.-L., Woodward, M., Rahimi, K., Blair, S. N., & Dwyer, T. (2021). Objectively measured physical activity and all cause mortality: A systematic review and meta-analysis. *Preventive Medicine*, *143*, 106356. https://doi.org/10.1016/j.ypmed.2020.106356

Rand, D. G., Brescoll, V. L., Everett, J. A. C., Capraro, V., & Barcelo, H. (2016). Social heuristics and social roles: Intuition favors altruism for women but not for men. *Journal of Experimental Psychology. General*, *145*(4), 389–396. https://doi.org/10.1037/xge0000154

Rathanaswami, K., Bengoechea, E. G., & Blush, P. L. (2016). Physical Activity in First Generation South Asian Women Living in Canada: Barriers and Facilitators to Participation. *Women in Sport and Physical Activity Journal*, *24*(2). https://doi.org/10.1123/wspaj.2015-0019

Reichert, F. F., Barros, A. J. D., Domingues, M. R., & Hallal, P. C. (2007). The Role of Perceived Personal Barriers to Engagement in Leisure-Time Physical Activity. *American Journal of Public Health*, *97*(3), 515–519. https://doi.org/10.2105/AJPH.2005.070144

Reiner, M., Niermann, C., Jekauc, D., & Woll, A. (2013). Long-term health benefits of physical activity – a systematic review of longitudinal studies. *BMC Public Health*, *13*(1), 813. https://doi.org/10.1186/1471-2458-13-813

Research About Physical Activity. (n.d.). *Healthy Monday*. Retrieved 14 September 2025, from https://healthymonday.com/physical-activity-research

Reuter, T., Ziegelmann, J. P., Wiedemann, A. U., Geiser, C., Lippke, S., Schüz, B., & Schwarzer, R. (2010). Changes in Intentions, Planning, and Self-efficacy Predict Changes in Behaviors: An Application of Latent True Change Modeling. *Journal of Health Psychology*, *15*(6), 935–947. https://doi.org/10.1177/1359105309360071

Rhodes, R. E., McEwan, D., & Rebar, A. L. (2019). Theories of physical activity behaviour change: A history and synthesis of approaches. *Psychology of Sport and Exercise*, *42*, 100–109. https://doi.org/10.1016/j.psychsport.2018.11.010

Riddoch, C. J., Bo Andersen, L., Wedderkopp, N., Harro, M., Klasson-Heggebø, L., Sardinha, L. B., Cooper, A. R., & Ekelund, U. (2004). Physical Activity Levels and Patterns of 9- and 15-yr-Old European Children: *Medicine & Science in Sports & Exercise*, *36*(1), 86–92. https://doi.org/10.1249/01.MSS.0000106174.43932.92

Ripley-Gonzalez, J. W., Zhou, N., Zeng, T., You, B., Zhang, W., Liu, J., & Liu, S. (2023). The long-term impact of the COVID-19 pandemic on physical fitness in young adults: A historical control study. *Scientific Reports*, *13*(1), 15430.

Robinson, E., Sutin, A. R., Daly, M., & Jones, A. (2022). A systematic review and meta-analysis of longitudinal cohort studies comparing mental health before versus during the COVID-19 pandemic in 2020. *Journal of Affective Disorders*, *296*, 567–576. https://doi.org/10.1016/j.jad.2021.09.098

Roche, C., Fisher, A., Fancourt, D., & Burton, A. (2022). Exploring Barriers and Facilitators to Physical Activity during the COVID-19 Pandemic: A Qualitative Study. *International Journal of Environmental Research and Public Health*, *19*(15), 9169. https://doi.org/10.3390/ijerph19159169

Rodgers, R. F., Laveway, K., Campos, P., & de Carvalho, P. H. B. (2023). Body image as a global mental health concern. *Cambridge Prisms: Global Mental Health*, *10*, e9. https://doi.org/10.1017/gmh.2023.2

Rodriguez, D. V., Lawrence, K., Luu, S., Yu, J. L., Feldthouse, D. M., Gonzalez, J., & Mann, D. (2021). Development of a computer-aided text message platform for user engagement with a digital Diabetes Prevention Program: A case study. *Journal of the American Medical Informatics Association : JAMIA*, *29*(1), 155–162. https://doi.org/10.1093/jamia/ocab206

Roemer, J. E., & Trannoy, A. (2015). Chapter 4—Equality of Opportunity. In A. B. Atkinson & F. Bourguignon (Eds), *Handbook of Income Distribution* (Vol. 2, pp. 217–300). Elsevier. https://doi.org/10.1016/B978-0-444-59428-0.00005-9

Rogers, L. Q., Hopkins-Price, P., Vicari, S., Markwell, S., Pamenter, R., Courneya, K. S., Hoelzer, K., Naritoku, C., Edson, B., Jones, L., Dunnington, G., & Verhulst, S. (2009). Physical Activity and Health Outcomes Three Months After Completing a Physical Activity Behavior Change Intervention: Persistent and Delayed Effects. *Cancer Epidemiology, Biomarkers & Prevention*, *18*(5), 1410–1418. https://doi.org/10.1158/1055-9965.EPI-08-1045

Rogerson, M., Wood, C., Pretty, J., Schoenmakers, P., Bloomfield, D., & Barton, J. (2020). Regular Doses of Nature: The Efficacy of Green Exercise Interventions for Mental Wellbeing. *International Journal of Environmental Research and Public Health*, *17*(5), 1526. https://doi.org/10.3390/ijerph17051526

Román-Gálvez, M. R., Amezcua-Prieto, C., Salcedo-Bellido, I., Olmedo-Requena, R., Martínez-Galiano, J. M., Khan, K. S., & Bueno-Cavanillas, A. (2021). Physical activity before and during pregnancy: A cohort study. *International Journal of Gynecology & Obstetrics*. https://obgyn.onlinelibrary.wiley.com/doi/abs/10.1002/ijgo.13387

Romeo, A., Edney, S., Plotnikoff, R., Curtis, R., Ryan, J., Sanders, I., Crozier, A., & Maher, C. (2019). Can Smartphone Apps Increase Physical Activity? Systematic Review and Meta-Analysis. *Journal of Medical Internet Research*, *21*(3), e12053. https://doi.org/10.2196/12053

Rosenbaum, S., Tiedemann, A., Sherrington, C., Curtis, J., & Ward, Philip. B. (n.d.). Physical Activity Interventions for People With Mental Illness: A Systematic Review and Meta-Analysis. *The Journal of Clinical Psychiatry*, *75*(9), 964–974.

Roshanaei-Moghaddam, B., Katon, W. J., & Russo, J. (2009). The longitudinal effects of depression on physical activity. *General Hospital Psychiatry*, *31*(4), 306–315. https://doi.org/10.1016/j.genhosppsych.2009.04.002

Rosselli, M., Ermini, E., Tosi, B., Boddi, M., Stefani, L., Toncelli, L., & Modesti, P. A. (2020). Gender differences in barriers to physical activity among adolescents. *Nutrition, Metabolism and Cardiovascular Diseases*, *30*(9), 1582–1589. https://doi.org/10.1016/j.numecd.2020.05.005

Rostila, M. (2008). The Swedish labour market in the 1990s: The very last of the healthy jobs? *Scandinavian Journal of Public Health*, *36*(2), 126–134. https://doi.org/10.1177/1403494807085067

Rudin, J., Billing, T., Farro, A., & Yang, Y. (2023). When are trans women treated worse than trans men? *Equality, Diversity and Inclusion*, *42*(6), 723–736. https://doi.org/10.1108/EDI-08-2021-0195

Ruissen, G. R., Rhodes, R. E., & Beauchamp, M. R. (2019). 'Active'ating thoughts about affect: Elicitation of physical activity judgements in insufficiently active women. *Psychology & Health*, *34*(5), 590–608. https://doi.org/10.1080/08870446.2018.1554183

Ruiz, Jonatan. R., Ortega, Francisco. B., Martinez-Gomez, D., Labayen, I., Moreno, Luis. A., De Bourdeaudhuij, I., Manios, Y., Gonzales-Gross, M., Mauro, B., Molnar, D.,

Widhalm, K., Marcos, A., Beghin, L., Castillo, Manuel. J., & Sjöström, M. (2011). Objectively measured physical activity and sedentary time in European adolescents: The HELENA study. *American Journal of Epidemiology*, *174*(2), 173–184. https://doi.org/10.1093/aje/kwr068

Rumsfeld, D. (2011). *Known and Unknown: A Memoir*. Penguin.

Ryan, J., & Martens, K. (2023). Defining and implementing a sufficient level of accessibility: What's stopping us? *Transportation Research Part A: Policy and Practice*, *175*, 103792. https://doi.org/10.1016/j.tra.2023.103792

Ryan, R. A., Lappen, H., & Bihuniak, J. D. (2022). Barriers and Facilitators to Healthy Eating and Physical Activity Postpartum: A Qualitative Systematic Review. *Journal of the Academy of Nutrition and Dietetics*, *122*(3), 602-613.e2. https://doi.org/10.1016/j.jand.2021.11.015

Ryan, S., Ussher, J. M., & Hawkey, A. (2021). Managing the premenstrual body: A body mapping study of women's negotiation of premenstrual food cravings and exercise. *Journal of Eating Disorders*, *9*(1), 125. https://doi.org/10.1186/s40337-021-00478-6

Safi, A., & Myers, T. D. (2021). Barriers to Physical Activity: A comparison of Afghans living in the UK and Afghanistan. *Advances in Physical Education*, *11*(01), 103–117.

Sallis, J. F., & Saelens, B. E. (2000a). Assessment of physical activity by self-report: Status, limitations, and future directions. *Research Quarterly for Exercise and Sport*, *71 Suppl 2*, 1–14. https://doi.org/10.1080/02701367.2000.11082780

Sallis, J. F., & Saelens, B. E. (2000b). Assessment of physical activity by self-report: Status, limitations, and future directions. , 71(sup2), 1-14. - Google Search. *Research Quarterly for Exercise and Sport*, *71*(sup2), 1–14.

Sallis, J., & Own, N. (1998). *Physical Activity and Behavioral Medicine. In Sallis, J. and Owen, N., Eds., Behavioral Medicine and Health Psychology,* (Vol. 3). Sage Publications. https://www.scirp.org/reference/referencespapers?referenceid=1456171

Sanchez, A., Bully, P., Martinez, C., & Grandes, G. (2015). Effectiveness of physical activity promotion interventions in primary care: A review of reviews. *Preventive Medicine*, *76*, S56-67. https://doi.org/10.1016/j.ypmed.2014.09.012

Sanetti, L. M. H., Cook, B. G., & Cook, L. (2021). Treatment Fidelity: What it is and Why it Matters. *Learning Disabilities Research & Practice*, *36*(1), 5–11. https://doi.org/10.1111/ldrp.12238

Santos, A. C., Willumsen, J., Meheus, F., Ilbawi, A., & Bull, F. C. (2023). The cost of inaction on physical inactivity to public health-care systems: A population-attributable fraction analysis. *The Lancet Global Health*, *11*(1), e32–e39. https://doi.org/10.1016/S2214-109X(22)00464-8

Sanz-Remacha, M., García-González, L., Sevil Serrano, J., Generelo Lanaspa, E., & Aibar Solana, A. (2019). Barriers to Physical Activity in Disadvantaged Population: A Qualitative Comparison between Roma and Non-Roma Women. *Research Quarterly for Exercise and Sport*, *90*(4), 567–577. https://doi.org/10.1080/02701367.2019.1635245

Scarabottolo, C. C., Tebar, W. R., Gobbo, L. A., Ohara, D., Ferreira, A. D., da Silva Canhin, D., & Christofaro, D. G. D. (2022). Analysis of different domains of physical activity with health-related quality of life in adults: 2-year cohort. *Health and Quality of Life Outcomes*, *20*(1), 71. https://doi.org/10.1186/s12955-022-01981-3

Seale, H., Dyer, C. E. F., Abdi, I., Rahman, K. M., Sun, Y., Qureshi, M. O., Dowell-Day, A., Sward, J., & Islam, M. S. (2020). Improving the impact of non-pharmaceutical

interventions during COVID-19: Examining the factors that influence engagement and the impact on individuals. *BMC Infectious Diseases*, *20*(1), 607. https://doi.org/10.1186/s12879-020-05340-9

Segar, M. L., Heinrich, K. M., Zieff, S. G., Lyn, R., Gustat, J., Tompkins, N. O., Perry, C. K., Umstattd Meyer, M. R., Bornstein, D., Manteiga, A., & Eyler, A. A. (2017). What walking means to moms: Insights from a national sample to frame walking in compelling ways to low-income urban mothers. *Journal of Transport & Health*, *5*, 5–15. https://doi.org/10.1016/j.jth.2016.06.004

Sekhon, M., Cartwright, M., & Francis, J. J. (2017). Acceptability of healthcare interventions: An overview of reviews and development of a theoretical framework. *BMC Health Services Research*, *17*(1), 88. https://doi.org/10.1186/s12913-017-2031-8

Sendra, P. (2024). The ethics of co-design. *Journal of Urban Design*, *29*(1), 4–22. https://doi.org/10.1080/13574809.2023.2171856

Sequeira, S., Cruz, C., Pinto, D., Santos, L., & Marques, A. (2011). Prevalence of barriers for physical activity in adults according to gender and socioeconomic status. *British Journal of Sports Medicine*, *45*(15), A18–A19. https://doi.org/10.1136/bjsports-2011-090606.59

Shah, N., Kramer, J., Borrelli, B., & Kumar, D. (2020). Sex differences in barriers and facilitators related to physical activity in adults with knee pain. *Osteoarthritis and Cartilage*, *28*, S169. https://doi.org/10.1016/j.joca.2020.02.275

Sharara, E, Akik, C, Ghattas, H, & Obermeyer, C. M. (2018). Physical inactivity, gender and culture in Arab countries: A systematic assessment of the literature. *BMC Public Health*, *18*(1), 1–19. https://doi.org/10.1186/s12889-018-5472-z

Sheeran, P. (2002). Intention—Behavior Relations: A Conceptual and Empirical Review. *European Review of Social Psychology*, *12*(1), 1–36. https://doi.org/10.1080/14792772143000003

Sheeran, P., Maki, A., Montanaro, E., Avishai-Yitshak, A., Bryan, A., Klein, W. M. P., Miles, E., & Rothman, A. J. (2016). The impact of changing attitudes, norms, and self-efficacy on health-related intentions and behavior: A meta-analysis. *Health Psychology*, *35*(11), 1178–1188. https://doi.org/10.1037/hea0000387

Sheeran, P., & Webb, T. L. (2016). The Intention–Behavior Gap. *Social and Personality Psychology Compass*, *10*(9), 503–518. https://doi.org/10.1111/spc3.12265

Shin, H., & Park, C. (2023). Gender differences in social networks and physical and mental health: Are social relationships more health protective in women than in men? *Frontiers in Psychology*, *14*. https://doi.org/10.3389/fpsyg.2023.1216032

Short, C. E., Vandelanotte, C., & Duncan, M. J. (2014). Individual characteristics associated with physical activity intervention delivery mode preferences among adults. *International Journal of Behavioral Nutrition and Physical Activity*, *11*(1), 25. https://doi.org/10.1186/1479-5868-11-25

Siddiqi, Z., Tiro, J. A., & Shuval, K. (2011). Understanding impediments and enablers to physical activity among African American adults: A systematic review of qualitative studies. *Health Education Research*, *26*(6), 1010–1024. https://doi.org/10.1093/her/cyr068

Silva-Jose, C., Sánchez-Polán, M., Barakat, R., Gil-Ares, J., & Refoyo, I. (2022). Level of Physical Activity in Pregnant Populations from Different Geographic Regions: A Systematic Review. *Journal of Clinical Medicine*, *11*(15), 4638. https://doi.org/10.3390/jcm11154638

Simko, L., Chin, B., Na, S., Saluja, H. K., Zhu, T. Q., Kohno, T., Hiniker, A., Yip, J., & Cobb, C. (2021). Would You Rather: A Focus Group Method for Eliciting and Discussing Formative Design Insights with Children. *Interaction Design and Children*, 131–146. https://doi.org/10.1145/3459990.3460708

Simmons, W. O., & Emanuele, R. (2007). Male-female giving differentials: Are women more altruistic? *Journal of Economic Studies*, *34*(6), 534–550. https://doi.org/DOI:%252010.1108/01443580710830989

Singh, B., Olds, T., Curtis, R., Dumuid, D., Virgara, R., Watson, A., Szeto, K., O'Connor, E., Ferguson, T., Eglitis, E., Miatke, A., Simpson, C. E., & Maher, C. (2023). Effectiveness of physical activity interventions for improving depression, anxiety and distress: An overview of systematic reviews. *British Journal of Sports Medicine*, *57*(18), 1203–1209. https://doi.org/10.1136/bjsports-2022-106195

Singh, B., Olds, T., Curtis, R., Dumuid, D., Virgara, R., Watson, A., Szeto, K., O'Connor, E., Ferguson, T., Eglitis, E., Miatke, A., Simpson, Catherine, E. M., & Maher, C. (2023). Effectiveness of physical activity interventions for improving depression, anxiety and distress: An overview of systematic reviews. *British Journal of Sports Medicine*. https://bjsm.bmj.com/content/57/18/1203

Singh, J. (2013). Critical appraisal skills programme. *Ournal of Pharmacology and Pharmacotherapeutics, 4*(1), 76–77.

Sivertsen, T. B., Åstrøm, A. N., Greve, G., Aßmus, J., & Skeie, M. S. (2018). Effectiveness of an oral health intervention program for children with congenital heart defects. *BMC Oral Health*, *18*(1), 50. https://doi.org/10.1186/s12903-018-0495-5

Skivington, K., Matthews, L., Simpson, S. A., Craig, P., Baird, J., Blazeby, J. M., Boyd, K. A., Craig, N., French, D. P., McIntosh, E., Petticrew, M., Rycroft-Malone, J., White, M., & Moore, L. (2021). A new framework for developing and evaluating complex interventions: Update of Medical Research Council guidance. *BMJ*, n2061. https://doi.org/10.1136/bmj.n2061

Slater, A., & Tiggemann, M. (2010). "Uncool to do sport": A focus group study of adolescent girls' reasons for withdrawing from physical activity. *Psychology of Sport and Exercise*, *11*(6), 619–626. https://doi.org/10.1016/j.psychsport.2010.07.006

Slattery, P., Saeri, A. K., & Bragge, P. (2020). Research co-design in health: A rapid overview of reviews. *Health Research Policy and Systems*, *18*(1), 17. https://doi.org/10.1186/s12961-020-0528-9

Slimani, M., Paravlic, A., Mbarek, F., Bragazzi, N. L., & Tod, D. (2020). The Relationship Between Physical Activity and Quality of Life During the Confinement Induced by COVID-19 Outbreak: A Pilot Study in Tunisia. *Frontiers in Psychology*, *11*, 1882. https://doi.org/10.3389/fpsyg.2020.01882

Sniehotta, F. F., Presseau, J., & Araújo-Soares, V. (2014). Time to retire the theory of planned behaviour. *Health Psychology Review*, *8*(1), 1–7. https://doi.org/10.1080/17437199.2013.869710

Soltani, A. (2021). Hijab in the water! Muslim women and participation in aquatic leisure activities in New Zealand: An intersectional approach. *Leisure Studies*, *40*(6), 810–825. https://doi.org/10.1080/02614367.2021.1933143

Sørensen, M., & Gill, D. L. (2008). Perceived barriers to physical activity across Norwegian adult age groups, gender and stages of change. *Scandinavian Journal of Medicine & Science in Sports*, *18*(5), 651–663. https://doi.org/10.1111/j.1600-0838.2007.00686.x

Spence, J. C., Rhodes, R. E., McCurdy, A., Mangan, A., Hopkins, D., & Mummery, W. K. (2021). Determinants of physical activity among adults in the United Kingdom during the COVID-19 pandemic: The DUK-COVID study. *British Journal of Health Psychology*, *26*(2), 588–605. https://doi.org/10.1111/bjhp.12497

Spencer, R. A., Rehman, L., & Kirk, S. F. (2015). Understanding gender norms, nutrition, and physical activity in adolescent girls: A scoping review. *International Journal of Behavioral Nutrition and Physical Activity*, *12*, 1–10.

Spencer, R. A., Rehman, L., & Kirk, S. F. (2015). Understanding gender norms, nutrition, and physical activity in adolescent girls: A scoping review. *International Journal of Behavioral Nutrition and Physical Activity*, *12*(1), 6. https://doi.org/10.1186/s12966-015-0166-8

Sport England (2018) Active lives adult survey, November 16/17 report. Sport England. https://www.sportengland.org/media/13052/active-lives-adult-survey-nov-16-17-report.pdf.

Sport England. (n.d.). *New strategy to tackle inactivity*. Retrieved 13 September 2025, from https://www.sportengland.org/news/sport-england-triples-investment-in-tackling-inactivity

Spotswood, F., Nobles, J., & Armstrong, M. (2021). "We're just stuck in a daily routine": Implications of the temporal dimensions, demands and dispositions of mothering for leisure time physical activity. *Sociology of Health & Illness*, *43*(5), 1254–1269. https://doi.org/10.1111/1467-9566.13291

Stamatakis, E., Hillsdon, M., & Primatesta, P. (2007). Domestic physical activity in relationship to multiple CVD risk factors. *American Journal of Preventive Medicine*, *32*(4), 320–327. https://doi.org/10.1016/j.amepre.2006.12.020

Staniford, L. J., & Schmidtke, K. A. (2020). A systematic review of hand-hygiene and environmental-disinfection interventions in settings with children. *BMC Public Health*, *20*(1), 195. https://doi.org/10.1186/s12889-020-8301-0

Starck, P. L. (n.d.). Human Suffering. In *Logotherapy and Existential Analysis* (pp. 57–75). https://doi.org/10.1007/978-3-031-48922-8_4

Steinmo, S., Hagger-Johnson, G., & Shahab, L. (2014). Bidirectional association between mental health and physical activity in older adults: Whitehall II prospective cohort study. *Preventive Medicine*, *66*, 74–79. https://doi.org/10.1016/j.ypmed.2014.06.005

Stern, C., Lizarondo, L., Carrier, J., Godfrey, C., Rieger, K., Salmond, S., Apóstolo, J., Kirkpatrick, P., & Loveday, H. (2020). Methodological guidance for the conduct of mixed methods systematic reviews. *JBI Evidence Synthesis*, *18*(10), 2108–2118. https://doi.org/10.11124/JBISRIR-D-19-00169

Stevens, C. (2018). Fat on Campus: Fat College Students and Hyper(in)visible Stigma. *Sociological Focus*, *51*(2), 130–149. https://doi.org/10.1080/00380237.2017.1368839

Stewart-Brown, S., Tennant, A., Tennant, R., Platt, S., Parkinson, J., & Weich, S. (2009). Internal construct validity of the Warwick-Edinburgh Mental Well-being Scale (WEMWBS): A Rasch analysis using data from the Scottish Health Education Population Survey. *Health and Quality of Life Outcomes*, *7*, 15. https://doi.org/10.1186/1477-7525-7-15

Strasser, B., Spreitzer, A., & Haber, P. (2007). Fat Loss Depends on Energy Deficit Only, Independently of the Method for Weight Loss. *Annals of Nutrition and Metabolism*, *51*(5), 428–432. https://doi.org/10.1159/000111162

Strategic exit interviewing: Encouraging voice, enhancing alignment and examining process. (2017). *Journal of Organizational Effectiveness: People and Performance*, *4*(1), 59–75. https://doi.org/10.1108/JOEPP-03-2016-0023

Streetman, A. E., Lister, M. M., Brown, A., Brin, H. N., & Heinrich, K. M. (2023). A Mixed-Methods Study of Women's Empowerment through Physical Activities: Relationships with Self-Efficacy and Physical Activity Levels. *Journal of Functional Morphology and Kinesiology*, *8*(3), 118. https://doi.org/10.3390/jfmk8030118

Stubbs, B., Vancampfort, D., Rosenbaum, S., Ward, P. B., Richards, J., Soundy, A., Veronese, N., Solmi, M., & Schuch, F. B. (2016). Dropout from exercise randomized controlled trials among people with depression: A meta-analysis and meta regression. *Journal of Affective Disorders*, *190*, 457–466. https://doi.org/10.1016/j.jad.2015.10.019

Suderman, K., Skene, T., Sellar, C., Dolgoy, N., Pituskin, E., Joy, A. A., Culos-Reed, S. N., & McNeely, M. L. (2022). Virtual or In-Person: A Mixed Methods Survey to Determine Exercise Programming Preferences during COVID-19. *Current Oncology*, *29*(10), 6735–6748. https://doi.org/10.3390/curroncol29100529

Sumption, M., Walsh, P. W., & Brindle, B. (n.d.). *Net migration to the UK: Migration observatory briefing*. University of Oxford. Retrieved 14 September 2025, from https://migrationobservatory.ox.ac.uk/resources/briefings/long-term-international-migration-flows-to-and-from-the-uk/

Sun, F., Norman, I. J., & While, A. E. (2013). Physical activity in older people: A systematic review. *BMC Public Health*, *13*(1), 449. https://doi.org/10.1186/1471-2458-13-449

Sutton-Long, C. (2015). Co-design for community inclusion (Huddle report). National Disability Services. https://nds.org.au/images/events/files/huddle_report.pdf

Swami, V. (2015). Cultural influences on body size ideals: Unpacking the impact of Westernization and modernization. *European Psychologist*, *20*(1), 44–51. https://doi.org/10.1027/1016-9040/a000150

Swann, C., Jackman, P. C., Lawrence, A., Hawkins, R. M., Goddard, S. G., Williamson, O., Schweickle, M. J., Vella, S. A., Rosenbaum, S., & Ekkekakis, P. (2023). The (over)use of SMART goals for physical activity promotion: A narrative review and critique. *Health Psychology Review*, *17*(2), 211–226. https://doi.org/10.1080/17437199.2021.2023608

Tabatabaei, S. V. A., Ardabili, H. E., Haghdoost, A. A., Nakhaee, N., & Shams, M. (2017). Promoting physical activity in Iranian women: A qualitative study using social marketing. *Electronic Physician*, *9*(9), 5279–5286. https://doi.org/10.19082/5279

Tay, B. S. J., Cox, D. N., Brinkworth, G. D., Davis, A., Edney, S. M., Gwilt, I., & Ryan, J. C. (2021). Co-Design Practices in Diet and Nutrition Research: An Integrative Review. *Nutrients*, *13*(10), 3593. https://doi.org/10.3390/nu13103593

Taylor, D., Bury, M., Campling, N., Carter, S., Garfied, S., Newbould, J., & Rennie, T. (2007). *A Review of the use of the Health Belief Model (HBM), the Theory of Reasoned Action (TRA), the Theory of Planned Behaviour (TPB) and the Trans-Theoretical Model (TTM) to study and predict health related behaviour change*. The School of Pharmacy, University of London. http://eprints.soton.ac.uk/id/eprint/458013

Taylor, P. D., Bury, P. M., Campling, D. N., Carter, D. S., Garfied, D. S., Newbould, D. J., & Rennie, D. T. (n.d.). *A Review of the use of the Health Belief Model (HBM), the Theory of Reasoned Action (TRA), the Theory of Planned Behaviour (TPB) and the*

Trans-Theoretical Model (TTM) to study and predict health related behaviour change.

Teixeira, A. L. S., Damasceno, V. O., Dias, M. R. C., Lamounier, J. A., & Gardner, R. M. (2013). Association between Different Phases of Menstrual Cycle and Body Image Measures of Perceived Size, Ideal Size, and Body Dissatisfaction. *Perceptual and Motor Skills*, *117*(3), 892–902. https://doi.org/10.2466/24.27.PMS.117x31z1

ten Have, M., de Beaufort, I. D., Teixeira, P. J., Mackenbach, J. P., & van der Heide, A. (2011). Ethics and prevention of overweight and obesity: An inventory. *Obesity Reviews: An Official Journal of the International Association for the Study of Obesity*, *12*(9), 669–679. https://doi.org/10.1111/j.1467-789X.2011.00880.x

Tennant, R., Hiller, L., Fishwick, R., Platt, S., Joseph, S., Weich, S., Parkinson, J., Secker, J., & Stewart-Brown, S. (2007). The Warwick-Edinburgh Mental Well-being Scale (WEMWBS): Development and UK validation. *Health and Quality of Life Outcomes*, *5*, 63. https://doi.org/10.1186/1477-7525-5-63

Teychenne, M., Ball, K., & Salmon, J. (2010). Sedentary Behavior and Depression Among Adults: A Review. *International Journal of Behavioral Medicine*, *17*(4), 246–254. https://doi.org/10.1007/s12529-010-9075-z

Thabrew, H., Fleming, T., Hetrick, S., & Merry, S. (2018). Co-design of eHealth Interventions With Children and Young People. *Frontiers in Psychiatry*, *9*. https://doi.org/10.3389/fpsyt.2018.00481

The IMAGE Study Group, Greaves, C. J., Sheppard, K. E., Abraham, C., Hardeman, W., Roden, M., Evans, P. H., & Schwarz, P. (2011). Systematic review of reviews of intervention components associated with increased effectiveness in dietary and physical activity interventions. *BMC Public Health*, *11*(1), 119. https://doi.org/10.1186/1471-2458-11-119

Thorn, P., Hill, N. T., Lamblin, M., Teh, Z., Battersby-Coulter, R., Rice, S., Bendall, S., Gibson, K. L., Finlay, S. M., Blandon, R., Souza, L. de, West, A., Cooksey, A., Sciglitano, J., Goodrich, S., & Robinson, J. (2020). Developing a Suicide Prevention Social Media Campaign With Young People (The #Chatsafe Project): Co-Design Approach. *JMIR Mental Health*, *7*(5), e17520. https://doi.org/10.2196/17520

Tiggemann, M., & Zaccardo, M. (2018). 'Strong is the new skinny': A content analysis of #fitspiration images on Instagram. *Journal of Health Psychology*, *23*(8), 1003–1011. https://doi.org/10.1177/1359105316639436

Tinius, R. A., Polston, M., Bradshaw, H., Ashley, P., Greene, A., & Parker, A. (2021). An Assessment of Mobile Applications Designed to Address Physical Activity During Pregnancy and Postpartum. *International Journal of Exercise Science*, *14*(7). https://doi.org/10.70252/AQIG9215

Tinker, A., Molloy, L., Monks, I., Pennells, L., Russell, E., & Haines, E. (2017). The benefits and barriers of exercise for the physical health of older women. *Journal of Aging and Clinical Research*, *6*, 73–79. https://doi.org/10.14283/jarcp.2017.6

Tong, A., Flemming, K., McInnes, E., Oliver, S., & Craig, J. (2012). Enhancing transparency in reporting the synthesis of qualitative research: ENTREQ. *BMC Medical Research Methodology*, *12*(1), 181. https://doi.org/10.1186/1471-2288-12-181

Troiano, R. P., Berrigan, D., Dodd, K. W., Mâsse, L. C., Tilert, T., & Mcdowell, M. (2008). Physical Activity in the United States Measured by Accelerometer. *Medicine & Science in Sports & Exercise*, *40*(1), 181–188. https://doi.org/10.1249/mss.0b013e31815a51b3

Trost, S. G., Pate, R. R., Sallis, J. F., Freedson, P. S., Taylor, W. C., Dowda, M., & Sirard, J. (2002). Age and gender differences in objectively measured physical activity in youth: *Medicine and Science in Sports and Exercise*, *34*(2), 350–355. https://doi.org/10.1097/00005768-200202000-00025

Turner, P., & Turner, S. (2011). Is stereotyping inevitable when designing with personas? *Design Studies*, *32*(1), 30–44. https://doi.org/10.1016/j.destud.2010.06.002

UK Government, Office for Health Improvement and Disparities. (2022, March 10). Physical activity: Applying All Our Health. GOV.UK. https://www.gov.uk/government/publications/physical-activity-applying-all-our-health/physical-activity-applying-all-our-health

Uhlendorff, A., & Zimmermann, K. F. (2014). Unemployment Dynamics among Migrants and Natives. *Economica*, *81*(322), 348–367. https://doi.org/10.1111/ecca.12077

Using the Student's t-test with extremely small sample sizes. (n.d.).

Van Aerde, J. (n.d.). *BOOK REVIEW: The Behaviour Change Wheel: A Guide to Designing interventions*. Canadian Conference on Physician Leadership, Vancouver. Retrieved 21 September 2025, from https://cjpl.ca/picard.html

Van Gorp, K. (2013). The Second Shift: Why it is Diminishing but Still an Issue. *The Review: A Journal of Undergraduate Student Research*, *14*(1), 31–37.

van Nes, F., Abma, T., Jonsson, H., & Deeg, D. (2010). Language differences in qualitative research: Is meaning lost in translation? *European Journal of Ageing*, *7*(4), 313–316. https://doi.org/10.1007/s10433-010-0168-y

van Sluijs, E. M. F., van Poppel, M. N. M., Twisk, J. W. R., Chin A Paw, M. J., Calfas, K. J., & van Mechelen, W. (2005). Effect of a tailored physical activity intervention delivered in general practice settings: Results of a randomized controlled trial. *American Journal of Public Health*, *95*(10), 1825–1831. https://doi.org/10.2105/AJPH.2004.044537

Van Uffelen, J. G. Z., Khan, A., & Burton, N. W. (2017). Gender differences in physical activity motivators and context preferences: A population-based study in people in their sixties. *BMC Public Health*, *17*(1), 624. https://doi.org/10.1186/s12889-017-4540-0

van Wee, B. (2022). Accessibility and equity: A conceptual framework and research agenda. *Journal of Transport Geography*, *104*, 103421. https://doi.org/10.1016/j.jtrangeo.2022.103421

Vandelanotte, C., Spathonis, K. M., Eakin, E. G., & Owen, N. (2007). Website-Delivered Physical Activity Interventions: A Review of the Literature. *American Journal of Preventive Medicine*, *33*(1), 54–64. https://doi.org/10.1016/j.amepre.2007.02.041

Vargas, C., Whelan, J., Brimblecombe, J., & Allender, S. (2022). Co-creation, co-design, co-production for public health – a perspective on definition and distinctions. *Public Health Research & Practice*, *32*(2). https://doi.org/10.17061/phrp3222211

Vella, S. A., Swann, C., Allen, M. S., Schweickle, M. J., & Magee, C. A. (2017). Bidirectional Associations between Sport Involvement and Mental Health in Adolescence. *Medicine and Science in Sports and Exercise*, *49*(4), 687–694. https://doi.org/10.1249/MSS.0000000000001142

Verbeek, M. J. A., Hommes, M. A., Stutterheim, S. E., van Lankveld, J. J. D. M., & Bos, A. E. R. (2020). Experiences with stigmatization among transgender individuals after transition: A qualitative study in the Netherlands. *International Journal of Transgender Health*, *21*(2), 220–233. https://doi.org/10.1080/26895269.2020.1750529

Viciana, J., Mayorga-Vega, D., & Martínez-Baena, A. (2016). Moderate-to-Vigorous Physical Activity Levels in Physical Education, School Recess, and After-School Time: Influence of Gender, Age, and Weight Status. *Journal of Physical Activity and Health*, *13*(10), 1117–1123. https://doi.org/10.1123/jpah.2015-0537

Villanti, A. C., West, J. C., Klemperer, E. M., Graham, A. L., Mays, D., Mermelstein, R. J., & Higgins, S. T. (2020). Smoking-Cessation Interventions for U.S. Young Adults: Updated Systematic Review. *American Journal of Preventive Medicine*, *59*(1), 123–136. https://doi.org/10.1016/j.amepre.2020.01.021

Vuong, Q. (2022). *Design process for a photography service application: The application of Double Diamond to UX/ UI design process*. http://www.theseus.fi/handle/10024/755313

Walsh, A., & Simpson, E. E. A. (2020). Health cognitions mediate physical (in)activity and walking in midlife women. *Maturitas*, *131*, 14–20. https://doi.org/10.1016/j.maturitas.2019.10.005

Wang, J., & Geng, L. (2019). Effects of Socioeconomic Status on Physical and Psychological Health: Lifestyle as a Mediator. *International Journal of Environmental Research and Public Health*, *16*(2), 281. https://doi.org/10.3390/ijerph16020281

Wang, L.-J., Chen, C.-K., Hsu, S.-C., Lee, S.-Y., Wang, C.-S., & Yeh, W.-Y. (2011). Active job, healthy job? Occupational stress and depression among hospital physicians in Taiwan. *Industrial Health*, *49*(2), 173–184. https://doi.org/10.2486/indhealth.ms1209

Wang, X., Huang, Z., Xu, T., Li, Y., & Qin, X. (2023). Exploring the Future Design Approach to Ageing Based on the Double Diamond Model. *Systems*, *11*(8), 404. https://doi.org/10.3390/systems11080404

Wanner, M., Martin-Diener, E., Braun-Fahrländer, C., Bauer, G., & Martin, B. W. (2009). Effectiveness of active-online, an individually tailored physical activity intervention, in a real-life setting: Randomized controlled trial. *Journal of Medical Internet Research*, *11*(3), e23. https://doi.org/10.2196/jmir.1179

Warburton, D. E. R., Bredin, S. S. D., Jamnik, V. K., & Gledhill, N. (2011). Validation of the PAR-Q+ and ePARmed-X+. *The Health & Fitness Journal of Canada*, *4*(2), 38–46. https://doi.org/10.14288/hfjc.v4i2.151

Warburton, D. E. R., Nicol, C. W., & Bredin, S. S. D. (2006). Health benefits of physical activity: A systematic review of the evidence. *CMAJ: Canadian Medical Association Journal = Journal de l'Association Medicale Canadienne*, *174*(6), 801–809. https://doi.org/10.1503/cmaj.051351

Ware, L. J., Prioreschi, A., Bosire, E., Cohen, E., Draper, C. E., Lye, S. J., & Norris, S. A. (2019). Environmental, Social, and Structural Constraints for Health Behavior: Perceptions of Young Urban Black Women During the Preconception Period—A *Healthy Life Trajectories Initiative*. *Journal of Nutrition Education and Behavior*, *51*(8), 946–957. https://doi.org/10.1016/j.jneb.2019.04.009

Ware, M. (2008). Peer review in scholarly journals: Perspective of the scholarly community – Results from an international study. *Information Services & Use*, *28*(2), 109–112. https://doi.org/10.3233/ISU-2008-0568

Washington, M. S., & Economides, M. (2016). Strong is the new sexy: Women, CrossFit, and the postfeminist ideal. *Journal of Sport & Social Issues*, *40*(2), 143–161. https://doi.org/10.1177/0193723515615181

Webb, T., Joseph, J., Yardley, L., & Michie, S. (2010). Using the Internet to Promote Health Behavior Change: A Systematic Review and Meta-analysis of the Impact of

Theoretical Basis, Use of Behavior Change Techniques, and Mode of Delivery on Efficacy. *Journal of Medical Internet Research*, *12*(1), e1376. https://doi.org/10.2196/jmir.1376

Weinstein, N. D., Rothman, A. J., & Sutton, S. R. (1998). Stage theories of health behavior: Conceptual and methodological issues. *Health Psychology*, *17*(3), 290–299. https://doi.org/10.1037/0278-6133.17.3.290

Williams, J., Shorter, G. W., Howlett, N., Zakrzewski-Fruer, J., & Chater, A. M. (2021). Can Physical Activity Support Grief Outcomes in Individuals Who Have Been Bereaved? A Systematic Review. *Sports Medicine - Open*, *7*(1), 26. https://doi.org/10.1186/s40798-021-00311-z

Williams, S. L., & French, D. P. (2011). What are the most effective intervention techniques for changing physical activity self-efficacy and physical activity behaviour—And are they the same? *Health Education Research*, *26*(2), 308–322. https://doi.org/10.1093/her/cyr005

Wong, L.-M. (2013). Gender Differences in Body Image Perception among Northern Malaysian Tertiary Students. *British Journal of Medicine and Medical Research*, *3*(3), 727–747. https://doi.org/10.9734/BJMMR/2013/3069

Wright, A. J., Jermutus, E., Howes, E., O'Mara-Eves, A., Veall, C., Ives, J., & Michie, S. (2024). The Artificial Intelligence in Public Health Toolkit: A novel resource for stakeholder engagement. *Wellcome Open Research*, *9*. http://dx.doi.org/10.12688/wellcomeopenres.22480.1

Wu, T., Gao, X., Chen, M., & Van Dam, R. M. (2009). Long-term effectiveness of diet-plus-exercise interventions vs. diet-only interventions for weight loss: A meta-analysis. *Obesity Reviews*, *10*(3), 313–323. https://doi.org/10.1111/j.1467-789X.2008.00547.x

Wu, T., Jia, X., Shi, H., Niu, J., Yin, X., Xie, J., & Wang, X. (2021). Prevalence of mental health problems during the COVID-19 pandemic: A systematic review and meta-analysis. *Journal of Affective Disorders*, *281*, 91–98. https://doi.org/10.1016/j.jad.2020.11.117

Yang, K., & Girgus, J. S. (2019). Are women more likely than men are to care excessively about maintaining positive social relationships? A meta-analytic review of the gender difference in sociotropy. *Sex Roles: A Journal of Research*, *81*(3–4), 157–172. https://doi.org/10.1007/s11199-018-0980-y

Yang, Y., Gao, Y., An, R., & Wan, Q. (2024). Barriers and facilitators to exercise adherence in community-dwelling older adults: A mixed-methods systematic review using the COM-B model and Theoretical Domains Framework. *International Journal of Nursing Studies*, *157*, 104808. https://doi.org/10.1016/j.ijnurstu.2024.104808

Young, M. D., Plotnikoff, R. C., Collins, C. E., Callister, R., & Morgan, P. J. (2014). Social cognitive theory and physical activity: A systematic review and meta-analysis. *Obesity Reviews*, *15*(12), 983–995. https://doi.org/10.1111/obr.12225

Yucel, R. (2018). Scientists' Ontological and Epistemological Views about Science from the Perspective of Critical Realism. *Science & Education*, *27*(5), 407–433. https://doi.org/10.1007/s11191-018-9983-x

Zhang, L., Zheng, Y.-L., Wang, R., Wang, X.-Q., & Zhang, H. (2022). Exercise for osteoporosis: A literature review of pathology and mechanism. *Frontiers in Immunology*, *13*, 1005665. https://doi.org/10.3389/fimmu.2022.1005665

Zhang, W. (2014). Mixed methods application in health intervention research: A multiple case study. *International Journal of Multiple Research Approaches*, *8*(1), 24–35. https://doi.org/10.5172/mra.2014.8.1.24

Zou, Q., Wang, H., Su, C., Du, W., Ouyang, Y., Jia, X., Wang, Z., Ding, G., & Zhang, B. (2021). Longitudinal association between physical activity and blood pressure, risk of hypertension among Chinese adults: China Health and Nutrition Survey 1991–2015. *European Journal of Clinical Nutrition*, *75*(2), 274–282. https://doi.org/10.1038/s41430-020-0653-0

Zourladani, A., Alexandris, K., & Ntovoli, A. (2024). Traditional exercise vs. online fitness classes: A comparison based on participants' enjoyment. *Retos*, *61*.

Appendices

Appendix 1: TIDieR Intervention Description

The intervention and its content are reported here using the TIDieR (Template for Intervention Description and Replication) Checklist (Hoffman et al., 2014).

Brief Name: Four-week pilot PA Intervention for Women from the East Midlands

Why: Physical activity protects against almost all non-communicable diseases and promotes positive health and wellbeing (See Sections 1.2.2. & 1.2.3). Women are less active than men cross-nationally (See Section 1.3.1.) and the East Midlands is a geographical area in which mortality is higher than the national average (See Section 3.2.). A PA intervention for women from the East Midlands is therefore considered likely to be an efficacious public health intervention, which is cost-effective (See Sections 1.2.4. & 1.2.5.).

What: The pilot intervention ran for 4 weeks and consisted of three major components:
1. Exercise classes
2. Physical activity prompting
3. Goal-setting support/education.

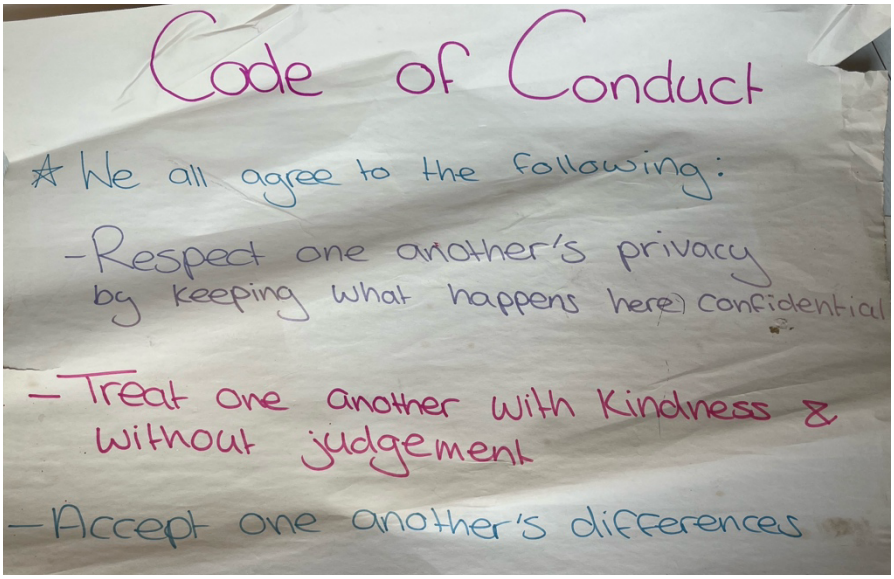


Figure A1: The code of conduct that was decided within the first session

Key features for social culture

Intervention options that were considered to contribute to the development of a (highly important) supportive and non-judgemental social culture included:

- A code-of-conduct (See Figure A1) was co-produced and signed by the group during the first session.

- Tone of voice in-person and in writing. This was kept encouraging and enthusiastic with emphasis placed on effort and self-improvement
- Positive, rather than negative reinforcement and avoiding use/threats of punishment
- Language. This was chosen carefully when describing exercises, avoiding loaded terms like 'easy' or 'difficult' when describing exercise alternatives, instead using more neutral terms such as 'low/high impact' and 'options 1 & 2'.
- Participants were made aware that sessions were non-compulsory and they were free to drop in and out at any time.

Component 1: <u>The exercise classes</u>
These consisted of circuit training sessions which focussed on 'booty building', incorporated stretching, required no equipment, took place in a local community space, were free to access, were streamed live online, were uploaded to an online anytime library and lasted between 45 minutes and one hour, three times each week.

All exercise sessions followed the same structure and were deliberately centred around timed intervals, rather than on number of repetitions. Alternative, low impact options were provided for all exercises throughout. At the beginning of every session, there was the opportunity for those who participated live, whether online or in-person, to inform the instructor of any specific limitations, such that further appropriate alternatives could be included. An example session plan can be seen in Table A1. After each live exercise class, the workout from that session was uploaded to a private YouTube channel and all participants were provided with a link, such that they could complete or repeat the workout in their own time.

<u>Component 1 Included BCTs:</u>
2.2 Feedback on behaviour
3.1 Social support (unspecified)
3.2 Social support (practical)
3.3 Social support (emotional)
4.1 Instruction on how to perform the behaviour
5.1 Information about health consequences
5.3 Information about social and environmental consequences
5.6 Information about emotional consequences
6.1 Demonstration of the behaviour
8.1 Behavioural practice/rehearsal
8.3 Habit formation
8.7 Graded tasks
9.1 Credible source
10.4 Social reward
12.6 Body changes
15.1 Verbal persuasion about capability

Table A1: An example session plan from one of the exercise classes

Feature	Exercise/Activity	Time	Notes
Welcome	Welcome, thanks, introduce myself, check everybody has completed pre-participation questionnaire , briefly explain how things will run, note about recording of sessions, attendance, code of conduct, what we'll be doing today and why, any injuries/adaptations, chance for any questions	10 mins	
Warm-up	Aerobic style – one song increasing intensity	5 mins	Full body with focus on glutes and range of motion
Demo	Demo all of exercises	3 mins	
Circuit	1. Squats 2. Walk-outs 3. Sit-ups 4. Left leg 1 leg hip thrusts 5. Right leg 1 leg hip thrusts 6. Push-ups (on knees) 7. Mountain climbers 8. Alternating lunges 9. Leg raises 10. Hip thrusts	36 minutes	Round 1 = 60s work, 30s recovery 2 mins rest Round 2 = 45s work, 20s recovery 2 mins rest Round 3 = 30s work, 15s recovery
Cool-down	Stretch & relaxation	5 mins	
Data collection	Survey measures for treatment receipt	5 mins	
Conclusion	Any questions, remind people about next session, thanks	2 mins	

Component 2: The daily physical activity prompting

Prompts were developed to encourage the participants to engage in non-competitive personal daily 'challenges', in which participants were encouraged to be active based on a range of cues including their own behaviour (such as going to the toilet), environmental cues (such as when a song came on the radio) and encouraging the making of conscious choices to engage in PA/exercise (such as challenging participants to complete three planks to failure throughout the day). Each challenge was repeated on a weekly basis but was made increasingly challenging each week. For example, one challenge required participants to move to music throughout a fixed number of songs. In week 1, participants were encouraged to be active during five songs. This number was then increased by one on each consecutive week, peaking at 8 songs during week 4.

Component 2 included BCTs:
1.4 Action planning

2.3 Self-monitoring of behaviour

4.1 Instruction on how to perform the behaviour

7.1 Prompts and cues

8.1 Behavioural practice/rehearsal
8.2 Behaviour substitution
8.3 Habit formation
8.6 Generalisation of a target behaviour
8.7 Graded tasks

Component 3: The goal setting support and education
Women were provided with the opportunity to select from a range of goals and to have support with setting, monitoring and reviewing these. A goal setting workbook, (See Appendix 20) was created to supplement the educational workshops. The workbook aimed to take a user-friendly approach to the guidance of goal-setting, both in relation to increasing PA behaviour directly and in relation to outcomes that might typically be expected from engaging in PA (e.g. weight loss). Participants could self-select goals with personal relevance that were personally motivating. The goal-setting within the workbook used the later iteration of SMART goal setting (Doran, 1981), SMARTER (MacLeod, 2012).

Component 3 Included BCTs:
1.1 Goal setting (behaviour)
1.2 Problem solving
1.3 Goal setting (outcome)
1.4 Action planning
1.5 Review behaviour goal(s)
1.7 Review outcome goals

2.3 Self-monitoring of behaviour
2.4 Self-monitoring of outcomes(s) of a behaviour

3.1 Social support (unspecified)
3.2 Social support (practical)
3.3 Social support (emotional)

5.1 Information about health consequences
5.1 Salience of consequences

6.3 Information about others' approval

8.7 Graded tasks

10.4 Social reward

15.1 Verbal persuasion about capability
15.3 Focus on past success

16.2 Imaginary reward

Resources
The resources that were needed, to deliver the intervention as planned were:

- Flipchart paper and pens (for the code of conduct)
- A laptop with a webcam (for live streaming)
- A community space, with WiFi (for live streaming and online questionnaire access)
- Attendance register
- YouTube Channel (to develop online anytime library, link to videos: https://www.youtube.com/playlist?list=PLTj7xDgwQZjqW7d4bykucSmJ0rPT8tq1q)
- Exercise mats (helpful but not necessary, participants encouraged to bring own and lead researcher owned 6)
- Speaker and device for music
- An exercise timer App
- WhatsApp (to enable broadcasting of daily PA challenges)
- Questionnaire measures for research evaluation (See Section 7.3.2.)
- Information sheets, debrief sheets, informed consent questionnaire etc. in line with ethical requirements for research (See Section 7.3.3.)

Who provided?: The programme was delivered and the specific exercises were selected by the Lead Researcher. Relevant qualifications held by the Lead Researcher include Level 2 Fitness Instructor and Level 3 Personal Trainer, an Undergraduate Degree in Psychology and a Masters Degree in the Psychology of Sport and Exercise. At the time, the Lead Researcher had seven years' experience of working in gym and fitness settings full time, primarily running 1:1 personal training and group fitness sessions for women.

How?: The group exercise and goal-setting sessions happened in-person and were also live streamed via Zoom using the same link each week, to simplify the access process.

The exercise classes were uploaded to the YouTube library as soon as possible after the previous class had taken place and before the next had begun. Participants were broadcast a specific link to access each workout via WhatsApp, once it had been uploaded and were informed that they could subscribe to the YouTube channel, if they wished to. At the end of the programme, participants were emailed a range of debrief information, including the links to the YouTube video library again.

Physical activity challenges were broadcast to participants via WhatsApp, but designed to be completed individually in participants' daily lives. Participants were allowed to

message the researcher with questions, queries, for clarifications/adaptations and/or to update achievements on via WhatsApp, throughout the programme.

Where?: The exercise classes were delivered in a local community centre in Nottingham. The centre had free parking and was on a regular bus route. There was a side entrance, that was only accessed by women attending the session, a single occupancy toilet was available only to women attending the session and there was no way for people who were not part of the session to see inside, once it began. Goal setting sessions happened at the same location.

Daily PA challenges were designed to be completed by participants in the home, work or day-to-day setting.

When and how much?: Exercise classes took place three times per week on a Monday, Wednesday and Friday, 6:30pm-7:30pm. Goal setting occurred before the sessions on Mondays (to plan for the week ahead) and Fridays (to discuss how the week had gone and consider active goals for the weekend). A table showing how each of the 3 major intervention components fit within the 4-week programme can be seen in Table A2.

Table A2: A timetable showing how each of the 3 major components of the intervention were fit into the 4-week schedule

Week	1							2							3							4						
Day	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S
PA prompting	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Exercise Class	X		X		X			X		X		X			X		X		X			X		X		X		
Goal setting	X				X			X				X			X				X			X				X		

A schedule of each of the activities, prompts and the volume of activity encouraged each week can be seen in Table A3. Prompts were delivered using the WhatsApp broadcasting feature, which allows messages to be 'broadcast' to numerous people, without breaching confidentiality or GDPR guidelines by sharing other participants' contact details in a group chat format. Prompts were sent in the evening for the following day, alongside a reminder to report back about how they had managed with that day's challenge.

Tailoring: This intervention was tailored to suit women from the East Midlands needs and preferences. Initially, local women's barriers and facilitators to PA were explored using focus groups (See Chapter 5). Next, women from the East Midlands supported the co-design of a bespoke PA intervention, to get them active, by attending a series of co-design workshops (See Chapter 6). The intervention was further tailored to suit one participant who had a knee injury – this participant was unable to kneel so undertook push-up standing in a forward leaning position, with hands on a ballet bar for example.

Table A3: A schedule showing each of the daily physical activity challenges with the associated prompts and the volume of activity suggested each week

Day	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Activity/exercise	Tricep dips	Squats	Sit-ups	Walk	Move to music	Planks to failure	Active travel
Prompt/cue	When you use the toilet	When you boil the kettle	When there's an ad break (or a streaming show ends)	N/A	When you hear a song	N/A	When you would have used motorised transport
Week 1 volume	8-10 reps each time	8-10 reps each time	8-10 reps each time	30 mins	5 songs	3 times	Short journey (<10-15 mins walking)
Week 2 volume	10-12 reps each time	10-12 reps each time	10-12 reps each time	40 mins	6 songs	4 times	Short to medium journey (15-25 mins walking)
Week 3 volume	12-15 reps each time	12-15 reps each time	12-15 reps each time	50 mins	8 songs	6 times	Medium to long journey (30-60 mins walking)
Week 4 volume	15-20 reps each time	15-20 reps each time	15-20 reps each time	60 mins	10 songs	8 times	Long journey (>60 mins walking)

Modifications: Throughout the intervention, exercises and challenges were modified to suit participants' personal needs and sometimes preferences. For example, one participant wore a leg brace, which meant that she was unable to kneel and so tailored adaptations were consistently provided to suit her needs throughout the programme. Another participant explained privately to the Lead Researcher that it would feel inappropriate and uncomfortable for her to complete the squat challenge that was scheduled for a Tuesday, as she worked in an office beside a warehouse on Tuesdays, which meant she was the only woman in a space full of men. As such, the programme was modified for her, and it was agreed that she would move to music when in the office on a Tuesday and squat by the kettle on Fridays, when she was working from home.

How well planned?: Treatment fidelity was assessed throughout the intervention and the means of achieving this will be reported in Chapter 8 (See Sections 8.3.2. for measures).

How well delivered?: Features of treatment fidelity that were assessed include treatment receipt, behavioural enactment and behavioural adherence (See Sections 8.4.3., 8.4.4. and 8.4.5. respectively for results).

Appendix 2: PROSPERO registration for systematic qualitative evidence synthesis (2015-2020)

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PROSPERO

International prospective register of systematic reviews

Barriers and facilitators to physical activity in women: a qualitative evidence synthesis with findings mapped onto COM-B

Madeleine Leather, Madelynne Arden, Laura Kilby, Julie Leather

Citation

Madeleine Leather, Madelynne Arden, Laura Kilby, Julie Leather. Barriers and facilitators to physical activity in women: a qualitative evidence synthesis with findings mapped onto COM-B. PROSPERO 2024 Available from https://www.crd.york.ac.uk/PROSPERO/view/CRD42020171355

REVIEW TITLE AND BASIC DETAILS

Review title

Barriers and facilitators to physical activity in women: a qualitative evidence synthesis with findings mapped onto COM-B

Review objectives

What do women perceive to be the barriers and facilitators to physical activity, and how do these fit into the COM-B model of behaviour change?
What do women perceive to be the factors relating to capability that enable or inhibit them from engaging in physical activity?
What do women perceive to be the factors relating to opportunity that enable or inhibit them from engaging in physical activity?
What do women perceive to be the factors relating to motivation that enable or inhibit them from engaging in physical activity?

Keywords

Attitudes, Barriers, Behaviour change wheel, COM-B, Exercise, Facilitators, Females, Perceptions, Physical Activity, Qualitative evidence synthesis, Qualitative synthesis, TDF, Theoretical Domains Framework, Views, Women

SEARCHING AND SCREENING

Searches

Databases to be searched:
• CINAHL
• SPORTDiscus
• MEDLINE (EBSCO)
• ASSIA (Proquest)
• PsycARTICLES (Proquest)

• PsycINFO (Proquest)
• Sociological abstracts (Proquest)
Citation lists from included studied will also be consulted
Peer reviewed journal articles only
English language only
2016-present (In line with Sport England's Towards an Active Nation Strategy 2016-2021)
Searches will be re-run shortly prior to final analysis in case of new research being released

Study design

Included:
All qualitative and mixed methods studies in which the qualitative element is analysed independently, are to be included.
Excluded:
Studies in a foreign language (not English) due to potential problems with interpretation following translation
Studies in which participants have been recruited on the basis of being pregnant/prenatal/postnatal and/or having a pre-existing illness or condition.

ELIGIBILITY CRITERIA

Condition or domain being studied

Physical activity in adult females

Population

Inclusion criteria:
Females
Adults (18-65)
Studies in English language
Exclusion criteria:
Will not include studies in which participants have been recruited on the basis of being pregnant/prenatal/postnatal and/or having a pre-existing illness or condition.

Intervention(s) or exposure(s)

Any barrier and/or facilitator perceived by women to enable or inhibit engagement in physical activity.

Comparator(s) or control(s)

Not applicable

OUTCOMES TO BE ANALYSED

Main outcomes

Establish the factors that women perceive to be barriers and/or facilitators to physical activity.

Measures of effect

Factors will be established based on the reported outcomes of papers selected for inclusion

Additional outcomes

To understand how the barriers and facilitators to physical activity as perceived by adult females map on to the COM-B model of behaviour change.
i.e.:
-Understand what factors relating to capability (physical/psychological) women perceive to enable or inhibit their engagement in physical activity
-Understand what factors relating to opportunity (physical/social) women perceive to enable or inhibit their engagement in physical activity
-Understand what factors relating to motivation (automatic/reflective) women perceive to enable or inhibit their engagement in physical activity

Measures of effect

The themes emerging from the synthesis will then be evaluated in line with the Taxonomy of Behaviour Change to identify which aspects of the COM-B model each aligns with (with a view to these findings being useful for future practical intervention design)

DATA COLLECTION PROCESS

Data extraction (selection and coding)

The lead author (ML) will review the titles, abstracts and full texts of the articles identified through searching, using the inclusion/exclusion criteria outlined above. An Administrator (JL - Doctor of Applied Psychology) will review 20% of these articles to ensure reliability. If there are any discrepancies, these papers will be further reviewed by the Doctoral Research Supervisory team of the lead author (MA & LK).
The data to be extracted will be: Author, country, qualitative study design and data collection method, population, context, sample size, recruitment strategy, type of qualitative analysis, participants' perceptions of barriers to physical activity, participants' perceptions of facilitators for physical activity.

Risk of bias (quality) assessment

The included articles will be assessed for quality and methodological rigour using the Critical Appraisal Skills Programme (2018) approach.

PLANNED DATA SYNTHESIS

Strategy for data synthesis

Data will be synthesised using a thematic analysis in line with the three stage process outlined by Thomas & Harden (2008).
Stage 1 (The coding of text line by line): Will be completed by the lead reviewer using the NVivo software. All text under the headings "results" or "findings" will be copied verbatim into Nvivo for coding.
20% of this text will be randomly selected and coded by a second reviewer to ensure there is consensus at this stage. Where there are issues of disagreement, discussion will take place with the third and fourth reviewer until consensus is reached by all of the review team.
Stage 2 (The development of 'descriptive themes'): Coded data will be assigned to themes inductively so that key concepts can be grouped together.
Stage 3 (The generation of analytical themes): The descriptive themes will be translated so that each theme
a) includes matching concepts across different studies despite differences in labelling and

b) can be mapped onto COM-B (to "go beyond" the findings of the original studies included for analysis)
c) is a basis upon which practical recommendations regarding how to promote physical activity for women
The ENTREQ (2012) and PRISMA statement will be followed when reporting this qualitative synthesis.

Analysis of subgroups or subsets

Not applicable

REVIEW AFFILIATION, FUNDING AND PEER REVIEW

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TIMELINE OF THE REVIEW

Review timeline

Start date: 20 September 2020. End date: 30 November 2020

Date of first submission to PROSPERO

28 June 2020

Date of registration in PROSPERO

22 September 2020

CURRENT REVIEW STAGE

Publication of review results

The intention is to publish the review once completed.The review will be published in English

Stage of the review at this submission

Review stage	Started	Completed
Pilot work		

Review stage	Started	Completed
Formal searching/study identification	✓	✓
Screening search results against inclusion criteria		
Data extraction or receipt of IP		
Risk of bias/quality assessment		
Data synthesis		

Preliminary searches completed and search strategy amended as appropriate

Review status

The review is currently planned or ongoing.

ADDITIONAL INFORMATION

Additional information

This review is being undertaken as part of a PhD - the findings are intended to be used to inform a community-based intervention design

PROSPERO version history

Version 1.1 published on 13 Jan 2021

Version 1.0 published on 22 Sep 2020

Review conflict of interest

None known

Country

England

Medical Subject Headings

Exercise; Female; Humans; Motivation

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Appendix 3: Step-by-step documentation of development of a single line search strategy, for the systematic qualitative evidence synthesis (2015-2020):

Search strategy for qualitative evidence synthesis establishing barriers and facilitators to physical activity for women
This search strategy is completed in line with the Bramer and colleagues' (2018) systematic approach to searching. Each stage of development/decision making within the search is numbered in line with which step of the protocol that stage is aligned with.

Step 1: Determine a clear and focussed research question:
The aim of this qualitative evidence synthesis is to establish in a rich and nuanced way: What the barriers and facilitators to physical activity for women as perceived by themselves?

Step 2: Describe articles that can answer the question:
Qualitative papers, likely using interviews and focus groups.

Step 3: Decide which key concepts address the different elements of the question:
It is noteworthy that this is a qualitative evidence synthesis, and not a systematic review. This means that the PICO structure is not well aligned or relevant. For this reason, these key concepts were not identified in line with this, as is suggested in the Bramer et al. (2018) paper. Instead – the key concepts were outlines as follows:
Physical activity
Barriers and facilitators
Qualitative
Women

Step 4: Decide which elements should be used for best results
It was decided that all of the key concepts above are crucial to consider when developing this search strategy to identify papers which will answer this research question.

Bias: The only key concept which was deemed to potentially introduce bias was the "barriers and facilitators" key concept. However, it was determined that these two terms are opposing and as such, that they represent both sides of the metaphorical coin. Therefore, it was decided that this key concept would be unlikely to present an issue in terms of bias.

Overlapping elements: There was not considered to be a risk of overlapping elements amongst the four key concepts identified and included.

Step 5: Choose an appropriate database:
MEDLINE (Ebsco)

McGowan et al. (2016) developed the PRESS Peer Review of Electronic Search Strategies checklist. This paper explicitly states that “peer review should be undertaken after the
MEDLINE search had been prepared but before it had been translated to other databases” (p40).

Bramer, Giustini and Kramer (2016) highlighted Medline as a database that contains a relatively large number of thesaurus terms (MeSH headings), which are crucial for developing a comprehensive search. Although in that instance, Embase was identified as the database containing the most thesaurus terms, this database was deemed inappropriate due to its focus on the Medical, rather than Psychological research, which is most relevant when answering the present research question.

A further justification for using Medline, powered by Ebsco is that Bramer et al’s (2018) paper has a useful table in which appropriate Boolean operators, syntax etc. for this database are clearly presented – it was decided that this would reduce the likelihood of errors being made in the development of this single line search strategy.

The reason for selecting this database as powered by Ebsco is largely practical. When using databases powered by Ebsco; title and abstract terms must be searched separately rather than being grouped together, as is the case with other databases. For this reason, the longest single line search strategy will be that which is input into Ebsco; it is assumed that a longer search strategy is more likely to contain errors and so following this step by step process for a search strategy which is developed for Ebsco seems most prudent).

(Step 6: Document the search process in a text document)

Step 7: Identify appropriate index terms (MeSH headings):
KEY CONCEPT 1: PHYSICAL ACTIVITY
Index term 1: Exercise
(explode)

KEY CONCEPT 2: BARRIERS/FACILITATORS
Index term 2: Causality
(explode)

KEY CONCEPT 3: QUALITATIVE/METHODOLOGY
Index term 3: Qualitative research
(explode)

KEY CONCEPT 4: WOMEN
Index term 4: Women
Index term 5: Female
(Do not require exploding)
Step 8: Identify synonyms in the thesaurus
KEY CONCEPT 1: PHYSICAL ACTIVITY

Walking
Stair climbing
Swimming
Running
Jogging
Physical conditioning, human
Gymnastics
Plyometric exercise
Circuit-based exercise
Resistance training
Endurance training
High-intensity interval training

KEY CONCEPT 2: BARRIERS/FACILITATORS
Risk factors
Protective factors
Precipitating factors
Confounding factors, epidemiologic
Age factors
Race factors
Sex factors

KEY CONCEPT 3: QUALITATIVE/METHODOLOGY
Qualitative
Hermeneutics
Grounded theory
Empirical research

KEY CONCEPT 4: WOMEN
N/A

Step 9: Add variations in search terms
KEY CONCEPT 1: PHYSICAL ACTIVITY
Exercise*
Walking
Stair climbing
Swimming
Running
Jogging
Physical conditioning, human
Gymnastics
Gym
Plyo* exercise
Circuit-based exercise
Circuit-based training
Circuit training
Circuit class
Resistance training
Weight training
Endurance training
High-intensity interval training
HIIT
HIIT training
Interval training
Physical activit*
Sedentary behaviour*
Inactivity

KEY CONCEPT 2:
BARRIERS/FACILITATORS
Causality
Causation
Cause*
Risk factor*
Protective factor*
Precipitating factor*
Confounding factor, epidemiologic
Age factor*
Race factor*
Sex factor*
Barrier*
Facilitator*
Obstacle*
Challenge*
Difficult*
Issue*
Motivator*
Enabler*
Inhibit*
Prevent*

KEY CONCEPT 3:
QUALITATIVE/METHODOLOGY
Qualitative research+
Qualitative
Qualitative study
Qualitative methodology
Interview*
Mixed Method*
Hermeneutics
Grounded theory
Empirical research

KEY CONCEPT 4: WOMEN
Women
Female*

Step 10: Use database appropriate syntax
KEY CONCEPT 1: PHYSICAL ACTIVITY
MH “Exercise+”
Exercis*
TI walk* OR AB walk*
TI stair climbing OR AB stair climbing
TI swimming OR AB swimming
TI running OR AB running
TI jogging OR AB jogging
TI physical conditioning, human OR AB physical conditioning, human
TI gymnastics OR AB gymnastics
TX Gym
TI plyo* exercise OR AB plyo* exercise
TI circuit-based exercise OR AB circuit-based exercise
TX circuit-based training
TX circuit training
TX circuit class
TI resistance training OR AB resistance training
TX weight training
TI endurance training OR AB endurance training
TI high-intensity interval training OR AB high-intensity interval training
TX HIIT
TX HIIT training
TX Interval training
TX Physical activit*
TX Sedentary behavio?r*
TX Inactivity

KEY CONCEPT 2: BARRIERS/FACILITATORS
MH “Causality+”
TX Causation
TX Cause*
TI risk factor* OR AB risk factor*
TI protective factor* OR AB protective factor*
TI precipitating factor* OR AB precipitating factor*
TI confounding factor*, epidemiologic OR AB confounding factor*, epidemiologic
TI age factor* OR TI age factor*
TI race factor* OR AB race factor*
TI sex factor* OR AB sex factor*
TX barrier*
TX facilitator*
TX obstacle*
TX challenge*
TX difficult*
TX issue*
TX motivator*
TX enabler*
TX inhibit*
TX prevent*

KEY CONCEPT 3: QUALITATIVE/METHODOLOGY
MH “Qualitative research+”
TI qualitative OR AB qualitative
TI qualitative study OR AB qualitative study
TI qualitative methodology OR AB qualitative methodology
TX interview
TX mixed Methods
TI hermeneutics OR AB hermeneutics
TI grounded theory OR AB grounded theory
TI empirical research OR AB empirical research

KEY CONCEPT 4: WOMEN
Wom?n
Female*

Note: At this point, prior to running preliminary searches for each key concept, limits for the search were decided.

The limits chosen and justifications were as follows:

English language only - "Challenges of translation are discussed from the perspective that interpretation of meaning is the core of qualitative research. As translation is also an interpretive act, meaning may get lost in the translation process." (Van Nes, Abma, Jonsson & Deeg, 2010, p. 313)

Peer reviewed articles only - This qualitative evidence synthesis aims to summarise what barriers and facilitators to physical activity for women have been identified in high quality, qualitative research. Anecdotal evidence or research of poor quality would not be appropriate to include.

Papers published between 2010 and 2020 - In 2002 the WHO acknowledged a global issue with inactivity, by 2004 it was declared that new guidelines for PA and its promotion would be released. These guidelines were released in 2010 and in response to this, an influx of research into the area occurred.

Unique key concept searches:
KEY CONCEPT 1: PHYSICAL ACTIVITY
MH “Exercise+”
OR
TI: walk* OR stair climbing OR swimming OR running OR AB running OR jogging OR physical conditioning, human OR gymnastics OR plyo* exercise OR circuit-based exercise OR resistance training OR endurance training OR high-intensity interval training
OR
AB: walk* OR stair climbing OR swimming OR running OR AB running OR jogging OR physical conditioning, human OR gymnastics OR plyo* exercise OR circuit-based exercise OR resistance training OR endurance training OR high-intensity interval training
OR
TX: gym OR circuit-based training OR circuit training OR circuit class OR weight training OR HIIT OR HIIT training OR interval training OR physical activity OR sedentary behavio?r OR inactivity

Limits:
English language only
Peer reviewed articles only
2010-2020

Total # papers identified: 227, 015

KEY CONCEPT 2:
BARRIERS/FACILITATORS
MH “Causality+”
OR
TI: risk factor* OR protective factor* OR precipitating factor* OR confounding factor*, epidemiologic OR age factor* OR race factor* OR sex factor*
OR
AB: risk factor* OR protective factor* OR precipitating factor* OR confounding factor*, epidemiologic OR age factor* OR race factor* OR sex factor*
OR
TX: Causation OR Cause* OR barrier* OR facilitator* OR obstacle* OR challenge* OR difficult* OR issue* OR motivator* OR enabler* Or inhibit* OR prevent*

Limits:
English language only
Peer reviewed articles only
2010-2020

Total # papers identified: 3,858, 428

KEY CONCEPT 3:
QUALITATIVE/METHODOLOGY
MH “Qualitative research+”
OR
TI: qualitative OR qualitative study OR qualitative methodology OR hermeneutics OR grounded theory OR empirical research
OR
AB: qualitative OR qualitative study OR qualitative methodology OR hermeneutics OR grounded theory OR empirical research
OR
TX: interview OR mixed Methods

Limits:
English language only
Peer reviewed articles only
2010-2020

Total # papers identified: 264,318

KEY CONCEPT 4: WOMEN
TX: Wom?n OR Female*

Limits:
English language only
Peer reviewed articles only
2010-2020
Total # papers identified: 3, 059, 949

Combined searches:
(MH “Exercise+” OR TI (walk* OR stair climbing OR swimming OR running OR jogging OR physical conditioning, human OR gymnastics OR plyo* exercise OR circuit-based exercise OR resistance training OR endurance training OR high-intensity interval training) OR AB (walk* OR stair climbing OR swimming OR running OR jogging OR physical conditioning, human OR gymnastics OR plyo* exercise OR circuit-based exercise OR resistance training OR endurance training OR high-intensity interval training) OR TX (gym OR circuit-based training OR circuit training OR circuit class OR weight training OR HIIT OR HIIT training OR interval training OR physical activity OR sedentary behavio?r OR inactivity)) AND (MH “Causality+” OR TI (risk factor* OR protective factor* OR precipitating factor* OR confounding factor*, epidemiologic OR age factor* OR race factor* OR sex factor*) OR AB (risk factor* OR protective factor* OR precipitating factor* OR confounding factor*, epidemiologic OR age factor* OR race factor* OR sex factor*) OR TX (Causation OR Cause* OR barrier* OR facilitator* OR obstacle* OR challenge* OR difficult* OR issue* OR motivator* OR enabler* Or inhibit* OR prevent*)) AND (MH "qualitative research+” OR AB (qualitative OR qualitative study OR qualitative methodology OR hermeneutics OR grounded theory OR empirical research) OR TI (qualitative OR qualitative study OR qualitative methodology OR hermeneutics OR grounded theory OR empirical research) OR TX (interview OR mixed Methods)) AND TX (wom?n or female*)

Limits:
English language only
Peer reviewed articles only
2010-2020

Total # papers identified: 4,851

Step 11: Optimise the search

Key concept 1
Remove MeSH heading for key concept 1:
(TI (walk* OR stair climbing OR swimming OR running OR jogging OR physical conditioning, human OR gymnastics OR plyo* exercise OR circuit-based exercise OR resistance training OR endurance training OR high-intensity interval training) OR AB (walk* OR stair climbing OR swimming OR running OR jogging OR physical conditioning, human OR gymnastics OR plyo* exercise OR circuit-based exercise OR resistance training OR endurance training OR high-intensity interval training) OR TX (gym OR circuit-based training OR circuit training OR circuit class OR weight training OR HIIT OR HIIT training OR interval training OR physical activity OR sedentary behavio?r OR inactivity)) AND (MH “Causality+” OR TI (risk factor* OR protective factor* OR precipitating factor* OR confounding factor*, epidemiologic OR age factor* OR race factor* OR sex factor*) OR AB (risk factor* OR protective factor* OR precipitating factor* OR confounding factor*, epidemiologic OR age factor* OR race factor* OR sex factor*) OR TX (Causation OR Cause* OR barrier* OR facilitator* OR obstacle* OR challenge* OR difficult* OR issue* OR motivator* OR enabler* Or inhibit* OR prevent*)) AND (MH "qualitative research+” OR AB (qualitative OR qualitative study OR qualitative methodology OR hermeneutics OR grounded theory OR empirical research) OR TI (qualitative OR qualitative study OR qualitative methodology OR hermeneutics OR grounded theory OR empirical research) OR TX (interview OR mixed Methods)) AND TX (wom?n or female*)
NOT
MH “Exercise+”

Limits:
English language only
Peer reviewed articles only
2010-2020

Total # papers identified: 2,786

Add words based on papers identified without MeSH heading:
N/A – No new references were identified in the first 100 results of this modified search (as ordered by relevance), that were not identified by the original search.
Add words based on synonyms identified without MeSH heading
Add:
KC1: Sport, pilates, soccer
KC2: Correlates, determinants (barriers add to AB and TI, not just TX)
KC3: Thematic, perceptions, perspectives, narrative
KC4: N/A

Completed search up to this point:

(MH “Exercise+” OR TI (sport OR pilates OR soccer OR walk* OR stair climbing OR swimming OR running OR jogging OR physical conditioning, human OR gymnastics OR plyo* exercise OR circuit-based exercise OR resistance training OR endurance training OR high-intensity interval training) OR AB (sport OR pilates OR soccer OR walk* OR stair climbing OR swimming OR running OR jogging OR physical conditioning, human OR gymnastics OR plyo* exercise OR circuit-based exercise OR resistance training OR endurance training OR high-intensity interval training) OR TX (gym OR circuit-based training OR circuit training OR circuit class OR weight training OR HIIT OR HIIT training OR interval training OR physical activity OR sedentary behavio?r OR inactivity)) AND (MH “Causality+” OR TI (correlate* OR determinant* OR barrier* OR risk factor* OR protective factor* OR precipitating factor* OR confounding factor*, epidemiologic OR age factor* OR race factor* OR sex factor*) OR AB (correlate* OR determinant* OR barrier* OR risk factor* OR protective factor* OR precipitating factor* OR confounding factor*, epidemiologic OR age factor* OR race factor* OR sex factor*) OR TX (Causation OR Cause* OR barrier* OR facilitator* OR obstacle* OR challenge* OR difficult* OR issue* OR motivator* OR enabler* Or inhibit* OR prevent*)) AND (MH "qualitative research+” OR AB (thematic OR perspective* OR perception* or narrative OR qualitative OR qualitative study OR qualitative methodology OR hermeneutics OR grounded theory OR empirical research) OR TI (thematic OR perspective* OR perception* or narrative OR qualitative OR qualitative study OR qualitative methodology OR hermeneutics OR grounded theory OR empirical research) OR TX (interview OR mixed Methods)) AND TX (wom?n or female*)

Limits:
English language only
Peer reviewed articles only
2010-2020

Total # papers identified: 8,346

Remove free text terms for Key Concept 1
(MH “Exercise+” OR TI (sport OR pilates OR soccer OR walk* OR stair climbing OR swimming OR running OR jogging OR physical conditioning, human OR gymnastics OR plyo* exercise OR circuit-based exercise OR resistance training OR endurance training OR high-intensity interval training) OR AB (sport OR pilates OR soccer OR walk* OR stair climbing OR swimming OR running OR jogging OR physical conditioning, human OR gymnastics OR plyo* exercise OR circuit-based exercise OR resistance training OR endurance training OR high-intensity interval training)) AND (MH “Causality+” OR TI (correlate* OR determinant* OR barrier* OR risk factor* OR protective factor* OR precipitating factor* OR confounding factor*, epidemiologic OR age factor* OR race factor* OR sex factor*) OR AB (correlate* OR determinant* OR barrier* OR risk factor* OR protective factor* OR precipitating factor* OR confounding factor*, epidemiologic OR age factor* OR race factor* OR sex factor*) OR TX (Causation OR Cause* OR barrier* OR facilitator* OR obstacle* OR challenge* OR difficult* OR issue* OR motivator* OR enabler* Or inhibit* OR prevent*)) AND (MH "qualitative research+” OR AB (thematic OR perspective* OR perception* or narrative OR qualitative OR qualitative

study OR qualitative methodology OR hermeneutics OR grounded theory OR empirical research) OR TI (thematic OR perspective* OR perception* or narrative OR qualitative OR qualitative study OR qualitative methodology OR hermeneutics OR grounded theory OR empirical research) OR TX (interview OR mixed Methods)) AND TX (wom?n or female*)
NOT
TX (gym OR circuit-based training OR circuit training OR circuit class OR weight training OR HIIT OR HIIT training OR interval training OR physical activity OR sedentary behavio?r OR inactivity)

Limits:
English language only
Peer reviewed articles only
2010-2020

Total # papers identified: 2,777

Add words based on papers identified without free text terms:
N/A
Add words based on synonyms identified without free text terms:
KC1: Athletics
KC2: N/A
KC3: N/A
KC4: N/A

Completed search up to this point:
(MH “Exercise+” OR TI (athletics OR sport OR pilates OR soccer OR walk* OR stair climbing OR swimming OR running OR jogging OR physical conditioning, human OR gymnastics OR plyo* exercise OR circuit-based exercise OR resistance training OR endurance training OR high-intensity interval training) OR AB (athletics OR sport OR pilates OR soccer OR walk* OR stair climbing OR swimming OR running OR jogging OR physical conditioning, human OR gymnastics OR plyo* exercise OR circuit-based exercise OR resistance training OR endurance training OR high-intensity interval training) OR TX (gym OR circuit-based training OR circuit training OR circuit class OR weight training OR HIIT OR HIIT training OR interval training OR physical activity OR sedentary behavio?r OR inactivity)) AND (MH “Causality+” OR TI (correlate* OR determinant* OR barrier* OR risk factor* OR protective factor* OR precipitating factor* OR confounding factor*, epidemiologic OR age factor* OR race factor* OR sex factor*) OR AB (correlate* OR determinant* OR barrier* OR risk factor* OR protective factor* OR precipitating factor* OR confounding factor*, epidemiologic OR age factor* OR race factor* OR sex factor*) OR TX (Causation OR Cause* OR barrier* OR facilitator* OR obstacle* OR challenge* OR difficult* OR issue* OR motivator* OR enabler* Or inhibit* OR prevent*)) AND (MH "qualitative research+” OR AB (thematic OR perspective* OR perception* or narrative OR qualitative OR qualitative study OR qualitative methodology OR hermeneutics OR grounded theory OR empirical research) OR TI (thematic OR perspective* OR perception* or narrative OR qualitative OR qualitative study OR

qualitative methodology OR hermeneutics OR grounded theory OR empirical research) OR TX (interview OR mixed Methods)) AND TX (wom?n or female*)

Limits:
English language only
Peer reviewed articles only
2010-2020

Total # papers identified: 8,444

Key Concept 2
Remove MeSH heading for Key concept 2
(MH “Exercise+” OR TI (athletics OR sport OR pilates OR soccer OR walk* OR stair climbing OR swimming OR running OR jogging OR physical conditioning, human OR gymnastics OR plyo* exercise OR circuit-based exercise OR resistance training OR endurance training OR high-intensity interval training) OR AB (athletics OR sport OR pilates OR soccer OR walk* OR stair climbing OR swimming OR running OR jogging OR physical conditioning, human OR gymnastics OR plyo* exercise OR circuit-based exercise OR resistance training OR endurance training OR high-intensity interval training) OR TX (gym OR circuit-based training OR circuit training OR circuit class OR weight training OR HIIT OR HIIT training OR interval training OR physical activity OR sedentary behavio?r OR inactivity)) AND (TI (correlate* OR determinant* OR barrier* OR risk factor* OR protective factor* OR precipitating factor* OR confounding factor*, epidemiologic OR age factor* OR race factor* OR sex factor*) OR AB (correlate* OR determinant* OR barrier* OR risk factor* OR protective factor* OR precipitating factor* OR confounding factor*, epidemiologic OR age factor* OR race factor* OR sex factor*) OR TX (Causation OR Cause* OR barrier* OR facilitator* OR obstacle* OR challenge* OR difficult* OR issue* OR motivator* OR enabler* Or inhibit* OR prevent*)) AND (MH "qualitative research+” OR AB (thematic OR perspective* OR perception* or narrative OR qualitative OR qualitative study OR qualitative methodology OR hermeneutics OR grounded theory OR empirical research) OR TI (thematic OR perspective* OR perception* or narrative OR qualitative OR qualitative study OR qualitative methodology OR hermeneutics OR grounded theory OR empirical research) OR TX (interview OR mixed Methods)) AND TX (wom?n or female*)
NOT
MH “Causality+”

Limits:
English language only
Peer reviewed articles only
2010-2020

Total # papers identified: 7,235

Add words based on papers identified without MeSH heading:
N/A – 1 reference came up which may be relevant and was not picked up by the initial search strategy. However, after further investigation it was discovered that this was not

due to the search strategy being inappropriate, but was due to the paper being so novel that MeSH headings had not yet been assigned. This study will be assessed for eligibility later in the review process.

Note: Missing reference - Dnes, N., Coley, B., Frisby, K., Keller, A., Suyom, J., Tsui, C., ... & Hunter, J. (2020). "A little bit of a guidance and a little bit of group support": a qualitative study of preferences, barriers, and facilitators to participating in community-based exercise opportunities among adults living with chronic pain. Disability and Rehabilitation, 1-10.

Add words based on synonyms identified without MeSH heading
KC1: N/A
KC2: N/A
KC3: focus group*
KC4: N/A

Completed search up to this point:
(MH "Exercise+" OR TI (athletics OR sport OR pilates OR soccer OR walk* OR stair climbing OR swimming OR running OR jogging OR physical conditioning, human OR gymnastics OR plyo* exercise OR circuit-based exercise OR resistance training OR endurance training OR high-intensity interval training) OR AB (athletics OR sport OR pilates OR soccer OR walk* OR stair climbing OR swimming OR running OR jogging OR physical conditioning, human OR gymnastics OR plyo* exercise OR circuit-based exercise OR resistance training OR endurance training OR high-intensity interval training) OR TX (gym OR circuit-based training OR circuit training OR circuit class OR weight training OR HIIT OR HIIT training OR interval training OR physical activity OR sedentary behavio?r OR inactivity)) AND (MH "Causality+" OR TI (correlate* OR determinant* OR barrier* OR risk factor* OR protective factor* OR precipitating factor* OR confounding factor*, epidemiologic OR age factor* OR race factor* OR sex factor*) OR AB (correlate* OR determinant* OR barrier* OR risk factor* OR protective factor* OR precipitating factor* OR confounding factor*, epidemiologic OR age factor* OR race factor* OR sex factor*) OR TX (Causation OR Cause* OR barrier* OR facilitator* OR obstacle* OR challenge* OR difficult* OR issue* OR motivator* OR enabler* Or inhibit* OR prevent*)) AND (MH "qualitative research+" OR AB (focus group* OR thematic OR perspective* OR perception* or narrative OR qualitative OR qualitative study OR qualitative methodology OR hermeneutics OR grounded theory OR empirical research) OR TI (focus group* OR thematic OR perspective* OR perception* or narrative OR qualitative OR qualitative study OR qualitative methodology OR hermeneutics OR grounded theory OR empirical research) OR TX (interview OR mixed Methods)) AND TX (wom?n or female*)

Limits:
English language only
Peer reviewed articles only
2010-2020
Total # papers identified: 8,592

Remove free text terms for Key Concept 2

(MH “Exercise+” OR TI (athletics OR sport OR pilates OR soccer OR walk* OR stair climbing OR swimming OR running OR jogging OR physical conditioning, human OR gymnastics OR plyo* exercise OR circuit-based exercise OR resistance training OR endurance training OR high-intensity interval training) OR AB (athletics OR sport OR pilates OR soccer OR walk* OR stair climbing OR swimming OR running OR jogging OR physical conditioning, human OR gymnastics OR plyo* exercise OR circuit-based exercise OR resistance training OR endurance training OR high-intensity interval training) OR TX (gym OR circuit-based training OR circuit training OR circuit class OR weight training OR HIIT OR HIIT training OR interval training OR physical activity OR sedentary behavio?r OR inactivity)) AND (MH “Causality+” OR TI (correlate* OR determinant* OR barrier* OR risk factor* OR protective factor* OR precipitating factor* OR confounding factor*, epidemiologic OR age factor* OR race factor* OR sex factor*) OR AB (correlate* OR determinant* OR barrier* OR risk factor* OR protective factor* OR precipitating factor* OR confounding factor*, epidemiologic OR age factor* OR race factor* OR sex factor*)) AND (MH "qualitative research+” OR AB (focus group* OR thematic OR perspective* OR perception* or narrative OR qualitative OR qualitative study OR qualitative methodology OR hermeneutics OR grounded theory OR empirical research) OR TI (focus group* OR thematic OR perspective* OR perception* or narrative OR qualitative OR qualitative study OR qualitative methodology OR hermeneutics OR grounded theory OR empirical research) OR TX (interview OR mixed Methods)) AND TX (wom?n or female*)
NOT
TX (Causation OR Cause* OR barrier* OR facilitator* OR obstacle* OR challenge* OR difficult* OR issue* OR motivator* OR enabler* Or inhibit* OR prevent*)

Limits:
English language only
Peer reviewed articles only
2010-2020

Total # papers identified: 1,320

Add words based on papers identified without free text terms:
N/A
Add words based on synonyms identified without free text terms:
N/A

Note: No changes to completed search

Key Concept 3
Remove MeSH heading for Key Concept 3

(MH “Exercise+” OR TI (athletics OR sport OR pilates OR soccer OR walk* OR stair climbing OR swimming OR running OR jogging OR physical conditioning, human OR gymnastics OR plyo* exercise OR circuit-based exercise OR resistance training OR endurance training OR high-intensity interval training) OR AB (athletics OR sport OR pilates OR soccer OR walk* OR stair climbing OR swimming OR running OR jogging OR physical conditioning, human OR gymnastics OR plyo* exercise OR circuit-based exercise OR resistance training OR endurance training OR high-intensity interval training) OR TX (gym OR circuit-based training OR circuit training OR circuit class OR weight training OR HIIT OR HIIT training OR interval training OR physical activity OR sedentary behavio?r OR inactivity)) AND (MH “Causality+” OR TI (correlate* OR determinant* OR barrier* OR risk factor* OR protective factor* OR precipitating factor* OR confounding factor*, epidemiologic OR age factor* OR race factor* OR sex factor*) OR AB (correlate* OR determinant* OR barrier* OR risk factor* OR protective factor* OR precipitating factor* OR confounding factor*, epidemiologic OR age factor* OR race factor* OR sex factor*) OR TX (Causation OR Cause* OR barrier* OR facilitator* OR obstacle* OR challenge* OR difficult* OR issue* OR motivator* OR enabler* Or inhibit* OR prevent*)) AND (AB (focus group* OR thematic OR perspective* OR perception* or narrative OR qualitative OR qualitative study OR qualitative methodology OR hermeneutics OR grounded theory OR empirical research) OR TI (focus group* OR thematic OR perspective* OR perception* or narrative OR qualitative OR qualitative study OR qualitative methodology OR hermeneutics OR grounded theory OR empirical research) OR TX (interview OR mixed Methods)) AND TX (wom?n or female*)
NOT
MH "qualitative research+”

Limits:
English language only
Peer reviewed articles only
2010-2020

Total # papers identified: 7,357

Add words based on papers identified without MeSH heading:
N/A – No new references were identified in the first 100 results of this modified search (as ordered by relevance), that were not identified by the original search.
ii. Add words based on synonyms identified without MeSH heading:
N/A

Remove free text terms for Key Concept 3
(MH “Exercise+” OR TI (athletics OR sport OR pilates OR soccer OR walk* OR stair climbing OR swimming OR running OR jogging OR physical conditioning, human OR gymnastics OR plyo* exercise OR circuit-based exercise OR resistance training OR endurance training OR high-intensity interval training) OR AB (athletics OR sport OR pilates OR soccer OR walk* OR stair climbing OR swimming OR running OR jogging OR physical conditioning, human OR gymnastics OR plyo* exercise OR circuit-based exercise OR resistance training OR endurance training OR high-intensity interval training) OR TX (gym OR circuit-based training OR circuit training OR circuit class OR

weight training OR HIIT OR HIIT training OR interval training OR physical activity OR sedentary behavio?r OR inactivity)) AND (MH “Causality+” OR TI (correlate* OR determinant* OR barrier* OR risk factor* OR protective factor* OR precipitating factor* OR confounding factor*, epidemiologic OR age factor* OR race factor* OR sex factor*) OR AB (correlate* OR determinant* OR barrier* OR risk factor* OR protective factor* OR precipitating factor* OR confounding factor*, epidemiologic OR age factor* OR race factor* OR sex factor*) OR TX (Causation OR Cause* OR barrier* OR facilitator* OR obstacle* OR challenge* OR difficult* OR issue* OR motivator* OR enabler* Or inhibit* OR prevent*)) AND (MH "qualitative research+” OR AB (focus group* OR thematic OR perspective* OR perception* or narrative OR qualitative OR qualitative study OR qualitative methodology OR hermeneutics OR grounded theory OR empirical research) OR TI (focus group* OR thematic OR perspective* OR perception* or narrative OR qualitative OR qualitative study OR qualitative methodology OR hermeneutics OR grounded theory OR empirical research)) AND TX (wom?n or female*)
NOT
TX (interview OR mixed Methods)

Limits:
English language only
Peer reviewed articles only
2010-2020

Total # papers identified: 4, 064 results

Add words based on papers identified without free text terms:
N/A
Add words based on synonyms identified without free text terms:
N/A

Note: No changes to completed search

Key Concept 4
Remove MeSH heading for Key Concept 4
This step was not applicable as Key Concept 4 (women) was not attached to any MeSH heading.

Remove free text terms for Key Concept 4
(MH “Exercise+” OR TI (athletics OR sport OR pilates OR soccer OR walk* OR stair climbing OR swimming OR running OR jogging OR physical conditioning, human OR gymnastics OR plyo* exercise OR circuit-based exercise OR resistance training OR endurance training OR high-intensity interval training) OR AB (athletics OR sport OR pilates OR soccer OR walk* OR stair climbing OR swimming OR running OR jogging OR physical conditioning, human OR gymnastics OR plyo* exercise OR circuit-based exercise OR resistance training OR endurance training OR high-intensity interval training) OR TX (gym OR circuit-based training OR circuit training OR circuit class OR weight training OR HIIT OR HIIT training OR interval training OR physical activity OR sedentary behavio?r OR inactivity)) AND (MH “Causality+” OR TI (correlate* OR

determinant* OR barrier* OR risk factor* OR protective factor* OR precipitating factor* OR confounding factor*, epidemiologic OR age factor* OR race factor* OR sex factor*) OR AB (correlate* OR determinant* OR barrier* OR risk factor* OR protective factor* OR precipitating factor* OR confounding factor*, epidemiologic OR age factor* OR race factor* OR sex factor*) OR TX (Causation OR Cause* OR barrier* OR facilitator* OR obstacle* OR challenge* OR difficult* OR issue* OR motivator* OR enabler* Or inhibit* OR prevent*)) AND (MH "qualitative research+" OR AB (focus group* OR thematic OR perspective* OR perception* or narrative OR qualitative OR qualitative study OR qualitative methodology OR hermeneutics OR grounded theory OR empirical research) OR TI (focus group* OR thematic OR perspective* OR perception* or narrative OR qualitative OR qualitative study OR qualitative methodology OR hermeneutics OR grounded theory OR empirical research) OR TX (interview OR mixed Methods))
NOT
TX (wom?n OR female*)

Limits:
English language only
Peer reviewed articles only
2010-2020

Total # papers identified: 5, 547 results

Add words based on papers identified without free text terms:
N/A
Add words based on synonyms identified without free text terms:
KC1: tai chi
KC2: N/A
KC3: N/A
KC4: N/A

Completed search up to this point:
(MH "Exercise+" OR TI (tai chi OR athletics OR sport OR pilates OR soccer OR walk* OR stair climbing OR swimming OR running OR jogging OR physical conditioning, human OR gymnastics OR plyo* exercise OR circuit-based exercise OR resistance training OR endurance training OR high-intensity interval training) OR AB (tai chi OR athletics OR sport OR pilates OR soccer OR walk* OR stair climbing OR swimming OR running OR jogging OR physical conditioning, human OR gymnastics OR plyo* exercise OR circuit-based exercise OR resistance training OR endurance training OR high-intensity interval training) OR TX (gym OR circuit-based training OR circuit training OR circuit class OR weight training OR HIIT OR HIIT training OR interval training OR physical activity OR sedentary behavio?r OR inactivity)) AND (MH "Causality+" OR TI (correlate* OR determinant* OR barrier* OR risk factor* OR protective factor* OR precipitating factor* OR confounding factor*, epidemiologic OR age factor* OR race factor* OR sex factor*) OR AB (correlate* OR determinant* OR barrier* OR risk factor* OR protective factor* OR precipitating factor* OR confounding factor*, epidemiologic OR age factor* OR race factor* OR sex factor*) OR TX (Causation OR Cause* OR barrier* OR facilitator* OR obstacle* OR challenge* OR difficult* OR issue* OR motivator* OR enabler* Or inhibit*

OR prevent*)) AND (MH "qualitative research+" OR AB (focus group* OR thematic OR perspective* OR perception* or narrative OR qualitative OR qualitative study OR qualitative methodology OR hermeneutics OR grounded theory OR empirical research) OR TI (focus group* OR thematic OR perspective* OR perception* or narrative OR qualitative OR qualitative study OR qualitative methodology OR hermeneutics OR grounded theory OR empirical research) OR TX (interview OR mixed Methods)) AND TX (wom?n or female*)

Limits:
English language only
Peer reviewed articles only
2010-2020

Total # papers identified: 8,613

Step 12: Evaluate the initial results
To evaluate the initial search results, it was necessary to check whether a paper familiar to the lead reviewer, which would certainly be included in the qualitative evidence synthesis was picked up by the search.

The paper chosen was:
Hubbell, A. M., Hardy, E. C., Astroth, K. S., Jenkins, S. H., Woith, W. M., & Mallory, C. (2020). A qualitative study of influences on long-term physical activity in physically active African American women. *Nursing Forum*. *55*(2), 227-235

This paper was found in the first page of results as ordered by relevance. Thus, no further action was required at this stage.

Step 13: Check for errors
Initially, the search strategy was carefully read through with special focus on location of brackets as well as “and” and “or” Boolean operators. It is noteworthy here that (as stated in Step 5 – Choosing a database), Medline with the Ebsco interface was selected partly on the basis of how the interface works. Both ‘Boolean operators’ and ‘field to be searched’ can be selected from a drop down menu. Once the search has been run, the database logs the full search as a single line search strategy in the ‘search history/alert’ section, meaning that the risk of making this type of error is reduced. Careful checking identified no errors of this kind.

Each search that was conducted during the development of the completed single line search strategy, as it appears above, was re-run.

The number of results was assessed in terms of:
-the number expected based on whether the search had been broadened or made more specific
- How the number of results compared to other searches at the same stage of development
- How many results were identified when running the same searches at an earlier date

Nothing was identified here that seemed to require alterations or amendments. All searches, without exception, showed just a small increase in the number of papers identified compared to when that search was last run. This would be expected due to the passage of time and more papers being published.

The PRESS Checklist

Although Bramer and colleagues propose that ideally searches should be checked by an Information Specialist, the lead reviewer was unable to establish contact with a relevant professional. As such, the second reviewer (who has a Doctorate in Applied Psychology and had not played a part in the development of this literature search up to this point), assessed the search in line with the Peer Review Electronic Search Strategy (PRESS) Checklist: 2015 Guideline Statement (McGowan et al., 2016). No revisions were suggested at this stage.

PRESS Guideline — Search Submission & Peer Review Assessment

SEARCH SUBMISSION: THIS SECTION TO BE FILLED IN BY THE SEARCHER

Searcher: Madeleine Leather	Email: b9039819@my.shu.ac.uk	
Date submitted:17/05/2020	Date requested by :22/05/2020	*[Maximum = 5 working days]*

Systematic Review Title:

Understanding women's perceptions of barriers and facilitators to physical activity: A qualitative evidence synthesis with findings mapped onto COM-B

This search strategy is ...

X	My PRIMARY (core) database strategy — First time submitting a strategy for search question and database
	My PRIMARY (core) strategy — Follow-up review NOT the first time submitting a strategy for search question and database. If this is a response to peer review, itemize the changes made to the review suggestions
	SECONDARY search strategy— First time submitting a strategy for search question and database
	SECONDARY search strategy — NOT the first time submitting a strategy for search question and database. If this is a response to peer review, itemize the changes made to the review suggestions

Database

(i.e., MEDLINE,CINAHL…): *[mandatory]*

MEDLINE

Interface

(i.e., Ovid, EBSCO…): *[mandatory]*

EBSCO

Research Question

(Describe the purpose of the search) *[mandatory]*

What are the barriers and facilitators to physical activity for women as described by themselves in a rich and nuanced way

PICO Format

(Outline the PICOs for your question — i.e., Patient, Intervention, Comparison, Outcome, and Study Design — as applicable)

P	Women who have not been recruited on the basis of having a pre-existing illness or condition
I	N/A
C	N/A

O	Identified barriers and facilitators to physical activity
S	Qualitative

Inclusion Criteria

Females

Adults (18-65 years)

Exclusion Criteria

Participants must not have been recruited on the basis of having a pre-existing illness or condition

Was a search filter applied?

Yes X No

If YES, which one(s) (e.g., Cochrane RCT filter, PubMed Clinical Queries filter)? Provide the source if this is a published filter. *[mandatory if YES to previous question — textbox]*

Date: 2010-2020

Peer reviewed Journal articles only

English language only

Other notes or comments you feel would be useful for the peer reviewer? *[optional]*

The date limitation was applied due to the WHO publishing guidelines regarding physical activity guideline recommendations at this point in time.

Please copy and paste your search strategy here, exactly as run, including the number of hits per line. *[mandatory]*

Single line search strategy:

(MH “Exercise+” OR TI (tai chi OR athletics OR sport OR pilates OR soccer OR walk* OR stair climbing OR swimming OR running OR jogging OR physical conditioning, human OR gymnastics OR plyo* exercise OR circuit-based exercise OR resistance training OR endurance training OR high-intensity interval training) OR AB (tai chi OR athletics OR sport OR pilates OR soccer OR walk* OR stair climbing OR swimming OR running OR jogging OR physical conditioning, human OR gymnastics OR plyo* exercise OR circuit-based exercise OR resistance training OR endurance training OR high-intensity interval training) OR TX (gym OR circuit-based training OR circuit training OR circuit class OR weight training OR HIIT OR HIIT training OR interval training OR physical activity OR sedentary behavio?r OR inactivity)) AND (MH “Causality+” OR TI (correlate* OR determinant* OR barrier* OR risk factor* OR protective factor* OR precipitating factor* OR confounding factor*, epidemiologic OR age factor* OR race factor* OR sex factor*) OR AB (correlate* OR determinant* OR barrier* OR risk factor* OR protective factor* OR precipitating factor* OR confounding factor*, epidemiologic OR age factor* OR race factor* OR sex factor*) OR TX (Causation OR Cause* OR barrier* OR facilitator* OR obstacle* OR challenge* OR difficult* OR issue* OR motivator* OR enabler* Or inhibit* OR prevent*)) AND (MH "qualitative research+” OR AB (focus group* OR thematic OR perspective* OR perception* or narrative OR qualitative OR qualitative study OR qualitative methodology OR hermeneutics OR grounded theory OR empirical research) OR TI (focus group* OR thematic OR perspective* OR perception* or narrative OR qualitative OR qualitative study OR qualitative methodology OR hermeneutics OR grounded theory OR empirical research) OR TX (interview OR mixed Methods)) AND TX (wom?n or female*)

Total # results identified: 8,613

PEER REVIEW ASSESSMENT: THIS SECTION TO BE FILLED IN BY THE REVIEWER

Reviewer: Dr Julie Leather. BSc. Hons., M.Sc. Clin. Psych., PsyD	Email: julieleather@hotmail.co.uk	Date completed: 17/05/2020

1. TRANSLATION

A ---No revisions	X
B --- Revision(s) suggested	
C --- Revision(s) required	

If "B" or "C," please provide an explanation or example:
A single line search strategy has been used so there is only one measure of total results identified. This single line search strategy is appropriate and justified by use of literature (Bramer et al., 2016). Consequently, some items within this checklist will not be entirely relevant and appropriate when assessing this electronic search strategy.

2. BOOLEAN AND PROXIMITY OPERATORS

A ---No revisions	X
B --- Revision(s) suggested	
C --- Revision(s) required	

If "B" or "C," please provide an explanation or example:

3. SUBJECT HEADINGS

A ---No revisions	X
B --- Revision(s) suggested	
C --- Revision(s) required	

If "B" or "C," please provide an explanation or example:
Although there is no subject heading for the key concept 'women', this is not assigned a subject heading by Medline. Therefore, this is not problematic as it would be inappropriate to assign a subject heading for this concept.

4. TEXT WORD SEARCHING

A ---No revisions	X
B --- Revision(s)suggested	
C --- Revision(s) required	

If "B" or "C," please provide an explanation or example:
Although no words have been input into to be searched within "all fields" (af). The number of identified papers from the search suggests that this is appropriate.

5. SPELLING, SYNTAX, AND LINE NUMBERS

A ---No revisions	X
B --- Revision(s)suggested	
C --- Revision(s) required	

If "B" or "C," please provide an explanation or example:

6. LIMITS AND FILTERS

A ---No revisions	X
B --- Revision(s) suggested	
C --- Revision(s) required	

If “B” or “C,” please provide an explanation or example:

OVERALL EVALUATION (Note: If one or more “revision required” is noted above, the response below must be “revisions required”.)

A --- No revisions	X
B --- Revision(s) suggested	
C --- Revision(s) required	

Additional comments:
Search appears to be careful and thorough. It was helpful to receive the Bramer et al. (2016) paper which defines the process of developing literature searches and then to see the additional document provided to me by the requestor detailing the implementation of each stage of the process.

Step 14: Translate to other databases

Hosted by Ebsco
MEDLINE – (8,613)
CINAHL complete (16,841 with Medline references removed)
SPORTDiscus (12,720)

(MH “Exercise+” OR TI (tai chi OR athletics OR sport OR pilates OR soccer OR walk* OR stair climbing OR swimming OR running OR jogging OR physical conditioning, human OR gymnastics OR plyo* exercise OR circuit-based exercise OR resistance training OR endurance training OR high-intensity interval training) OR AB (tai chi OR athletics OR sport OR pilates OR soccer OR walk* OR stair climbing OR swimming OR running OR jogging OR physical conditioning, human OR gymnastics OR plyo* exercise OR circuit-based exercise OR resistance training OR endurance training OR high-intensity interval training) OR TX (gym OR circuit-based training OR circuit training OR circuit class OR weight training OR HIIT OR HIIT training OR interval training OR physical activity OR sedentary behavio?r OR inactivity)) AND (MH “Causality+” OR TI (correlate* OR determinant* OR barrier* OR risk factor* OR protective factor* OR precipitating factor* OR confounding factor*, epidemiologic OR age factor* OR race factor* OR sex factor*) OR AB (correlate* OR determinant* OR barrier* OR risk factor* OR protective factor* OR precipitating factor* OR confounding factor*, epidemiologic OR age factor* OR race factor* OR sex factor*) OR TX (Causation OR Cause* OR barrier* OR facilitator* OR obstacle* OR challenge* OR difficult* OR issue* OR motivator* OR enabler* Or inhibit* OR prevent*)) AND (MH "qualitative research+” OR AB (focus group* OR thematic OR perspective* OR perception* or narrative OR qualitative OR qualitative study OR qualitative methodology OR hermeneutics OR grounded theory OR empirical research) OR TI (focus group* OR thematic OR perspective* OR perception* or narrative OR qualitative OR qualitative study OR qualitative methodology OR hermeneutics OR grounded theory OR empirical research) OR TX (interview OR mixed Methods)) AND TX (wom?n or female*)

Hosted by Proquest
Sociological abstracts (17,543 – 10th June 2020)

ASSIA (Applied Social Sciences Index and Abstracts) (14,648 – 11th June 2020)
PsycARTICLES & PsycINFO (searched together - 18, 832 – 12th June 2020)

(MAINSUBJECT.EXACT.EXPLODE("Physical Fitness") OR TI, AB (tai chi OR athletics OR sport OR pilates OR soccer OR walk* OR stair climbing OR swimming OR running OR jogging OR physical conditioning, human OR gymnastics OR plyo* exercise OR circuit-based exercise OR resistance training OR endurance training OR high-intensity interval training) OR ALL (gym OR circuit-based training OR circuit training OR circuit class OR weight training OR HIIT OR HIIT training OR interval training OR physical activity OR sedentary behavio?r OR inactivity)) AND (MAINSUBJECT.EXACT.EXPLODE("Causality") OR TI, AB (correlate* OR determinant* OR barrier* OR risk factor* OR protective factor* OR precipitating factor* OR confounding factor*, epidemiologic OR age factor* OR race factor* OR sex factor*) OR ALL (Causation OR Cause* OR barrier* OR facilitator* OR obstacle* OR challenge* OR difficult* OR issue* OR motivator* OR enabler* OR inhibit* OR prevent)) AND (MAINSUBJECT.EXACT.EXPLODE("Qualitative Methods") OR TI, AB (focus group* OR thematic OR perspective* OR perception* OR narrative OR qualitative OR qualitative study OR qualitative methodology OR hermeneutics OR grounded theory OR empirical research) OR ALL (interview OR mixed Methods)) AND (ALL (wom?n OR female*))

Web of science, scopus and science direct:
Not appropriate to use with this search strategy due to lack of MeSH headings or thesaurus terms

PubMed:
Too broad due to interdisciplinary nature of search alongside interdisciplinary nature of the database

Reflexive step (referring back to step 11):
Following initial analysis of the results from all of the above databases, it was noted that far too many irrelevant references were being retrieved by this search. As such, the Boolean operator “NOT” was used to eliminate words that were repeatedly coming up in the titles of irrelevant papers. These were based on the inclusion/exclusion criteria specified.

“NOT” CRITERIA:

MALE:
Man
Men
Male
Father*

AGE:
Older adult*
Elderly
Geriatric
Adolescent*
Youth
Pre-adolescent*
Child* (child, childhood, children?)
Girl*
Boy*

ABILITY:
Disabilit*
Disabled
Mobility impairment

SCHOOL:
Physical education
PE
School
Elementary
High-school??

ATHLETES:
Coach
Athlete*
Elite

PREGNANCY:
Prenatal
Antenatal
Perinatal
Postnatal

SPECIFIC HEALTH PROBLEMS:
Diabetes
Diabetic
Heart disease
Ischaemic
HIV
Multiple sclerosis
Chronic pain
Eating disorder
Anorexia
Bulimia

After adding NOT
Cancer
Osteoarthritis
Arthritis
Heart disease
Heart failure
Retired
Comorbid*
Multimorbid*
Multi-morbid*
Pregnan*
Inpatient
Gestational
Sclerosis
Diagnosed
Diagnosis
Breastfeeding
Low back pain
Back pain
Stress fracture
Surgery
Postpartum
Dementia
Substance use
Substance misuse
Paediatric

Round 2:
Inflammatory bowel disease
IBS
IBD
Coronary heart disease
Coronary artery disease
Obese
Obesity
Overweight
Older

Menopaus*
Post-menopaus*
Polio
Polycystic ovary syndrome
PCOS
Syndrome
Chronic illness
Asthma
Patients
Mental illness
Cystic fibrosis
COPD
Chronic obstructive pulmonary disease

The final limits chosen and justifications are as follows:

English language only - "Challenges of translation are discussed from the perspective that interpretation of meaning is the core of qualitative research. As translation is also an interpretive act, meaning may get lost in the translation process." (Van Nes, Abma, Jonsson & Deeg, 2010, p. 313)

Peer reviewed articles only - This qualitative evidence synthesis aims to summarise what barriers and facilitators to physical activity for women have been identified in high quality, qualitative research. Anecdotal evidence or research of poor quality would not be appropriate to include.

Papers published between 2016 and 2020 – *This amendment was made in response to the covid-19 pandemic*. December 2015 marked "the biggest shift in government policy on sport for more than a decade" with Sport Nation's Towards an Active Nation Strategy for 2016-2021. The strategy aimed to focus on *reducing inactivity,* as opposed to just increasing physical activity – this seems particularly relevant due to the focus on women for this study , n conjunction with the increased likelihood of women being inactive. Secondly, the strategy aimed to "keep pace with customer's digital expectations" which in light of social distancing/shielding guidelines in response to covid-19, seems particularly relevant at the current time as much delivery of initiatives aiming to increase physical activity are likely to be conducted online/remotely for now and in the near future.

The above completed single line search strategy, with the above limitations yielded a total of 2,084 results on Medline (hosted by Ebsco).

17th September 2020:
Medline = 2,084 results
CINAHL = 3,424
SportDISCUS = 6,229
Databases hosted by Proquest
Sociological abstracts (7,640 – 24th September 2020)
ASSIA (Applied Social Sciences Index and Abstracts) (6,880 – 20th September 2020)
PsycARTICLES (8,192 – 20th September 2020)
PsycINFO (1,532 – 20th September 2020)

Appendix 4: Completed single line search strategy for databases hosted by EBSCO

((MH “Exercise+” OR TI (tai chi OR athletics OR sport OR pilates OR soccer OR walk* OR stair climbing OR swimming OR running OR jogging OR physical conditioning, human OR gymnastics OR plyo* exercise OR circuit-based exercise OR resistance training OR endurance training OR high-intensity interval training) OR AB (tai chi OR athletics OR sport OR pilates OR soccer OR walk* OR stair climbing OR swimming OR running OR jogging OR physical conditioning, human OR gymnastics OR plyo* exercise OR circuit-based exercise OR resistance training OR endurance training OR high-intensity interval training) OR TX (gym OR circuit-based training OR circuit training OR circuit class OR weight training OR HIIT OR HIIT training OR interval training OR physical activity OR sedentary behavio?r OR inactivity)) AND (MH “Causality+” OR TI (correlate* OR determinant* OR barrier* OR risk factor* OR protective factor* OR precipitating factor* OR confounding factor*, epidemiologic OR age factor* OR race factor* OR sex factor*) OR AB (correlate* OR determinant* OR barrier* OR risk factor* OR protective factor* OR precipitating factor* OR confounding factor*, epidemiologic OR age factor* OR race factor* OR sex factor*) OR TX (Causation OR Cause* OR barrier* OR facilitator* OR obstacle* OR challenge* OR difficult* OR issue* OR motivator* OR enabler* Or inhibit* OR prevent*)) AND (MH "qualitative research+” OR AB (focus group* OR thematic OR perspective* OR perception* or narrative OR qualitative OR qualitative study OR qualitative methodology OR hermeneutics OR grounded theory OR empirical research) OR TI (focus group* OR thematic OR perspective* OR perception* or narrative OR qualitative OR qualitative study OR qualitative methodology OR hermeneutics OR grounded theory OR empirical research) OR TX (interview OR mixed Methods)) AND TX (wom?n or female*)) NOT TI (man OR men OR male OR males OR father OR older adult? OR elderly OR geriatric OR adolescent* OR youth OR pre-adolescent* OR child OR children OR childhood Or girl* OR boy* OR disabilit* OR disabled OR mobility impairment OR physical education OR PE OR school OR elementary OR coach OR athlete* OR elite OR prenatal OR antenatal OR perinatal OR postnatal OR diabetes OR diabetic OR heart disease OR ischaemic OR HIV OR Multiple sclerosis OR chronic pain OR eating disorder* OR anorexi* OR bulimi* Or cancer OR osteoarthriti* OR arthriti* OR heart disease OR heart failure OR retired OR comorbid* OR multimorbid* Or multi-morbid* Or pregnan* OR inpatient* OR gestational OR sclerosis OR diagnose OR diagnosis OR breastfeeding OR low back pain OR back pain OR stress fracture OR surgery OR postpartum OR dementia OR substance use OR substance misuse OR paediatric OR inflammatory bowel disease OR IBS OR IBD OR coronary heart disease OR coronary artery disease OR obese OR obesity OR overweight OR older OR menopause* or postmenopaus* OR polio OR polycystic ovary syndrome OR PCOS OR syndrome OR chronic illness OR asthma OR patients OR mental illness OR cystic fibrosis OR COPD OR chronic obstructive pulmonary disease)

Appendix 5: Completed single line search strategy for databases hosted by ProQuest

(MAINSUBJECT.EXACT.EXPLODE("Physical Fitness") OR TI, AB (tai chi OR athletics OR sport OR pilates OR soccer OR walk* OR stair climbing OR swimming OR running OR jogging OR physical conditioning, human OR gymnastics OR plyo* exercise OR circuit-based exercise OR resistance training OR endurance training OR high-intensity interval training) OR ALL (gym OR circuit-based training OR circuit training OR circuit class OR weight training OR HIIT OR HIIT training OR interval training OR physical activity OR sedentary behavio?r OR inactivity)) AND (MAINSUBJECT.EXACT.EXPLODE("Causality") OR TI, AB (correlate* OR determinant* OR barrier* OR risk factor* OR protective factor* OR precipitating factor* OR confounding factor*, epidemiologic OR age factor* OR race factor* OR sex factor*) OR ALL (Causation OR Cause* OR barrier* OR facilitator* OR obstacle* OR challenge* OR difficult* OR issue* OR motivator* OR enabler* OR inhibit* OR prevent)) AND (MAINSUBJECT.EXACT.EXPLODE("Qualitative Methods") OR TI, AB (focus group* OR thematic OR perspective* OR perception* OR narrative OR qualitative OR qualitative study OR qualitative methodology OR hermeneutics OR grounded theory OR empirical research) OR ALL (interview OR mixed Methods)) AND (ALL (wom?n OR female*)) NOT TI (man OR men OR male OR males OR father OR older adult? OR elderly OR geriatric OR adolescent* OR youth OR pre-adolescent* OR child OR children OR childhood Or girl* OR boy* OR disabilit* OR disabled OR mobility impairment OR physical education OR PE OR school OR elementary OR coach OR athlete* OR elite OR prenatal OR antenatal OR perinatal OR postnatal OR diabetes OR diabetic OR heart disease OR ischaemic OR HIV OR Multiple sclerosis OR chronic pain OR eating disorder* OR anorexi* OR bulimi* Or cancer OR osteoarthriti* OR arthriti* OR heart disease OR heart failure OR retired OR comorbid* OR multimorbid* Or multi-morbid* Or pregnan* OR inpatient* OR gestational OR sclerosis OR diagnose OR diagnosis OR breastfeeding OR low back pain OR back pain OR stress fracture OR surgery OR postpartum OR dementia OR substance use OR substance misuse OR paediatric OR inflammatory bowel disease OR IBS OR IBD OR coronary heart disease OR coronary artery disease OR obese OR obesity OR overweight OR older OR menopause* or postmenopaus* OR polio OR polycystic ovary syndrome OR PCOS OR syndrome OR chronic illness OR asthma OR patients OR mental illness OR cystic fibrosis OR COPD OR chronic obstructive pulmonary disease

Appendix 6: CASP assessments for systematic qualitative evidence synthesis (2015-2020)

	CASP 1	CASP 2	CASP 3	CASP 4	CASP 5	CASP 6	CASP 7	CASP 8	CASP 9	CASP 10	CASP Total
	Clear statement of research aims	Qualitative methodology appropriate?	Appropriate research design?	Appropriate recruitment strategy?	Appropriate method of data collection?	Adequate consideration of researcher-participant relationship?	Consideration of ethical issues?	Sufficiently rigorous data analysis?	Clear statement of findings?	How valuable out of 5?	Score out of 23
Alsarve & Tjønndal (2020)	Yes	Yes	Yes	Unclear	Yes	No	Yes	Yes	Yes	4	19
Blackstone et al. (2017)	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	4	21.5
Clark (2019)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	5	23
Daniel, Abendrot & Erlen (2017)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	5	23
Dawes, Sanders & Allen (2018)	Yes	Yes	Yes	Yes	Yes	Unclear	Yes	Yes	Yes	4	21.5
Dlugonski & Motl (2016)	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	4	21
Dorwart, Smith Cornelous & Patterson (2019)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	5	23
Kalani et al. (2017)	Yes	Yes	Yes	Yes	Yes	Can't tell	Yes	Yes	Yes	4	21.5
Lambert et al. (2019)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	4	21.5
Lenneis & Pfister (2016)	Yes	Yes	Yes	Yes	Yes	Yes	Unclear	Yes	Yes	5	22.5

Lenneis & Pfister (2016a)	Yes	Yes	Yes	Yes	Yes	Yes	Unclear	Yes	Yes	5	22.5
Lenneis & Pfister (2017)	Yes	Yes	Yes	Yes	Yes	Yes	Unclear	Yes	Yes	5	22.5
Mathews et al. (2016)	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	5	22
Miles & Benn (2014)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	5	23
Morton (2017)	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	4	20
Öztürk & Koca (2017)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	5	23
Rathanaswami et al. (2016)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	5	23
Ruissen et al. (2019)	Yes	Yes	Yes	Yes	Unclear	Unclear	Yes	Yes	Yes	4	19
Sanz-Remacha et al. (2019)	Yes	Yes	Yes	Yes	Yes	Unclear	Yes	Yes	Yes	4	21.5
Segar et al. (2016)	Yes	Yes	Yes	Yes	Yes	No	Unclear	Yes	Yes	4	19
Tabatabaei et al. (2017)	Yes	Yes	Yes	Yes	Yes	Unclear	Yes	Yes	Yes	4	22

Appendix 7: Data extraction table for systematic qualitative evidence synthesis (2015-2020)

No.	Name:	Country	Ptpt N	Ptpt Age	Population	PA type	Data collection method	Context	Recruitment strategy	Theoretical basis	Type of analysis
1	Alsarve & Tjønndal (2020)	Norway & Sweden	12	18-55 years	Female fighters	Combat sports	Semi-structured interviews and focus groups	Challenging gender stereotypes through male dominated sport (MMA)	Purposive sampling (Email lists from MMA clubs)	Hegemonic masculinity	two-sided discursive psychology inspired (Wetherell, 1998)
2	Blackstone et al. (2017)	USA	21	M = 29.5	University group fitness programme members	Group exercise classes	Semi-structured interviews	Motivations for participating in group exercise for women	Convenience and snowball - via entering uni fitness clases	SDT	Open and axial coding (Corbyn and Strauss (2008) Thematic analysis
3	Clark (2019)	UK	13	22-54	Female gym go-ers	Exercise	Semi-structured interviews	Body image and its impact on PA	"Criterion-based sampling"	Feminist phenomenology	Inductive thematic analysis
4	Daniel, Abendroth & Erlen (2017)	USA	40	40-65	South Asian Indian immigrants (primarily Hindu)	Lifestyle PA	Focus groups	Understanding pa in a cultural context that isn't necessarily supportive	Purposive and snowballing (via places of worship)	PA framework for SAI Immigrants	Inductive blended analysis
5	Dawes, Sanders & Allen (2018)	UK	11	23-57	Homeless (or previously	Running	Semi-structured interviews	Charity organisation promoting running for	Purposive sampling (via the running	Unclear/Inductive	Inductive thematic analysis

					homeless) women			homeless women	group under study)		
6	Dlugonski & Motl (2016)	USA	14	18-64	Single mothers	Any	Semi-structured interviews	Understanding pa for single mothers	Purposive sampling (from a previous non-intervention study)	SCT	Not stated but inductive thematic inspired
7	Dorwart, Smith Cornelous & Patterson (2019)	USA	10	25-51	African American women	Outdoor recreation	Semi-structured interviews	AA women in a white and male dominated sport	Purposive and snowballing	Crawford and Godbey's Model of Leisure Constraints	Open and axial coding (Corbyn and Strauss (2008) Constant comparison analysis
8	Kalani et al. (2017)	Iran	46	20-59	Iranian women	Exercise	Focus groups and one interview	Urban iranian women	Convenience sampling (claims to be purposive)	Inductive	Content analysis (Inductive - Graneheim & Lundman)
9	Lambert et al. (2019)	Australia	20	18-30	Sedentary young women with below average bone density	Osteoarthritis prevention intervention	Semi-structured interviews	Assessing acceptability and feasibility of osteoarthritis prevention intervention	Purposive sampling,Randomly selected for quant component then initial 20 respondents took part in qual element	Unclear/Inductive	Automated conceptual analysis
10	Lenneis & Pfister (2016)	Denmark	20	27-62	Female migrant cleaners	Team games	Observations and semi-structured interviews	Work-based PA intervention	Purposive sampling (via a University	Social ecological models	thematic analysis using "theoretically informed reading"

									and a hospital)		(inductive and deductive)
11	Lenneis & Pfister (2016a)	Denmark	33	27-62	Female migrant cleaners	Recreational PA	Observations and semi-structured interviews	Attitudes to health & PA	Purposive sampling (via a University and a hospital)	Social ecological models	thematic analysis using "theoretically informed reading" (inductive and deductive)
12	Lenneis & Pfister (2017)	Denmark	26	27-50	Female migrant cleaners	Recreational PA	Observations and semi-structured interviews	Attitudes to different PA modalities	Purposive sampling (via a University and a hospital)	Social ecological models	thematic analysis using "theoretically informed reading" (inductive and deductive)
13	Mathews et al. (2016)	India	26 included (2 men not included)	25-60	Indian women (in Thiruvananthapuram City)	Occupational and recreational PA	Focus groups	Understanding pa in a cultural context that isn't necessarily supportive	Purposive sampling (via convenience sample of workers from 4 Residents' Associations)	Social ecological models	Inductive thematic analysis
14	Miles & Benn (2016)	UK	34 then 6	18-30+	Muslim women in higher education	Sport and exercise despite title	Open-ended questionnaires and semi-structured interviews	Understanding pa in the context of being a muslim woman (in Higher Education)	Purposive sampling (via Islamic Society)	Bordieu's (1984) notions of 'habitus', 'tasyte' and concepts of the 'body'	Content analysis (Deductive and inductive)
15	Morton (2017)	UK	2	Early 30's	White British women in full-	Adventure sport	Observations and structured interviews	Understanding women's lived experiences	Convenience sampling (as opportunities arose	Grounded theory (influenced by	Inductive thematic analysis

					time employment with regular participation in adventure sports			in a male dominated sport (Adventure sports)	whilst author was ethnographically immersed)	hermeneutic phenomenology	
16	Öztürk & Koca (2017)	Turkey	20	19-58	17 gym-users and 3 instructors	Gym-based 30minute circuits	Observations and semi-structured interview	Female only gyms in a Muslim country	Purposive sampling: (3 days a week participation for at least 3 months)	SDT	Inductive thematic analysis
17	Rathanaswami et al. (2016)	Canada	8	37-55 (although one age not stated)	South Asian women living in Canada (1st gen)	Any	Semi-structured interviews and focus groups	Comparing experiences of women who are employees or clients of a south asian women's centre in Canada	Purposive sampling (via South Asian Women's Centres)	The Ecological Model of Health Behavior (Glanz et al., 2008)	Not stated but well described - appears to be both inductive and deductive
18	Ruissen et al. (2019)	Canada	110	M = 20.56	Insufficiently active University Students	Affective or instrumentally aimed PA intervention	One-on-one short structured interviews but not clearly stated	Comparing b's and f's stated when questions are worded as affective (like/dislike) or instrumental (advantages	Sample recruited from a large RCT	Based upon findings from the large RCT	Deductive anaysis (using a directed content analytic approach)

								/disadvantages)			
19	Sanz-Remacha et al. (2019)	Spain	11	27-58	Roma or non-roma disadvantaged women	Officially PA but primarily exercise discussed	Semi-structured interviews and focus groups	Exploring differences between Roma and non-roma disadvantaged women (with Roma women being a discriminated minority) and the impact of Mothers on childhood obesity	Purposive sampling (from previous study with N=14)	Social ecological models	Inductive interpretive analysis
20	Segar et al. (2016)	USA	52	35¬± 9	low-income urban mothers	Walking	Focus groups	Aiming to promote population-wide walking inititatives for low-income urban mothers	Convenience sampling (via the Physical Activity Policy Research Network)	Grounded theory	Inductive using journalistic questioning strategy
21	Tabatabaei et al. (2017)	Iran	51	36 (SD=7)	Iranian women	Any	Focus groups	Using social marketing theory as a way to encourage PA	Convenience sampling (via a randomly selected health centre)	Social marketing model	Deductive anaysis (using a directed content analytic approach)

22	Walsh & Simpson (2020)	UK	295	35-55	Midlife women	Leisure time PA/walking	Online survey (mixed methods)	Survey exploring PA for middle-aged women	Convenience sampling (via advertisement through community groups, surgeries and social media)	Unclear/Inductive	Inductive thematic analysis
23	Ware et al. (2019)	South Africa	29	18-24	Young urban black women who are "pre-conception"	Pa in the context of other health behaviours	Focus groups	Young urban women in SA being viewed as a vulnerable group (exposed to intimate partner violence, HIV risk and expectations /likelihood of young child-bearing)	Convenience sampling (via pamphlet handout in medical centres)	COM-B/BCW	Inductive thematic analysis

Appendix 8: Coding framework for systematic qualitative evidence synthesis (2015-2020)

Construct	Possible examples	Does not include[9]
Physical capability		
Physical exhaustion	• References to being so physically exhausted that PA seems impossible, unmanageable or unappealing • Reference to being so tired from a physically demanding job that being physically active in free time seems unimaginable • Reference to needing to rest or be still due to your body being so tired	• Reference to mental effort or psychological fatigue – use 'mental exhaustion' under 'psychological capability'. • Reference to being demotivated generally – use 'apathy' under 'automatic motivation
Injuries/ health problems/ concerns	• Reference to the impact of past/current/chronic health problems or injuries upon PA (including family history) • Reference to engaging in PA following injury, as a means of aiding recovery • Reference to using PA to manage pain or symptoms from illness or injury	• References to lack of physical fitness – categorise as 'lack of physical fitness' under 'physical capability' • References to psychological/emotional/ mental health problems or concerns such as depressed mood, apathy or poor motivation – categorise as 'poor mental health' under 'psychological capability' or 'apathy' under 'automatic motivation' • References to being advised to be active by professionals

[9] In 'Does not include' column: The word 'use' indicates a category that is already in use within this coding framework. The word 'categorise' indicates a category that is not present within this coding framework, but which may be present within other coding frameworks for other studies within this thesis.

		– use ‘doctor’s orders’ under ‘social opportunity’ • Reference to the belief that engaging in PA will support recovery from illness or injury – use ‘belief that exercise helps recovery’ under ‘reflective motivation’
Psychological capability		
Lack of knowledge re PA guidelines	• References to not needing to exercise based on inaccurate knowledge or beliefs • Reference to not needing to exercise based on inaccurate beliefs about the amount of PA required to maintain health • Reference to not needing to exercise based on lack of knowledge about what constitutes ‘vigorous’ PA • Referencing beliefs that household chores/occupational PA carry the same health benefits as purposeful exercise	• Accurate beliefs about PA including the health benefits of active travel and domestic/occupational PA – use ‘knowledge of benefits of PA’ under ‘psychological capability’ • Reference to PA damaging virginity/fertility – categorise as ‘misinformation’ under ‘psychological capability’
Awareness of appropriate activity opportunities	• References to being aware of local facilities, resources and classes to support PA • Reference to being aware of women-only or women-targeted facilities, spaces and classes to support PA • References to being aware of spaces that provide women with the opportunity to	• References to the tangible presence and/or actual availability of appropriate activity opportunities – use ‘facility convenience and appropriateness’ under ‘physical opportunity’ • References to the timetabling of appropriate PA opportunities – use ‘timing and scheduling of activity/activity spaces’ under ‘physical opportunity’

	engage in PA in a way that is culturally acceptable	
Knowledge of benefits of PA	• References to being active based on accurate knowledge of the physical, psychological, economic and/or environmental consequences of being active • References to being active to avoid the negative consequences associated with being inactive or sedentary – e.g. depression, gaining weight	• References to beliefs about the consequences of engaging in PA, regardless of accuracy – categorise as 'beliefs in positive consequences of PA' under 'reflective motivation'
Planning/scheduling	• Reference to proactively planning or scheduling in PA • References to organising, structuring or restructuring time to enable participation in PA	• Reference to the person's schedule, timetable or daily routine – categorise as 'fixed schedules' under 'physical opportunity' or use 'fixed routines' under 'psychological capability'
Fixed routines	• References to regulating one's behaviour, to fit PA into daily schedules, via routines • Reference to creating active routines (e.g. by walking for the school run)	• The action of structuring or scheduling time to proactively enable PA – use 'planning and scheduling' under 'psychological capability' • Having fixed schedules that are outside of any control and cannot be altered or changed to be more or less active – categorise as 'fixed schedules' under 'physical opportunity'
Social opportunity		
Male presence	• Reference to not wanting to engage in	• References to the actual availability of single sex spaces for promoting

	PA whilst men are present • Reference to not wanting to be seen by men whilst engaging in PA • Reference to only being comfortable to engage in PA in women-only spaces and settings	women's PA – categorise as 'single sex spaces' under 'physical opportunity'
Instructional support, supervision, expertise and encouragement	• References to preferring PA under the instruction of a trained professional • References to using instructional videos to support with the safe undertaking of PA • References to finding an exercise instructor motivational • References receiving encouragement from a qualified fitness professional	• Social support from people other than an instructor or group leader during PA – use 'activity-related social support' under 'social opportunity' • Advice from doctors to be active – use 'doctor's orders' under 'social opportunity' • The development of skills that happens as a result of instructional support, supervision, expertise and/or encouragement – categorise as 'developing physical skills' under 'physical capability' or 'mental skill development' under 'psychological capability'
Activity with others	• References to preferring group fitness classes • References to enjoying PA because it doubles up as social time • References to feeling safer or more comfortable being active with others	• References to being encouraged to be active by other people in an exercise class – categorise as 'activity-related social support' under 'social opportunity'
Exposure to active people	• References to seeing people engaging in PA locally • References to having relationships with	• References to being inspired to be active based on the story of another active woman – categorise as 'active role models

	people who engage in PA • References to social norms around engaging in PA	(especially women(‘ under ‘social opportunity’
Doctor’s orders	• Reference to being active based on the advice of health professionals	• References to instructional support whilst engaging in PA – use ‘instructional support, supervision, expertise and encouragement’ under ‘social opportunity’ • References to knowledge of the health benefits of PA – use ‘knowledge of benefits of PA’ under ‘psychological capability’ • References to beliefs in positive health-related consequences of PA – categorise as ‘beliefs in positive consequences’ under ‘reflective motivation’ • References to being active as a form of rehabilitation or because of health conditions or concerns – use ‘injuries/health problems and concerns’ under ‘physical capability’
Activity-related social support	• References to being active together with friends or family • References to being encouraged to be active by other people in an exercise class	• References to being supported to be active via the provision of childcare – categorise as ‘wider social support’ under ‘social opportunity’ • References to being driven in a car by a friend or family member, to engage in PA – categorise as ‘wider social support’ under ‘social opportunity’ • References to preferring group fitness classes – use ‘activity with others’ under ‘social opportunity’

Cultural and religious expectations and requirements	• Reference to the impact of being from a certain culture on PA • Reference to the expectations placed on women from certain cultures/religions and how these impact available time for PA • Reference to the expectations placed on women from certain cultures/religions and how these impact how acceptable it is considered to be to engage in PA	• References to traditional gender norms, roles and expectations – categorise as 'traditional gender norms, roles and expectations' under 'reflective motivation' • References to Patriarchal societal structures – categorise as 'the patriarchy' under 'social opportunity' • References to social disapproval from others based on being active – use 'social sanctions' under 'automatic motivation' • References to people stigmatising women who engage in aggressive types of PA generally – categorise as 'stigma and social disapproval' under social opportunity • Reference to the impact of personally held religious beliefs on PA, rather than on social responses to being perceived to have violated those beliefs – use 'religious beliefs' under 'reflective motivation'
Social comparison	• Reference to changing PA based on a comparison of the self to others • Reference to being more active based on perceiving oneself as less attractive than other women • Reference to being less active based on feeling fitness levels do not match those of other women • Reference to being more motivated to be	• References to being driven to be active based on aspirations to attain a body image that is in line with women seen on social media – categorise as 'social media posts and imagery of fit women' under 'social opportunity' • References to being inspired to be active based on another woman's active story – categorise as 'active role models (especially women' under 'social opportunity'

	active with others of similar ability	
Physical Opportunity		
Roles and responsibilities that restrict available time for PA	• Reference to being unable to engage in PA due to being a mother • Reference to being unable to engage in PA due to being a wife • Reference to being unable to engage in PA due to having household responsibilities • Reference to being unable to engage in PA due to paid work roles and responsibilities • Reference to being unable to engage in PA due to having to fulfil dual roles and second shifts associated with undertaking paid work alongside domestic, household and/or caring responsibilities	• Reference to the impact of being from a certain culture or religion on PA – use 'cultural and religious expectations and requirements' under 'social opportunity' and/or 'religious beliefs' under 'reflective motivation' • References to fixed routines/schedules that do or don't account for PA - use 'Fixed routines' under 'psychological capability or categorise as 'fixed schedules' under 'physical opportunity' • References to a perceived lack of time that is not linked to fixed roles and responsibilities – use 'perceived lack of time' under 'reflective motivation'
Adverse or challenging personal circumstances	• Reference to homelessness making it difficult to engage in PA • Reference to the impact of unemployment on PA • Reference to PA levels changing following bereavement • Reference to the negative impact of	• References to optional recent migration – categorise as 'migration' under 'environmental context and resources'

	forced migration on PA	
High cost of engaging PA	• References to the price of engaging in specific types of PA • References to PA being unaffordable • References to the lack of available subsidised PA opportunities • References to the high cost of equipment or clothing needed to undertake PA in a dignified manner	• References to unemployment making PA unaffordable – use 'adverse or challenging personal circumstances' under 'physical opportunity' • Reference to having a job role or salary that mean engaging in PA is unaffordable – use 'socioeconomic status' under 'physical opportunity' • References to not having appropriate clothing or equipment – use 'not having appropriate clothes or equipment' under 'physical opportunity'
Low cost/free PA	• Reference to subsidised PA opportunities • Reference to free access to spaces for PA • Reference to affordable exercise classes • Reference to free opportunities to engage in PA • Reference to the relatively low cost of cycling, compared to driving or getting public transport	• References to the availability of green or blue spaces locally – use 'infrastructure that is supportive of PA' under 'physical opportunity'
Appropriate equipment/ clothing	• Reference to feeling able to be active based on having the right clothing • Reference to being able to engage in Pa based on having some home gym equipment • Reference to the importance of having	• Reference to being able to use equipment in PA-related spaces for free, to support PA – categorise as 'low cost (or free) PA opportunities' • Reference to single sex spaces enabling religious women to be active without the need to adhere to such strict dress codes – categorise as 'single sex

	a sports bra to engage in high impact PA • Reference to having clothing which is appropriate for PA and for religious requirements	spaces' under 'physical opportunity'
Weather	• References to it being easier to active in certain weather • Reference to certain weather making it difficult to be active • Reference to being more/less active during certain seasons due to the weather • References to it being unsafe to be active because of the weather	• References to the availability of spaces with appropriate aircon, to accommodate the weather – use 'facility convenience and appropriateness' under 'physical opportunity' • References to not having the right clothing to be active in certain weather – categorise as 'not having appropriate clothes or equipment' under 'physical opportunity'
Aspects of available activity types	• References to specific exercises that are appealing or not to the individual • References to the intensity of a PA type that is appealing or not • Reference to the setting in which PA typically happens and whether that is appealing	• References to women's ability to undertake a certain type of PA – categorise under 'physical capability' or 'psychological capability' accordingly • Reference to the level of enjoyment experienced when undertaking PA – use 'fun and enjoyment' under 'automatic motivation' • References to the level of social support available within PA settings – use 'activity-related social support' under 'social opportunity'
Timing and scheduling of activity/activity spaces	• Reference to exercise classes being timetabled in a way that is/isn't incompatible with women's roles as	• Reference to the limitations that being a primary caregiver places on women's available time to be active – categroise as 'traditional gender norms,

	primary caregivers (e.g. cannot be fit around school pick-up times) • Reference to opening times of PA facilities being/not being sufficiently extensive enough to allow women to attend around other responsibilities • References to lunchtime classes allowing/not allowing time for women to get changed and return to work on time	roles and expectations' under 'reflective motivation' • Reference to daily schedule/routines that are/are not supportive of PA – categorise as 'fixed schedules' under 'physical opportunity' or use 'fixed routines' under 'psychological capability' • Reference to other things limiting available time to be active – use 'competing goals and priorities' under 'reflective motivation'
Facility convenience and appropriateness	• References to having facilities that are on a route that is frequently taken (e.g. between work and home) • References to facilities appropriately accommodating for the weather (e.g. by having air con) • References to facilities allowing modest dress codes	• References to women only facilities – categorise as 'single sex spaces' under 'physical opportunity' • Reference to the requirement for a single sex space, based on religious values – use 'cultural and religious expectations and requirements' under 'social opportunity' and/or 'religious beliefs' under 'reflective motivation' • References to the timing of PA being convenient or not – use 'timing and scheduling of activity/activity spaces' under 'physical opportunity'
Not owning a vehicle	• References to engaging in active travel due to not having a vehicle • References to not being able to attend PA spaces due to not owning a vehicle • References to having less available time	• References to the high price of public transport – use 'high cost of engaging in PA' under 'physical opportunity' • References to not having accessible spaces to be active – use 'facility convenience and appropriateness' under 'physical opportunity'

	due to not owning a vehicle, as other forms of travel take up more time • References to not owning a vehicle meaning the only available option for access is public transport	• References to the timetabling of public transport links – categorise as 'public transport timetabling' under 'physical opportunity' • References to not being able to afford a vehicle – categorise as 'lack of money' under 'physical opportunity'
Environment safety	• References to specific aspects of the environment that are unsafe or not – e.g. traffic • References to the level of crime that falls under the category of 'violence against women and girls' locally	• Perceptions of environmental safety that are not necessarily founded in any objective truth – categorise as 'perceptions of safety' under 'reflective motivation • Perceptions of the general safety for women to engage in PA – categorise as 'perceptions of safety' under 'reflective motivation • References to infrastructure that does not enable PA outside the context of safety (e.g. mentioning lack of cycle paths meaning access is difficult but not discussing personal safety whilst cycling or potential safety implications of cycling in traffic) – categorise as 'infrastructure that is not supportive of PA' under 'physical opportunity' • References to male presence making women feel uncomfortable in gym settings, if no mention of personal safety issues – use 'male presence' under 'social opportunity'
Reflective Motivation		
Competing goals and priorities	• References to having priorities that sit above PA • References to having difficulty finding time	• References to the impact of traditional gender roles on women's PA – categorise as 'traditional gender roles' under 'reflective motivation'

	to be active because of other priorities • Reference to PA not being a priority • References to struggling to prioritise PA over other things • Reference to the need to juggle many tasks, to allow time for PA • Reference to the relative unimportance of women's PA as a form of health promotion, compared to the health needs or importance of health promotion for people they care for	• References to the impact of adverse personal circumstances on available time to be active – use 'adverse or challenging personal circumstances' under 'physical opportunity' • References to having daily schedules/routines that are unsupportive of PA – categorise as categorise as 'fixed schedules' under 'physical opportunity' or use 'routines that are unsupportive of PA' under 'psychological capability'
Desire for weight loss/ management	• References to having goals related to losing weight, that PA can support with • References to wanting to be active to maintain bodyweight • References to wanting to be active to lose weight • References to being active as a means of weight management • References to being active to achieve weight loss	• References to using PA to improve physique in other ways, e.g. by building muscle – categorise as 'physique/bodyweight goals' under 'reflective motivation' • References to the stable intention to manage physique/bodyweight – categorise as 'intention to manage physique/bodyweight' under 'reflective motivation'
Prioritising PA	• References to the act of prioritising PA over other things • References to rescheduling other things to enable PA	• References to being active based on having goals related to PA – categorise as 'health and fitness goals' or 'physique/bodyweight goals' under 'reflective motivation'

		• References to having the intention to be active, regardless of actual prioritisation – categorise as 'intention to be active' under 'reflective motivation' • References to believing PA is a more healthy way to lose weight than other methods – categorise as 'perceiving PA as the healthy way to manage weight/physique' under 'psychological capability'
Competition goals & winning	• References to engaging in PA as a form of training, to achieve competition goals • References to using PA to increase the likelihood of winning in sport	• References to feeling competitive with other women (e.g. in terms of physique, outside of a bodybuilding competition context) – use 'social comparison' under 'social opportunity'
Defiance/ resisting gender stereotypes	• References to being defiant in the face of social norms that are unsupportive of women's PA • Reference to proactively challenging gender stereotypes through PA participation • Reference to fighting against social disapproval and stigma associated with engaging in PA • Reference to engaging PA as a means of being empowered to challenge the Patriarchy • Reference to rejecting societal oppression of women through PA	• References to beliefs in the positive consequences of engaging in PA for women's rights – use 'beliefs in positive consequences of PA' under 'reflective motivation' • Reference to the way that traditional gender roles limit women's PA – use 'traditional gender norms, roles and expectations' under 'reflective motivation' • Reference to the way the Patriarchy limits women's Pa – use 'the Patriarchy' under 'social opportunity'

Willingness to try/conscious effort	• References to making a conscious effort to engage in PA • References to being willing to try new things in respect of PA • References to deciding to engage in PA regularly	• References to the act of planning PA in – use 'planning /scheduling' under 'psychological capability' • References to prioritising Pa over other things – use 'prioritising PA' under 'reflective motivation'
<u>Beliefs in positive consequences of PA</u>		
Belief that PA improves physique	• References to a belief that PA will result in weight loss, if this is the desired physique • References to a belief that PA will result in muscularity, if that is the desired physique • References to a belief that engaging in PA will make a person make attractive • References to using PA to target 'problem areas'	• References to having experienced actual improvements in physique, because of PA participation – use 'physical improvements' under 'automatic motivation' • References to using PA because of pressure to conform to societal beauty standards – categorise as 'societal beauty standard' under 'social opportunity' • goals relating to changing or maintaining physique – categorise as 'physique/bodyweight goals' under 'reflective motivation' • References to a belief that PA will result in better body confidence – use 'belief that PA increases self-esteem' under 'reflective motivation' • References to engaging in PA based on having poor body image – use 'body image' under 'automatic motivation'
Belief that PA increases self-esteem	• References to a belief that PA will result in improved self-esteem directly • References to a belief that PA will result in improved self-esteem via other	• References to having experienced improvements in self-esteem because of PA – categorise beneath 'positive consequences of PA' under 'automatic motivation' • References to a belief that Pa will improve general mood – use 'belief that PA ius mood-

	pathways (e.g. improved physique)	enhancing' under 'reflective motivation'
Belief that PA promotes Holistic health & wellbeing	• References to a belief that PA will encourage engagement in healthy behaviours more generally • References to a belief that people who are more active have better physical and psychological health and wellbeing	• References to having experienced actual improvements in holistic health and wellbeing because of PA – categorise beneath 'positive consequences of PA' under 'automatic motivation' • References to a belief that PA will improve general mood – use 'belief that PA ius mood-enhancing' under 'reflective motivation' • References to a belief that exercise helps recovery from injury or illness – use 'belief that exercise helps recovery' under 'reflective motivation'
Anticipating positive social outcomes	• References to a belief that being active will mean becoming a good role model • References to a belief that PA provides the opportunity for social time • References to a belief that being active is a good way to make friends	• References to preferring being active with others – use 'activity with others' under 'social opportunity' • References to a belief that PA will increase confidence – use 'belief that PA increases self-esteem' under 'reflective motivation'
Belief that exercise helps recovery	• References to a belief that PA is a good form of injury rehabilitation • References to a belief that PA can support recovery from illness	• References to being active based on the advice of medical professionals – use 'doctor's orders' under 'social opportunity' • References to using Pa to manage pain symptoms associated with illness or injury – use 'injuries/health problems and concerns' under 'physical capability'

Belief that PA is Energising & productivity inducing	• References to a belief that PA boosts energy levels • References to a belief that engaging in PA supports productivity in other aspects of life	• References to a belief that PA boosts general mood – use 'belief that PA is mood enhancing' under 'reflective motivation' • References to the actual experience of having increased energy following PA – use 'immediate rewards' or categorise as 'positive consequences of PA' under 'automatic motivation'
Belief that PA is mood-enhancing	• References to a belief that PA improves general mood • References to a belief that PA promotes happiness • References to a belief that PA improves mental health	• References to the actual experience of having improved mood following PA – use 'immediate rewards' or categorise as 'positive consequences of PA' under 'automatic motivation' depending upon length of time between PA and reward • References to advice from medical professionals to use PA to promote mental health – use 'doctor's orders' under 'social opportunity'
End of beliefs in positive consequences		
Belief that It hurts/it's difficult/it's vigorous	• References to being dissuaded from being active based on a belief that PA will result in pain • References to being more likely to engage in PA based on am belief that it will elicit aches and pains (thereby meaning it is considered effective) • References to a belief that engaging in PA will be challenging, regardless of whether this is	• References to having experienced actual pain, struggle or injury during PA – categorise as 'pain, struggle or injury from PA' under 'automatic motivation' • Reference to not having the appropriate skills required to undertake PA – categorise as 'lack of [physical or mental] skill' accordingly under [physical or psychological' capability' • References to a belief that one does not have the physical skills required to undertake PA safely – categorise as 'low self-

	perceived as positive or negative	efficacy' under 'reflective motivation'
Perceived lack of time	• References to not having enough time to be active • References to being too busy to engage in PA	• References to the roles and responsibilities that restrict available time for PA – use 'roles and responsibilities that restrict available time for PA' under 'physical opportunity' • References to having fixed routines that do not account for/include PA and which are incompatible with PA timetabling – use 'fixed routines' under 'psychological capability' or categorise as 'fixed schedules' under 'physical opportunity' • References to struggling to attend PA spaces and opportunities due to the timetabling/opening times – use 'timing and scheduling of activity/activity spaces' under 'physical opportunity'
Perceived lack of physical fitness	• References to not being fit enough to undertake general or specific PA	• References to comparing oneself unfavourably to others in a PA setting, based on fitness – use 'social comparison' under 'social opportunity' • References to lack of belief that one is capable of undertaking PA – categorise as 'low self-efficacy' under 'reflective motivation'
Mental exhaustion	• Reference to being too mentally drained for PA • Reference to being too tired to focus on PA • Reference to being too tired to prioritise PA	• Reference to being demotivated generally – use 'apathy' under 'automatic motivation • References to being so physically exhausted that PA seems impossible, unmanageable or unappealing – use 'physical

		exhaustion' under 'physical capability' • Reference to needing to rest or be still due to your body being so tired (e.g. from manual labour) – use 'physical exhaustion' under 'physical capability'
Self-efficacy	• References to a belief that one is good at general or specific PA • References to a belief that one is good at certain exercises • References to a belief that one has the skills required to achieve PA • References to a belief that one is physically fit enough to undertake PA	• References to a belief that engaging in PA would promote skill development – categorise as 'belief PA promotes skill development' under 'reflective motivation' • References to enjoying undertaking PA based on having higher perceived self-efficacy than others – use 'social comparison' under 'social opportunity' • Reference to the actual lack of mental skills needed to undertake PA – categorise as '(lack of) psychological capability' under 'psychological capability • References to not having the physical skills needed to undertake PA without risk of injury – use 'lack of physical skills' under 'physical capability'
Taking accountability	• References to it being a personal choice to be active or not • References to feeling responsible for one's own health • References to having personal agency over PA behaviour	• Accountability to others – categorise as 'accountability to others' under 'social opportunity'
Lack of identification with participants	• References to PA being for people who are 'not like me'	• Lack of exposure to active people – categorise as 'lack of exposure to active people' under 'social opportunity'

	• References to PA being suitable for people of ethnicities other than my own • References to not feeling like one fits in in PA spaces/settings	
Shared sisterhood and sense of belonging	• References to feeling like one fits in within specific or general PA settings or spaces • References to feeling that others in PA spaces or settings are 'like me' • References to feeling like 'we're all in it together' during PA	• References to enjoying being active with others regardless of supportiveness of relationship – use 'activity with others' under 'social opportunity'
Religious beliefs	• Reference to the impact of being a religious person on PA • References to the impact of personally held religious beliefs on PA behaviour	• Reference to the lack of appropriate provision available to suit religious requirements – 'facility convenience and appropriateness' under 'physical opportunity' • Reference to negative social responses from others for perceived violations of religious requirements – use 'social sanctions' under 'automatic motivation' • References to the expectations placed on religious women by others – use 'cultural and religious expectations and requirements' under 'social influences'
Body image	• References to being active based on body dissatisfaction • References to avoiding PA due to body dissatisfaction • References to believing one's body	• References to the belief that PA improves physique – use 'belief PA improves physique' under 'reflective motivation' • References to the belief that PA improves body image – use 'belief PA improves self-

	is not deserving of PA based on poor body image	esteem' under 'reflective motivation' • References to experiences of social disapproval from others regarding one's body shape/size – use 'social sanctions' under 'automatic motivation
Automatic Motivation		
Slow/little/no progress	• References to not seeing results from PA • References to desired results from PA happening too slowly • References to not improving at PA quickly enough • References to becoming demotivated due to lack of progress	• References to being motivated by small improvements – categorise as 'positive consequences of PA' • References to losing interest in PA itself – use 'apathy' under 'automatic motivation'
Sense of accomplishment	• References to feeling like one has achieved something positive by being active • References to being proud because of PA-related achievements	• References to enjoying the activity – use 'fun and enjoyment' under 'automatic motivation'
Physical improvements	• References to having experienced actual improvements in physique, because of PA participation • References to having developed physical skills and proficiency at PA because of participation	• References to a belief that PA will result in improvements in physique – use 'belief that PA improves physique' • The physical skills which are developed, based on physical improvements – categorise as 'developing physical skills' under 'physical capability'
Immediate rewards	• References to the feeling good during and/or immediately following PA	• References to positive consequences of PA that are not immediate – categorise as 'positive consequences of

	• References to feeling more relaxed during and/or immediately following PA	PA' under 'automatic motivation' • References to enjoying PA itself – use 'fun and enjoyment' under 'automatic motivation
Fun & enjoyment	• Reference to enjoying participation in PA • Reference to finding it fun to be active with certain people • References to finding PA inherently enjoyable • References to finding specific types of PA inherently enjoyable • References to finding it fun to be active in certain settings	• The impact of other people on the amount of fun and enjoyment had whilst being active – use 'activity-related social support' under 'social opportunity' • The impact of certain aspects of PA on fun and enjoyment (e.g – impact of including burpees on fun and enjoyment) – use 'aspects of available activity types' under 'physical opportunity'
Low effort levels required	• Reference to enjoying PA that is considered to require low effort levels • Reference to not enjoying PA that requires low effort levels • Reference to PA being too easy • Reference to liking or disliking PA that is perceived	• Reference to believing one's own capabilities make PA easier to undertake - use 'self-efficacy' under 'reflective motivation'
Past experience of PA	• References to having had positive past experiences of PA that influence current PA • References to having had negative past experiences of PA that influence current PA • References to having had no real	• Reference to experiencing positive consequences as a result of PA participation – categorise as 'positive consequences of PA' under 'automatic motivation' • Having had limited opportunity specifically to develop the skills required to engage in PA –categorise as 'limited opportunity to practice or develop skills' under 'physical opportunity'

	experiences of PA participation • References to having had many chances to participate in different types of PA	
Social sanctions	• References to negative social responses from others whilst engaging in PA • References to people expressing disapproval because of engagement in PA	• Understanding of societally held beliefs about certain types of PA being considered indecent for women – categorise as 'stigma and social disapproval' under 'social opportunity' • References to people not considering (general or specific types of) PA as appropriate for women – categorise as 'perceiving PA as masculine' under 'reflective motivation'
Apathy	• References to finding PA boring • References to not finding PA interesting • References to not particularly enjoying PA • References to feeling demotivated in respect of PA	• References to expecting PA to be boring – categorise as 'anticipating boredom' under 'reflective motivation' • References to believing PA to have unpleasant consequences – use 'belief it's difficult/it hurts/it's vigorous'
Fear	• References to the emotional experience of being frightened when engaging in PA (may relate to risk of injury, embarrassment, getting left behind or perceptions of safety)	• References to not being active based on perceptions of lack of safety without mentioning any associated emotional response - categorise as 'perceived safety' under 'reflective motivations' • Reference to feeling nervous, anxious or apprehensive about the prospect of engaging in PA – categorise as 'nerves, anxiety and apprehension' under 'automatic motivation'

		• Expecting to experience stigma when participating in PA, without mentioning any associated emotional response – categorise as 'anticipated stigma' under 'reflective motivation'
Guilt	• Reference to feeling bad for taking time to engage in PA based on it being perceived as a selfish act • Reference to being driven to be active by a sense of guilt or feeling of obligation centred on physical health • Reference to feeling guilty for taking time out to be active, leaving others to fulfil roles and responsibilities that would typically be ours • Reference to maternal guilt making it difficult to be active	• Reference to the actual roles and responsibilities that restrict available time to be active, without mentioning the associated emotional response – use 'traditional gender roles' under 'reflective motivation' for example

Appendix 9: CASP assessments for forward citation search qualitative evidence synthesis (2020-2025)

	CASP 1	CASP 2	CASP 3	CASP 4	CASP 5	CASP 6	CASP 7	CASP 8	CASP 9	CASP 10	Notes	CASP Total
	Clear statement of research aims	Qualitative methodology appropriate?	Appropriate research design?	Appropriate recruitment strategy?	Appropriate method of data collection?	Adequate consideration of researcher-participant relationship?	Consideration of ethical issues?	Sufficiently rigorous data analysis?	Clear statement of findings?	How valuable out of 5?		Score out of 23
Davis et al. (2024)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	5	A high quality study but intervention specific	23
Enderle (2024)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Can't tell	Yes	5	Directly addresses research aims of this PhD	22
Kim & Kwon (2025)	Yes	Yes	Yes	Can't tell	Yes	Yes	Yes	Can't tell	Yes	4	Very specific in terms of both cultural context and PA type. Less useful in context of Western society and CASP assessment shows some lack of clarity	20
Laar et al. (2022)	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	5	Largely good quality but places particular emphasis on role of female empowerment and barriers in this regard, with little attention paid to other factors or perspectives	21
Lennei s et al. (2022)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	4	High quality based on CASP and relevance for growing cultural, ethnic and religious diversity in the UK that is resulting in the	22

											need for appropriate provision within a Western society	
Lenneis et al. (2022a)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	3	Arguably fulfils CASP criteria better than Lenneis et al. (2022) although CASP scoring does not illuminate this – could not be scored well for original contribution to knowledge, as re-used the same data as a previous study in this synthesis (Lenneis et al. 2022 – No. 5)	20
Leslie-Walker et al. (2023)	Yes	Yes	Yes	Can't tell	Can't tell	Yes	Yes	Can't tell	Yes	4	Some issue with reporting of some methodological considerations, not always clear about what came from qual element in discussion. Limited discussion of strengths and limitations. Has relevance in respect of understanding migrant communities' experience in Western provision	19
Rahbari & Mahmudabadi (2023)	Yes	Yes	Yes	Yes	Yes	No	Yes	Can't tell	Yes	5	Limited transferability due to high SES urban participants but highly relevant for understanding intersection between gender, culture and religion in determining sports participation	20
Ryan et al. (2021)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	5	Limited transferability as doesn't include women who do not experience premenstrual body dissatisfaction (discussed how it might link to women who do not experience this) but likely to have relevance for people of the female sex	23

											(as opposed to gender) and the physiological experience of being a cis gendered woman	
Sanz-Remacha et al. (2021)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	4	Limited transferability due to population and intervention being specific but a high quality study exploring highly relevant perspectives	22
Soltani (2021)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Can't tell	Yes	4	Important study of largely good quality. Good use of triangulation, highly relevant but would benefit from more in-depth description of analytical processes of diverse data set	21
Spotswood (2021)	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	5	Good quality paper that explores the capability of mothers, who are otherwise not well represented within the body of work included for analysis/synthesis	22
Streetman et al. (2023)	Yes	Yes	Yes	Can't tell	Yes	No	Yes	Yes	Yes	5	Highly relevant but qualitative element somewhat less of a key feature than the quantitative element in this mixed methods study	20

Appendix 10: Data extraction table for forward citation search qualitative evidence synthesis (2020-2025)

No.	Author(s)	Country	N	Ptpt age	Population	PA type	Data collection method	Context	Recruitment strategy	Theoretical basis	Type of analysis
1	Davis et al. (2024)	Ireland	38	19-49	Obese women who had participated in one of three trial conditions (aerobic, resistance or a combination of the two)	The EXOFFIT (Exercise for Obesity in Females to increase Fitness) PA intervention	Semi-structured interviews	Pilot trial of the intervention, which aims to tackle obesity	Random assignment to conditions but unclear how recruited	Theoretical Framework of Acceptability (TFA)	(Well described) inductive analysis followed by deductive framework mapping to TFA
2	Enderle (2024)	Germany	11	19-45 (M=29.4)	Refugee and asylum seeking women in Germany	Vélomobility practices (AKA active travel) in the form of cycling	Participant observation, life story interviews and a focus group discussion	Aiming to explore how women experience vélomobility practices and culture differently in different countries of residence (including the impact of vélomobility capital in Germany's "green capital")	Convenience purposive sampling (via a cycling group that teaches people how to ride a bike)	Bordieu's interrelated concepts of *habitus, field, doxa and hysteresis*	Thematic analysis "with the theoretical framework serving as a primary analytical tool"
3	Kim & Kwon (2025)	South Korea	12	Mid 20's to mid 30's	South Korean women	Aesthetic exercise ("trendy, healthy,	In-depth interviews and participati	Understanding PA in the context of weight	Purposive sampling as an "insider researcher"	Unclear	Thematic analysis

						female-appropriate" exercise with weight loss aims)	on observations	management within an image focussed culture that places large expectations on women			
4	Laar et al. (2022)	Pakistan	18	20-25 (M=21.5)	Young female students enrolled in a P.E Masters at one university	Sports and physical activities	Semi structures and informant-style interviews (completed in Punjabi and translated into English)	Young women as change agents in sport and PA (often by being the first woman in their family to pursue sport or a career in sport and PA)	Purposive and snowball sampling	Feminism in sports theory	Thematic analysis approach using 3 stage systematic data analysis
5	Lenneis et al. (2022)	Denmark	14	26-58 years	Danish Muslim women	Women-only, unstructured swimming	Observation, informal interviews, reflexive interviews between research team and semi-structured interviews	Understanding Muslim women's experiences of participation in women-only swimming during a time when this has been banned in some part for Denmark	Heterogeneity sampling (Patton, 2015) supported by swimming club officials	Foucauldian framework	Reflexive thematic analysis (Foucauldian)

								for political reasons			
6	Lenneis et al. (2022a)	Denmark	14	26-58 years (M=41.9)	Muslim women living in Denmark	Women only swimming	Observation, informal interviews, reflexive interviews between research team and semi-structured interviews	Understanding Muslim women's experiences of participation in women-only swimming during a time when this has been banned in some part for Denmark for political reasons	Heterogeneity sampling (Patton, 2015) supported by swimming club officials	Transnational feminism	Reflexive thematic analysis
7	Leslie-Walker et al. (2023)	England	15 (in qualitative element)	20-48 years (M = 33.5)	West African female students	University sport	Focus groups	Understanding migrant women (international students') experiences of sport participation outside of their home culture	Purposive sampling	Unclear/not stated	Thematic analysis
8	Rahbari & Mahmudabadi (2023)	Iran	26	19-47 years (average = 31)	Iranian women from urban areas who have lived their adult life after the 1979 revolution	Sports	Semi-structured interviews (in-person, online or written responses)	Understanding gender and sports participation in countries where Islamic	Convenience then snowballing	Feminist perspectives on body politics	Content analysis followed by inductive coding

								law is encoded			
9	Ryan et al. (2021)	Australia	460	18-45 (M=24.1)	Cisgender women who feel negatively about their bodies during the premenstrual stage of the hormonal cycle	Exercise	Online survey and semi-structured interviews	Understanding how women's health behaviour changes in line with hormonal changes and the associated elevation in body dissatisfaction	Convenience via social media (Facebook)	Adopted a material-discursive-intrapsychic theoretical framework	Inductive theoretical thematic analysis
10	Sanz-Remacha et al. (2021)	Spain	11	27-56 (M=37.72)	Disadvantaged mothers of overweight or obese children	20-month community-based PA intervention: "Pio keeps moving"	Discussion groups, one-to-one semi-structured interviews and field notes	Aiming to understand and promote women's PA based on the ripple effect this has on their children's PA	Purposive sampling	Self-Determination Theory	Deductive thematic analysis
11	Soltani (2021)	New Zealand	20	19-44	Muslim women	Aquatic leisure activities	Semi-structured interviews, online observation through social media and self-directed	Exploring how intersectionality impacts Muslim women's participation in aquatic leisure activities. Acknowledgin	Snowball sampling via professionals working with Muslim women and girls	Intersectionality theory	Thematic analysis

							photograph hy	g Muslim women are a diverse (not homogeneus) group			
12	Spotswood et al. (2021)	England	15	20-50	Mothers of pre-school children	Leisure time PA	Semi-structured narrative interviews	Understanding the specific implications of mothering practices for leisure time PA (specfically temporal dimensions, demands and dispositions)	Maximum variation sampling	Practice theory	Open and axial coding
13	Streetman et al. (2023)	USA	17	18-65	Women from the Midwest of the USA	Physical activity	Semi-structured interview	Understanding the role of empowerment (and self-efficacy) in women's PA	Convenience	Empowerment theory	Inductive iterative thematic analysis
1	Davis et al. (2024)	Ireland	38	19-49	Obese women who had participated in one of three trial conditions (aerobic, resistance or a combination of the two)	The EXOFFIT (Exercise for Obesity in Females to increase Fitness) PA intervention	Semi-structured interviews	Pilot trial of the intervention, which aims to tackle obesity	Random assignment to conditions but unclear how recruited	Theoretical Framework of Acceptability (TFA)	(Well described) inductive analysis followed by deductive framework mapping to TFA

Appendix 11: Coding framework for forward citation search qualitative evidence synthesis (2020-2025)

Construct	Possible examples	Does not include
Physical capability		
Lack of physical skills	• References to not having the physical skills needed to undertake PA safely • References to not having the physical skills needed to undertake PA without risk of injury	• Reference to lacking the mental skills needed to be active – categorise as '(lack of) psychological capability' under 'psychological capability • Reference to not feeling confident whilst undertaking physical skills – categorise as 'low self-efficacy' under 'reflective motivation'
Having the physical skills	• Reference to pre-existing physical skills that are necessary to safely undertake PA (e.g. being able to swim)	• References to the development of physical skills – use 'developing physical skills' under 'physical capability'
Developing physical skills	• Having physical skills that are developing, which enable PA to be undertaken safely	• References to pre-existing physical skills – use 'having the physical skills' under 'physical capability' • Elements of interventions that enable physical skill development – use 'aspects of available activity types' under 'physical opportunity' or 'instructional support, supervision, expertise and encouragement' under 'social opportunity'
Weakness	• References to not being strong enough to undertake PA safely and without injury • References to being too weak to undertake PA safely and without injury	• References to perceived weakness – categorise as 'low self-efficacy' under 'reflective motivation'
Psychological capability		

Lack of awareness of available PA opportunities	• References to not being aware of local facilities that support women's PA • References to not being aware of local classes for women to engage in PA • References to not being aware of spaces that allow women to engage in PA in a way that is culturally acceptable	• References to the actual absence of suitable PA opportunities – categorise as 'facility convenience and appropriateness' under 'physical opportunity' instead
Misinformation	• References to long distance running harming fertility • References to PA damaging virginity	• References to social sanctions associated with not following advice that is based on misinformation – use 'social sanctions' under 'automatic motivation'
Awareness of appropriate activity opportunities	• References to being aware of local facilities, resources and classes to support PA • Reference to being aware of women-only or women-targeted facilities, spaces and classes to support PA • References to being aware of spaces that provide women with the opportunity to engage in PA in a way that is culturally acceptable	• References to the tangible presence and/or actual availability of appropriate activity opportunities – categorise as 'facility convenience and appropriateness' under 'physical opportunity' • References to the timetabling of appropriate PA opportunities – categorise as 'timing and scheduling of activity/activity spaces' under 'physical opportunity'
Knowledge of benefits of PA	• References to being active based on accurate knowledge of the physical, psychological,	• References to beliefs about the consequences of engaging in PA, regardless of accuracy – use 'beliefs in positive consequences of PA' under 'reflective motivation'

	economic and/or environmental consequences of being active • References to being active to avoid the negative consequences associated with being inactive or sedentary – e.g. depression, gaining weight	
Routines that are unsupportive of PA[10]	• Reference to the person's schedule, timetable or daily routine that limits available time to be active • Reference to working hours that limit available time to be active • Reference to daily routines that limit the opportunity to be active (e.g. the school day/timetable) • References to sedentary routines (e.g. desk-based work)	• References to the act of poor planning or scheduling of time in a way that is unsupportive of PA – categorise under 'psychological capability' as 'poor planning/scheduling'
Planning/scheduling	• Reference to proactively planning or scheduling in PA • References to organising, structuring or restructuring time to enable participation in PA	• Reference to the person's schedule, timetable or daily routine – use 'routines that are unsupportive of PA' under 'psychological capability' if a barrier or add a new category of 'routines that are supportive of PA' under

[10] There were no examples in this synthesis of women describing having daily routines or fixed schedules that were supportive of PA, although this was a feature in Chapter 3, which includes a divergent category named 'fixed routines' under 'psychological capability' and in Chapter 5, which includes a divergent category named 'fixed schedules' under 'physical opportunity'.

		‘psychological capability’ if a facilitator
Perceiving PA as the healthy way to manage weight/physique	• Reference to PA being a better /healthier alternative to surgery for weight/physique management • Reference to PA being a better/healthier alternative to highly restricted eating for weight/physique management	• Reference to beliefs about the consequences of engaging in PA for physique/weight management – use ‘beliefs in positive consequences of PA’ under ‘reflective motivation’
Mental skill development	• References to developing the mental skills needed to undertake PA generally • References to developing the mental skills needed to undertake specific types of PA • References to developing the skills that peripherally support or enable PA (e.g. learning how to maintain a push bike)	• Pre-existing mental skills that support PA – categorise as ‘having the mental skills’ under ‘psychological capability’
Social opportunity		
Male presence	• Reference to not wanting to engage in PA whilst men are present • Reference to not wanting to be seen by men whilst engaging in PA • Reference to only being comfortable	• Reference to the availability of single sex spaces for promoting women’s PA – use ‘single sex spaces’ under ‘physical opportunity’

	to engage in PA in women-only spaces and settings	
Lack of exposure to active people	• References to not seeing other people engaging in PA • References to not having relationships with active people • References to family members not engaging in PA	• References to not having social support available to facilitate PA – use 'lack of social support' under 'social opportunity'
Lack of social support	• References to not having other people to be active with • References to not having people to help with childcare to facilitate PA	• Negative responses from others regarding engaging in PA – use 'social sanctions' under 'automatic motivation' • References to not having relationships with active people – use 'lack of exposure to active people' under 'social opportunity' • References to people holding stigmatising views about women engaging in PA – use 'stigma and social disapproval' under 'social influences'
Cultural and religious expectations and requirements	• Reference to the impact of being a religious person on PA • Reference to the impact of being from a certain culture on PA • Reference to the expectations placed on women from certain cultures/religions and how these impact available time for PA • Reference to the expectations placed on women	• References to traditional gender norms, roles and expectations – use 'traditional gender norms, roles and expectations' under 'reflective motivation' • References to Patriarchal societal structures – use 'the patriarchy' under 'social opportunity' • References to social disapproval from others based on being active – use 'social sanctions' under 'automatic motivation' • References to people stigmatising women who engage in aggressive types of PA generally – use 'stigma

	from certain cultures/religions and how these impact how acceptable it is considered to be to engage in PA	and social disapproval' under social influences
The Patriarchy	• References to societal systems in which men hold power • References to institutional female oppression	• References to traditional gender norms, roles and expectations – use 'traditional gender norms, roles and expectations' under 'reflective motivation' • References to social disapproval from men – use 'social sanctions' under 'automatic motivation' • References to the religious requirements of female modesty – use 'cultural and religious expectations and requirements' under 'social opportunity'
Instructional support, supervision, expertise and encouragement	• References to preferring PA under the instruction of a trained professional • References to using instructional videos to support with the safe undertaking of PA • References to finding an exercise instructor motivational • References receiving encouragement from a qualified fitness professional	• Social support from people other than an instructor or group leader during PA – use 'activity-related social support' under 'social influences' • Advice from doctors to be active – use 'doctor's orders' under 'social opportunity' • The development of skills that happens as a result of instructional support, supervision, expertise and/or encouragement – use 'developing physical skills' under 'physical capability' or 'mental skill development' under 'psychological capability'
Social media posts and imagery of fit women	• References to seeing a photo of a fit woman on social media and feeling	• References to being inspired by active role models – use 'active role models (especially women)' under 'social opportunity'

	pressure to be active • References to being motivated to be active because of pressure to look like women from photographs • References to feeling under pressure to look like other women on social media • References to wanting to be active to change physique so that social media posts match up to that of other women	• References to being inspired to be active based on societally held ideas about what beauty is – use 'societal beauty standards' under 'social opportunity'
Active role models (especially women)	• References to being inspired to be active based on the story of another active woman • References to feeling able to overcome barriers to PA because of another person's story of doing the same	• References to seeing active women generally – categorise as 'exposure to active people' under 'social opportunity' • References to social norms that are supportive of women's PA – categorise as 'social norms that are supportive of women's PA' under 'social opportunity' • References to seeing photographs of women's bodies and being motivated to be active based on this – use 'social media posts and imagery of fit women' under 'social opportunity'
Doctor's orders	• Reference to being active based on the advice of health professionals	• References to instructional support whilst engaging in PA – use 'instructional support, supervision, expertise and encouragement' under 'social influences' • References to knowledge of the health benefits of PA – use 'knowledge of benefits of

		PA' under 'psychological capability' • References to beliefs in positive health-related consequences of PA – use 'beliefs in positive consequences' under 'reflective motivation' • References to being active as a form of rehabilitation or because of health conditions or concerns – categorise as 'injuries/health problems and concerns' under 'physical capability'
Activity-related social support	• References to being active together with friends or family • References to being encouraged to be active by other people in an exercise class	• References to being supported to be active via the provision of childcare – use 'wider social support' under 'social opportunity' • References to being driven in a car by a friend or family member, to engage in PA – use 'wider social support' under 'social opportunity' • References to preferring group fitness classes – categorise as 'activity with others' under 'social opportunity'
Social norms that are supportive of women's PA	• References to 'everybody' engaging in some form of PA • References to it being 'normal' for women to engage in PA	• References to having examples of specific women who act as active role models – use 'active role models (especially women)' under 'social opportunity' • References to being practically supported to be active by those around – use 'wider social support' or 'activity-related social support' under 'social opportunity'
Wider social support	• References to being enabled to be active via the provision of childcare	• References to being encouraged by others in an exercise class – use 'activity-

	• References to being driven in a car by a family member or friend, to take part in PA • References to being supported by work colleagues to manage workload in a way which allows time for PA	related social support' under 'social opportunity' • References to having an exercise professional that is supportive of PA within a gym setting – use 'instructional support. Supervision, expertise and encouragement' under 'social opportunity' • References to the advice of medical professionals to be active – use 'doctor's orders' under 'social opportunity'
Societal beauty standards	• References to what physical features are considered beautiful • References to what physical features are considered unattractive for women • References to feeling under pressure to be thin	• References to anticipated stigma based on physical appearance – use 'anticipated stigma' under 'reflective motivation' • References to experiencing social disapproval based on physical appearance – use 'stigma and social disapproval' under 'social influences'
Stigma and social disapproval	• References to people holding stigmatising views about women engaging in PA • References to people holding stigmatising views about women engaging in PA in a way that suits differing cultural or religious requirements • References to people holding stigmatising views about overweight people engaging in PA	• References to experiencing negative social responses whilst engaging in PA – use 'social sanctions' under 'automatic motivation' • References to anticipating or expecting stigma or social disapproval based on PA participation – use 'anticipated stigma' under 'reflective motivation

	• References to stigma around perceptions of laziness for people who are not active	
Physical Opportunity		
Adverse or challenging personal circumstances	• Reference to homelessness making it difficult to engage in PA • Reference to the impact of unemployment on PA • Reference to PA levels changing following bereavement • Reference to the negative impact of forced migration on PA	• References to optional recent migration – use 'migration' under 'environmental context and resources'
High cost of PA participation	• References to the price of engaging in specific types of PA • References to PA being unaffordable • References to the lack of available subsidised PA opportunities • References to the high cost of equipment or clothing needed to undertake PA in a dignified manner	• References to unemployment making PA unaffordable – use 'adverse or challenging personal circumstances' under 'physical opportunity' • Reference to having a job role or salary that mean engaging in PA is unaffordable – use 'socioeconomic status' under 'physical opportunity' • References to not having appropriate clothing or equipment – use 'not having appropriate clothes or equipment' under 'physical opportunity'
Driving for transport	• References to not engaging in active travel because driving is the preferred mode of transport • References to driving being a safer	• References to perceived safety whilst cycling, walking or using public transport – use 'perceptions of safety' under 'reflective motivation' • References to the impact of infrastructure on travel choices – use 'infrastructure

	mode of transport locally than walking, cycling or using public transport • Reference to driving being more convenient than other modes of transport	that is supportive of PA' or infrastructure that is not supportive of PA' under 'physical opportunity' • References to stigmatising attitudes about women engaging in active travel – use 'stigma and social disapproval' under 'social influences' • References to negative reactions from others whilst engaging in active travel – use 'social sanctions' under 'automatic motivation'
Infrastructure that is not supportive of PA	• References to lack of cycle paths • References to lack of pedestrian facilities such as crossings and pavements/ sidewalks • References to not having appropriate regulations to make PA safe • Reference to not having access to green spaces to be active	• Reference to the perceived safety of engaging in PA – use 'perceptions of safety' under 'reflective motivation'
Limited opportunity to practice or develop skills	• Reference to not being able to engage in certain types of PA, based on having had limited opportunity to practice or develop skills • Reference to not knowing how to do PA due to having had limited opportunity to learn the practical skills required to support	• References to not having had the chance to develop active habits or norms - use 'past experience of PA' under 'automatic motivation' • References to not having the physical skills to be active, independent of the opportunity to develop those skills – use 'lack of physical skills' under 'physical capability' • References to not having the mental skills required to be active, independent of opportunity to develop those

	it directly or indirectly	skills – categorise as 'lack of mental skills' under 'psychological capability' • References to social norms that have been unsupportive of women's PA – categorise as 'social norms that are unsupportive of women's PA' under 'social opportunity'
Not having appropriate clothes or equipment	• Reference to not having appropriate clothes to undertake PA in a dignified manner • Reference to not having exercise equipment to undertake PA at home • Reference to not having appropriate footwear to undertake PA	• Reference to the high financial cost of clothes or equipment that are required to engage in PA in a dignified way – use 'high cost of PA participation' under 'physical opportunity' • Reference to the requirement for women to adhere to modest dress codes whilst undertaking PA, to suit religious requirements – use 'cultural and religious expectations and requirements' under 'social influences'
Poor timetabling of PA[11]	• Reference to exercise classes being timetabled in a way that is incompatible with women's roles as primary caregivers (e.g. cannot be fit around school pick-up times) • Reference to opening times of PA facilities not being sufficiently extensive enough to allow women to attend	• Reference to the limitations that being a primary caregiver places on women's available time to be active – use 'traditional gender norms, roles and expectations' under 'reflective motivation' • Reference to daily routines that are unsupportive of PA – use 'routines that are unsupportive of PA' under 'reflective motivation' • Reference to other things limiting available time to be active – use 'competing goals and priorities' under 'reflective motivation'

[11] There were no examples in this synthesis of women describing timetabling of PA that was helpful – in Chapter 3 however, there was a divergent category labelled 'timing and scheduling of activity/activity spaces' under 'physical opportunity'

	• References to lunchtime classes not allowing time for women to get changed and return to work on time	
Poor promotion of PA opportunities	• Reference to having seen promotion of PA opportunities but without sufficient detail to be able to attend (e.g. location, time, cost) • Reference to only finding out about formal PA opportunities because of word of mouth, rather than via more formal channels	• References to having no awareness of suitable PA opportunities – use 'lack of awareness of available PA opportunities' under 'physical capability' • References to there not being suitable spaces to engage in PA locally – use 'infrastructure that is not supportive of PA' under 'physical opportunity'
Appropriate equipment/ clothing	• Reference to owning appropriate clothing to be able to engage PA in a dignified manner • Reference to owning appropriate clothing to engage in PA in line with religious requirements for modest dress codes • Reference to having the equipment needed to undertake PA at home • Reference to being provided with appropriate footwear to safely undertake PA	• Reference to being able to use equipment in PA-related spaces for free, to support PA – use 'low cost (or free) PA opportunities' • Reference to single sex spaces enabling religious women to be active without the need to adhere to such strict dress codes – use 'single sex spaces' under 'physical opportunity'

Infrastructure that is supportive of PA	• References to the presence of cycle paths • References to the presence of pedestrian facilities such as crossings and pavements/ sidewalks • References to there being appropriate regulations to make PA safe • Reference to having access to green or blue spaces to be active	• Reference to the perceived safety of engaging in PA – use 'perceptions of safety' under 'reflective motivation' • Reference to active social norms within a certain location – use 'social norms that are supportive of women's PA' under 'social opportunity'
Low cost (or free) PA opportunities	• Reference to subsidised PA opportunities • Reference to free access to spaces for PA • Reference to affordable exercise classes • Reference to free opportunities to engage in PA • Reference to the relatively low cost of cycling, compared to driving or getting public transport	• References to the availability of green or blue spaces locally – use 'infrastructure that is supportive of PA' under 'physical opportunity'
Single sex spaces	• References to the way that single sex spaces alleviate some of the requirements for Muslim women to adhere to modest dress codes • Reference to feeling more comfortable in single sex spaces	• Reference to the negative impact of men being present – use 'male presence' under 'social influences'

	• Reference to preferring being active with only women • References to the benefits of being in all female groups/spaces when being active	
Aspects of available activity types	• References to specific exercises that are appealing or not to the individual • References to the intensity of a PA type that is appealing or not • Reference to the setting in which PA typically happens and whether that is appealing	• References to women's ability to undertake a certain type of PA – categorise under 'physical capability' or 'psychological capability' accordingly • Reference to the level of enjoyment experienced when undertaking PA – use 'fun and enjoyment' under 'automatic motivation' • References to the level of social support available within PA settings – use 'activity-related social support' under 'social opportunity'
Migration	• Reference to the impact of migration on PA behaviour because of lack of social support • Reference to the impact of migration on perceived social norms • Reference to the impact of migration on PA behaviour, because of differences in infrastructure • Reference to the impact of migration on perceptions of beauty	• References to the trauma associated with forced migration – use 'adverse or challenging personal circumstances' under 'physical opportunity' • Reference to the direct impact of lack of social support on PA – use 'lack of social support' under 'social opportunity' • Reference to infrastructure that is supportive or unsupportive of PA – use 'infrastructure that is supportive of PA' or infrastructure that is not supportive of PA' under 'physical opportunity' • References to the direct impact of the cultural and

	• References to the challenges associated with navigating cultural and religious requirements in a new country that is not necessarily supportive of these	religious expectations placed on women, on their PA behaviour – use 'cultural and religious expectations and requirement'
Socioeconomic status	• References to the fact that people of a certain class do not engage in certain types of PA • References to the impact that being in a certain income bracket has on PA behaviour and available opportunities • References to the types of PA that affluent people engage in	• References to the high cost of PA participation – use 'high cost of PA' under 'physical opportunity' • References to the importance of having low cost or free PA opportunities – use 'low cost (or free) PA opportunities' • References to the impact of sudden unemployment on PA – use 'adverse or challenging personal circumstances' under 'physical opportunity'
Reflective motivation		
Competing goals and priorities	• References to having priorities that sit above PA • References to having difficulty finding time to be active because of other priorities • Reference to PA not being a priority • References to struggling to prioritise PA over other things • Reference to the need to juggle many tasks, to allow time for PA • Reference to the relative	• References to the impact of traditional gender roles on women's PA – use 'traditional gender roles' under 'reflective motivation' • References to the impact of adverse personal circumstances on available time to be active – use 'adverse or challenging personal circumstances' under 'physical opportunity' • References to having daily routines that are unsupportive of PA – use 'routines that are unsupportive of PA' under 'psychological capability'

	unimportance of women's PA as a form of health promotion, compared to the health needs or importance of health promotion for people they care for	
Prioritising PA	• References to the act of prioritising PA over other things • References to rescheduling other things to enable PA	• References to being active based on having goals related to PA – use 'health and fitness goals' or 'physique/bodyweight goals' under 'reflective motivation' • References to having the intention to be active, regardless of actual prioritisation – use 'intention to be active' under 'reflective motivation' • References to believing PA is a more healthy way to lose weight than other methods – use 'perceiving PA as the healthy way to manage weight/physique' under 'psychological capability'
Health and fitness goals	• References to being active based on goals relating to improving health • References to being active based on goals relating to improving physical fitness • References to engaging in PA based on a desire to improv mobility • References to engaging in PA to maintain pre-existing health and/or fitness	• References to engaging in PA as a form of weight management (unless this is related directly to health) – use 'physique/bodyweight goals' under 'reflective motivation' • References to engaging in PA to improve physical appearance – use 'physique/bodyweight goals' under 'reflective motivation' • References to engaging in PA to promote positive mental health – use 'to achieve 'me-time'/engage in self-care' under 'reflective motivation'

Physique/ bodyweight goals	• References to having goals related to changing or maintaining bodyweight • References having goals relating to changing or maintaining physique	• References to societal beauty standards putting pressure on women to conform – use 'societal beauty standards' under 'social opportunity' • References to the stable intention to manage physique/bodyweight – use 'intention to manage physique/bodyweight' under 'reflective motivation' • References to engaging in PA to improve physical health – use 'health and fitness goals' under 'reflective motivation'
Defiance/ resisting gender stereotypes	• References to being defiant in the face of social norms that are unsupportive of women's PA • Reference to proactively challenging gender stereotypes through PA participation • Reference to fighting against social disapproval and stigma associated with engaging in PA • Reference to engaging PA as a means of being empowered to challenge the Patriarchy • Reference to rejecting societal oppression of women through PA	• References to beliefs in the positive consequences of engaging in PA for women's rights – use 'beliefs in positive consequences of PA' under 'reflective motivation' • Reference to the way that traditional gender roles limit women's PA – use 'traditional gender norms, roles and expectations' under 'reflective motivation' • Reference to the way the Patriarchy limits women's Pa – use 'the Patriarchy' under 'social opportunity'
Intention to be active	• References to having the stable intention to engage in PA, regardless of what else is occurring	• Reference to proactively rearranging things as a means of prioritising PA – use 'prioritising PA' under 'reflective motivation'

To achieve me-time/engage in self-care	• Reference to using PA as a means of spending time alone • Reference to PA being 'just for me' • Reference to PA as me-time • Reference to PA being something for the self • Reference to PA being used as a means of relaxing • Reference to PA being used as a means of managing or maintaining mental health	• References to using PA to promote good health – use 'health and fitness goals' under 'reflective motivation' • References to using PA to manage weight – use 'physique and bodyweight goals' under 'reflective motivation'
Intention to manage physique/ bodyweight	• References to having the stable intention to engage in PA as a means of physique/ bodyweight management • References to having stable intentions to manage physique/ bodyweight • References to engaging in PA as a means of managing physique	• References to having more fleeting goals related to physique – use 'physique/bodyweight goals' under 'reflective motivation • Having the general intention to be active – use 'intention to be active' under 'reflective motivation' • References to beliefs in the consequences of engaging in PA for physique/bodyweight – use 'beliefs in positive consequences of PA' under 'reflective motivation'
Anticipated stigma	• References to expecting to experience stigma whilst engaging in PA • References to expecting to experience stigma because of general engagement in PA	• Actual stigma around women's PA – use 'stigma and social disapproval' under 'social opportunity' • Negative social responses to engagement in PA – use 'social sanctions' under 'social opportunity' • The motional response to anticipated stigma – use 'nerves, anxiety and

	• References to expecting to experience stigma in respect of physique/ bodyweight whilst engaging in PA • References to expecting to experience stigma based on engaging in PA in a way that suits religious or cultural needs	apprehension' under 'automatic motivation'
Belief PA is harmful	• Reference to PA being likely to exacerbate illness or injury • Reference to certain types of PA being likely to result in injury • Reference to beliefs that PA might damage virginity	• Information that pertains to PA damaging virginity – use 'misinformation' under 'psychological capability' • References to expecting to be socially stigmatised because of PA participation – use 'anticipated stigma' under 'reflective motivation
Beliefs in positive consequences of PA	• References to beliefs about PA improving physique • References to beliefs about PA improving health • References to beliefs about PA improving stress • References to a belief that PA will result in better social connections • References to beliefs that engaging in PA could result in the 'perfect' body	• Reference to the experience of having seen actual positive consequences as a result of being more active – use 'positive consequences of PA' under 'automatic motivation' • References to confirmed knowledge about the benefits of engaging in PA – use 'knowledge of benefits of PA' under 'psychological capability'
Belief that PA is appropriate for women	• References to certain types of PA being feminine	• References to general social norms that are supportive of PA – use 'social norms that

	• References to women being able to participate in all types of sport • References to certain types of PA being acceptable for women based on the way they impact women's physique in line with societal beauty standards (e.g. by promoting thinness as opposed to muscularity)	are supportive of women's PA' under 'social influences • References to being motivated to be active based on a desire to change or manage bodyweight/physique in line with societal beauty standards – use 'intention to manage physique/bodyweight' under 'reflective motivation'
Perceptions of safety	• References to the impact of local crime rates on perceptions of safety • References to perceptions that PA may put women's safety at risk • References to perceptions that PA will enhance women's personal safety (e.g. through improved strength or learning self-defence/combat) • References to perceived safety for women of participating in specific types of PA • References to safety considerations that must be made in respect of adhering to modest dress codes whilst swimming	• References to specific aspects of the environment that are unsafe or not – e.g. traffic – categorise as 'environment safety' under 'physical opportunity' • References to the level of crime that falls under the category of 'violence against women and girls' locally - categorise as 'environment safety' under 'physical opportunity' References to infrastructure that does not enable PA outside the context of safety (e.g. mentioning lack of cycle paths meaning access is difficult but not discussing personal safety whilst cycling or potential safety implications of cycling in traffic) – use 'infrastructure that is not supportive of PA' under 'physical opportunity' • References to male presence making women feel uncomfortable in gym settings, if no mention of personal safety issues – use

		‘male presence’ under ‘social influences’ • References to a belief that PA may result in injury – use ‘belief PA is harmful’ under ‘reflective motivation’
Perceiving PA as masculine	• References to PA not being appropriate for women • References to PA not being ladylike • References to certain types of PA being for men • References to avoiding certain types of PA based on a belief that it would impact physique in a way that is incompatible with societal beauty standards for women (e.g. by making women muscular and that being considered manly or masculine) • References to it being inappropriate for women to participate in competitive sports, due to this violating ideals about feminine delicateness	• References to a belief that certain types of PA will result in injury – use ‘belief PA is harmful’ under ‘reflective motivation’ • References to social norms that are not supportive of women’s PA – categorise as ‘social norms that are unsupportive of women’s PA’ under ‘social opportunity’ • References to negative social responses from others based on being an active woman, because this is considered culturally inappropriate or is considered by others to violate gender norms – use ‘social sanctions’ under ‘automatic motivation’ • References to engaging in PA despite stigma and/or social disapproval – use ‘defiance/resisting gender stereotypes’ under ‘reflective motivation’ • References to a general sense of stigma and social disapproval from others in respect of women’s PA – use ‘stigma and social disapproval’ under ‘social opportunity’
Mental exhaustion/ fatigue	• References to being too tired after work to be able to think about PA • References to being too tired to prioritise PA	• Physical exhaustion from manual labour – categorise as ‘physical exhaustion’ under ‘physical capability’ • Reference to a belief that engaging in PA will result in exhaustion – use ‘belief PA is

	• References to being too exhausted to engage in planning or scheduling to enable PA • References to being too tired to be motivated to engage in PA	harmful' under 'reflective motivation'
Self-efficacy	• References to being confident in one's ability to perform PA safely • References to a belief that engaging in regular PA is achievable • References to believing one is good at a certain type of PA • References to being confident in one's fitness levels • References to being confident about how to perform given exercises correctly	• References to actual physical skills that one has – use 'having the physical skills'' under 'physical capability' • Reference to actual mental skills that one has that enable PA (e.g. time management skills) – use 'having the mental skills' under 'psychological capability' • Reference to actually having the physical strength and fitness required to undertake PA – categorise as 'physical strength' or 'physical fitness' under 'physical capability'
Being pre-menstrual	• References to the impact of hormonal changes associated with being premenstrual on motivation to be active • References to the impact on PA of changes in body image associated with being premenstrual (e.g. perceived premenstrual fatness)	• Mental exhaustion generally and its impact on PA – use 'mental exhaustion/fatigue' under 'reflective motivation' • Being motivated to be active based on a belief that it might improve pre-menstrual symptoms – use 'beliefs in positive consequences of PA' under 'reflective motivation' • References to physical exhaustion more generally – categorise as 'physical exhaustion' under 'physical capability'

	• References to the impact on PA of lethargy associated with being premenstrual	
Lack of identification with participants	• References to not fitting in with people who engage in PA • References to feeling like people who are active are 'not like me' • References to certain types of PA being for people of a different cultural or ethnic heritage	• References to PA not being appropriate for women – use 'perceiving PA as masculine' under 'reflective motivation' • References to social norms not being supportive of women's PA – categorise as 'social norms that are unsupportive of women's PA' under 'social influences'
Ageing and approaching womanhood	• References to PA being acceptable for girls during childhood, but not in adulthood • References to the impact on women's PA of leaving education and entering adult life (typically beginning to fulfil the role of wife, mother and daughter-in-law) • References to the changing religious requirements that are placed on Muslim girls as they enter adulthood (e.g. in respect of wearing a head scarf)	• References to declines in physical strength associated with ageing – categorise as 'weakness' under 'physical capability' • References to the opportunity to engage in PA that is appropriate for adult women – use 'availability of suitable PA opportunities' under 'physical opportunity'
Traditional gender norms, roles and expectations	• References to the traditionally female role of being primary caregiver making it difficult to engage in PA	• References to it not being normal for women to be active – instead use 'social norms that are unsupportive of women's PA' under 'social opportunity'

	• References to it being difficult to be active as a mother • References to it being difficult to be active as a wife • References to having to fulfil housework responsibilities, leaving little time available to engage in PA • References to PA being perceived as less important for women following marriage	• References to societal systems that are oppressive of women thereby inhibiting their PA – use 'the Patriarchy' under 'social opportunity' • References to the need for women to fulfil cultural and religious requirements around modesty – use 'cultural and religious expectations and requirements' under 'social opportunity'
Shared sisterhood and sense of belonging	• References to feeling like a part of a community whilst engaging in PA • References to feeling a sense of belonging when engaging in PA • Reference to the sense of shared sisterhood that comes from participating in PA with other women • References to feeling that (general or specific types of) PA are for women with whom one can identify	• References to it being normal for women to be active – use 'social norms' under 'social opportunity' • References to being part of an active family system – use 'active role models (especially women)' under 'social opportunity' • Being supported and encouraged by others during PA – use 'activity-related social support' • Being supported to be active via the provision of childcare – use 'wider social support' • References to PA being considered appropriate for women in general – use 'perceiving PA as appropriate for women' under 'reflective motivation'
Body dissatisfaction	• References to being active based on disliking one's body • References to being active based on feeling fat	• References to engaging in PA as a means of managing weight/physique – use 'physique/bodyweight goals' or 'intention to manage

		bodyweight/physique' under 'reflective motivation' • References to engaging PA based on a belief that it would result in improved physique – use 'beliefs in positive consequences of PA' under 'reflective motivation'
Optimism	• References to feeling confident that PA will be sustained long-term • References to feeling confident that engagement in a PA intervention would have lasting effects	• Belief in one's ability to sustain PA long-term – use 'self-efficacy' under 'reflective motivation' • Beliefs that engaging in PA will help to achieve desired physique – use 'beliefs in positive consequences of PA' under 'reflective motivation'
Automatic motivation		
Social sanctions	• References to negative social responses from others whilst engaging in PA • References to people expressing disapproval because of engagement in PA	• Understanding of societally held beliefs about certain types of PA being considered indecent for women – use 'stigma and social disapproval' under 'social opportunity' • References to people not considering (general or specific types of) PA as appropriate for women – use 'perceiving PA as masculine' under 'reflective motivation'
Positive consequences of PA	• References to having experienced positive consequences as a result of engaging in PA • References to feeling mood boosted as a result of PA • References to seeing physique improvements as a result of PA	• Expecting positive consequences in the future as a result of PA – use 'beliefs about positive consequences of PA' under 'reflective motivation' • Awareness of the fact that PA results in positive consequences – use 'knowledge of the benefits of PA' under 'psychological capability'

	• References to seeing improvements in other health behaviours as a result of PA	
Fun and enjoyment	• Reference to enjoying participation in PA • Reference to finding it fun to be active with certain people • References to finding PA inherently enjoyable • References to finding specific types of PA inherently enjoyable • References to finding it fun to be active in certain settings	• The impact of other people on the amount of fun and enjoyment had whilst being active – use 'activity-related social support' under 'social opportunity' • The impact of certain aspects of PA on fun and enjoyment (e.g – impact of including burpees on fun and enjoyment) – use 'aspects of available activity types' under 'physical opportunity'
Past experience of PA	• References to having had positive past experiences of PA that influence current PA • References to having had negative past experiences of PA that influence current PA • References to having had no real experiences of PA participation • References to having had a large number of chances to participate in different types of PA	• Reference to experiencing positive consequences as a result of PA participation – use 'positive consequences of PA' under 'automatic motivation' • Having had limited opportunity specifically to develop the skills required to engage in PA – use 'limited opportunity to practice or develop skills' under 'physical opportunity'
Fear	• References to the emotional	• References to not being active based on perceptions

	experience of being frightened when engaging in PA (may relate to risk of injury, embarrassment, getting left behind or perceptions of safety)	of lack of safety without mentioning any associated emotional response - use 'perceived safety' under 'reflective motivations' • Reference to feeling nervous, anxious or apprehensive about the prospect of engaging in PA – use 'nerves, anxiety and apprehension' under 'automatic motivation' • Expecting to experience stigma when participating in PA, without mentioning any associated emotional response – use 'anticipated stigma' under 'reflective motivation'
Nerves, anxiety and apprehension	• Reference to feeling nervous, anxious or apprehensive about the prospect of engaging in PA • Reference to feeling nervous, anxious or apprehensive about the prospect of engaging in PA in certain settings • Reference to feeling nervous, anxious or apprehensive in anticipation of trying new PA • References to feeling nervous, anxious or apprehensive based on the potential unknown outcomes of PA participation	• References to not being active based on perceptions of lack of safety without mentioning any associated emotional response - use 'perceived safety' under 'reflective motivations' • Expecting to experience stigma when participating in PA, without mentioning any associated emotional response – use 'anticipated stigma' under 'reflective motivation'
Guilt	• Reference to feeling bad for taking time to engage in PA based on it being	• Reference to the actual roles and responsibilities that restrict available time to be active, without mentioning the associated emotional

	perceived as a selfish act • Reference to feeling guilty for taking time out to be active, leaving others to fulfil roles and responsibilities that would typically be ours • Reference to maternal guilt making it difficult to be active	response – use 'traditional gender roles' under 'reflective motivation' for example

Appendix 12: Focus group schedule

TDF	Domain	Constructs	Interview question
Knowledge, behavioural regulation, memory, attention, decision processes, cognitive and interpersonal skills,	Capability	Psychological ability	• What is physical activity to you ○ Examples ○ Is it different to exercise? (provide definitions) ○ Do you know what to do and how to do it • Is there anything about you personally that makes you more or less likely to be active? (also reflective motivation) • Does being physically active make you feel more confident? ○ About yourself ○ In social situations
Skills, strengths, stamina		Physical ability	• What types of PA do you do? • Are you physically capable of doing it? ▪ Skills ▪ Strength ▪ Stamina?
Physical resources, location, time, affordability, cues,	Opportunity	Physical environment	• What things make you more or less likely to be active? ○ Time ○ Cost • Are there things about your surroundings that make you more or less likely to be active? ○ Where you live? ○ Your home? ○ Local facilities ○ Transport •
Cultural norms, social cues, interpersonal influences		Social environment	• What about the people around you? ○ Helpful or unhelpful? ○ Family ○ Friends ○ Children ○ Romantic partner ○ Colleagues ○ People at your place of worship • Is there anything about being a woman that makes it more difficult to be active? • Is there anything specific to your culture or religion that makes it more difficult to be active?
Beliefs about what is good or bad, intentions, goals, beliefs about	Motivation	Reflective	• Why do you do physical activity? ○ What are the good things that come from being active?

consequences, planning, optimism, self-conscious intent, evaluation			○ What are the bad things that come from being active? • What physical activity would you like to do that you don't do? ○ What's stopping you? ○ What might make you more likely to do? ○ What do you think you'd get out of doing it? • Are there any psychological strategies you use to help fit exercise into your routines? ○ Planning ○ Time management ○ Goal setting ○ Tracking/tech
Emotional reactions, reflex responses/impulses, reinforcement, drives, wants, needs,		Automatic	• How do you feel when you're active? ○ Better? ○ Worse? ○ Healthier? ○ Does it impact your sleep? ○ Do you feel more alert and efficient? ○ Sluggish and tired? • Do you have any habits that make you more or less likely to be active?

Focus group schedule in order:

1. **<u>When you think of a physically active person, how do you imagine they would look, act and be?</u>**
2. **<u>How would you describe physical activity?</u>**
    a. **What are some examples?**
    b. **Is it difference to exercise?**

NOTE TO SELF: PROVIDE DIFFERENCES IN DEFINITIONS

3. **<u>What types of physical activity do you do?</u>**
    a. **Why do you do it?**
    b. **What are the positives that come from being active?**
    c. **What are the negatives that come from being active?**
4. **<u>What things make you less likely to be active?</u>**
    a. **Time**
    b. **Cost**
    c. **Surroundings**
        i. Where you live?
        ii. Your home?
        iii. Local facilities
        iv. Transport
    d. **What about the people around you**

        i. Helpful or unhelpful?
        ii. Family
        iii. Friends
        iv. Romantic partner
        v. Colleagues
        vi. People at your place of worship
    e. **Your personality?**
5. **<u>What things make you more likely to be active?</u>**
    a. *NOTE TO SELF: SEE PROMPTS FROM Q4*
6. **<u>Is there anything specific about being a woman that makes it more difficult to be active?</u>**
    a. **How is it different (or more difficult) than being a man who is trying to be active?**
7. **<u>Is there anything specific about being a woman that makes it easier to be active?</u>**
    a. **How is it different (or easier) than being a man who is trying to be active?**
8. **<u>What physical activity would you like to do that you don't do?</u>**
    a. **What's stopping you?**
    b. **What might make you more likely to do it?**
    c. **What do you think you'd get out of doing it?**
9. **<u>Are there any strategies or techniques you use to help fit physical activity into your routines?</u>**
    a. **Planning?**
    b. **Time management**
    c. **Goal setting**
    d. **Tracking**
    e. **Technology**
10. **<u>Do you have any habits that make you more or less likely to be active?</u>**
11. **<u>How do you feel when you're active?</u>**
    a. **About yourself**
    b. **In social situations**
    c. **Better**
    d. **Worse**
    e. **Healthier**
    f. **More attractive**
    g. **Is your sleep impacted?**
    h. **Do you feel more alert and efficient**
    i. **Do you feel more sluggish and tired**
12. **<u>Anything else you'd like to add?</u>**

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Appendix 13: Participant info sheet for focus groups

UNDERSTANDING PHYSICAL ACTIVITY FOR WOMEN IN SHEFFIELD

PHASE 1/3

Hello, my name is Maddy and I am studying for a PhD at Sheffield Hallam University. This research project will aim to understand what factors influence women to be more or less physically active. Before agreeing to take part, please read the information below carefully and please feel free to ask me any questions which you may have. This is the first of a three-part study, it is completely up to you whether you'd like to participate. If you do, you will also be invited to take part in the next stage if you wish.

What will I be expected to do if I take part?
Should you choose to take part in this phase of the study, you will be asked to join an online group discussion about the things that make you more or less likely to be active. There will be approximately 5 other women in the group and everybody there (including you) will agree to keep anything said in the group private. You can say as much or as little as you feel comfortable with. I will lead the discussion and I will also screen record the voices of everybody in the group (no video will be recorded). If you'd like to take part but would prefer a one-to-one interview, please let the lead researcher know and this can be arranged.

Why have you asked me to take part?
You have been asked to take part because you are a woman living in Sheffield. I am working with Sheffield City Council, who have asked me to help them to understand what makes women in your local area more or less likely to be active. To be eligible to take part, you will need to be 18-65 years of age, identify as female, not have any health conditions which would permanently getting in the way of you being able to walk unaided for ten minutes and must not currently be pregnant or be 12 or less months post-partum.

Do I have to take part?
No. It is up to you whether you would like to take part. A copy of the information provided here is yours to keep, along with the consent form. If you do take part, you can still have the things you said removed from the research, without giving a reason. To do this you need to contact me within one week of the focus group. After this point the data will be anonymised and information can no longer be removed.

Where and when will this take place?
All of this will happen between July and September 2021 online on Microsoft Teams or in person (either at the Goodwin Sports Centre or at Sheffield Hallam University). If you choose to take part, you will receive a link to your online discussion group via email. Your discussion will be arranged at a time that is good for everybody in your group. It should take around 1 hour and you will only have to take part once.

Are there any possible risks or disadvantages in taking part?
Some people might feel uncomfortable talking about personal thoughts and feelings in front of other people. Remember, you always have the choice not to answer any question and you are welcome to share as much or as little as you feel comfortable.

What are the possible benefits of taking part?
I hope that you will find taking part interesting and will enjoy sharing your thoughts, feelings and wishes. The findings of this research will ultimately help to create a new programme to

help women in your area to be more active and you will get the chance to take part, if you want to.

When will I have the opportunity to discuss my participation?
I will be available before and after the discussion group so that I can answer any questions or in case there is something that you wish to share with me privately. You can also find my email address at the bottom of this form should you want to contact me at any time.

Will anyone be able to connect me with what is recorded and reported?
Only myself and the people present in your discussion group would be able to know who said what.
After your discussion group, the recording will be transcribed. All names will be replaced with a pretend name and I will remove any information that may reveal your identity (e.g. if you mention the street on which you live). Whilst I may use direct quotes from you when I report these findings, it will not be possible for anybody to know who took part or who said what.

Who will be responsible for all of the information and what will happen to it when this study is over?
I will be responsible for all of the information collected when the study is over. All data collected will be held as an electronic record and in accordance with the Data Protection Act 2018.

In accordance with University regulations, the final written version will be stored by the University for a 10-year period and, with permission, it can be accessed by other academics. This will not include any audio recordings, which will be destroyed as soon as they have been typed up.

Who will have access to it?
I will be the only person who has access to the recorded group discussions. However, once typed up and identifying information is removed, I may share your anonymised data with a small number of researchers (such as my Supervisors) to help me to make sensible conclusions about what has been said.

The findings will inform my PhD thesis and will be shared with both Sheffield United Community Foundation and with Sheffield City Council. I might also talk about these findings in other reports, articles, publications and presentations.

How can I find out about the results of the study?
If you are interested to find out the results of this research then please let me know and I will be happy to share the findings with you via email.

What about the next study, what does that involve?
The next phase of this study should you wish to take part, would involve you taking part in a co-design workshop with 3-5 other women who also took part in Phase 1. You would be talking about ways that we can address the things that women (such as yourself) said were getting in the way of them being active. If you take part in Phase 1 and 2 of the study, you will also get chance to be a part of Phase 3, which will be the activity programme that you will have helped to design. If you would like to be contacted with further details about the next phase of this study, you will get chance to let me know in your consent form. As ever, if you do consent to be contacted about the next phase of study, it is still entirely up to you whether you'd like to take part and there is no obligation to do so.

What else might I need to know?
Please note, the University undertakes research as part of its function for the community under its legal status. Data protection allows us to use personal data for research with appropriate safeguards in place under the legal basis of ***public tasks that are in the public interest.*** *A*

full statement of your rights can be found at https://www.shu.ac.uk/about-this-website/privacy-policy/privacy-notices/privacy-notice-for-research. However, all University research is reviewed to ensure that participants are treated appropriately and their rights respected. This study was approved by UREC with Converis number ER28012805. Further information at https://www.shu.ac.uk/research/ethics-integrity-and-practice

Researcher/ Research Team Details:
If you have any questions or concerns about the research or your participation, you can contact: Me at ml3270@my.shu.ac.uk
My Director of Studies - Professor Maddy Arden sslmma@my.shu.ac.uk
My Supervisor - Dr Laura Kilby dslk@my.shu.ac.uk

You should contact the Data Protection Officer if:	**You should contact the Head of Research Ethics (Professor Ann Macaskill) if:**
• you have a query about how your data is used by the University • you would like to report a data security breach (e.g. if you think your personal data has been lost or disclosed inappropriately) • you would like to complain about how the University has used your personal data	• you have concerns with how the research was undertaken or how you were treated
DPO@shu.ac.uk	a.macaskill@shu.ac.uk

Postal address: Sheffield Hallam University, Howard Street, Sheffield S1 1WBT Telephone: [redacted]

Appendix 14: Research data management plan

A COM-B APPROACH TO PHYSICAL ACTIVITY INTERVENTION DESIGN FOR WOMEN LIVING IN AREAS OF HIGH SOCIAL DEPRIVATION

Creator: Maddy Leather

Affiliation: Sheffield Hallam University

Project abstract:

I have been awarded a bursary from Sheffield Hallam University to conduct a PhD program of research which is supported by Sheffield City Council, in partnership with [insert organisation here] and which aims to encourage physical activity for women living in areas which are high on the multiple deprivation index. This is a three-phase project which is conducted in line with the 3-stage intervention design process outlined by the Behaviour Change Wheel (BCW). The first phase will involve online focus groups aiming to understand the barriers and facilitators to physical activity for women living in areas of high social deprivation in Sheffield. The second phase will involve co-design workshops with the goal of producing a pilot physical activity intervention that addresses the barriers and facilitators to physical activity identified in phase 1. The third and final phase will involve piloting of this community embedded intervention, with consideration of its acceptability and feasibility in a local community context.

Last modified: 6th December 2021

Data Collection

What data will you collect or create?

The project is split into 3 phases.

Phase 1 will involve focus groups to gain qualitative data regarding the barriers and facilitators to physical activity for this group of women. 3 focus groups of approximately 6 women will be conducted.

Phase 2 will involve co-design workshops aiming to design a pilot physical activity intervention for these women. Qualitative data will be collected from one or more online workshops involving up to 10 women.

Phase 3 will involve piloting of this intervention. Quantitative data will be collected at baseline and following the pilot intervention. Semi-structured interviews will also be used to gain qualitative data which explores the acceptability and feasibility of this intervention in a local community context.

How will the data be collected or created?

Phase 1: I will collect focus group data using a password protected audio digital recorder. Focus groups will be digitally recorded in .wav format using password protected recorders. Recordings will be stored according to all GDPR requirements and will be transcribed only by myself as the lead researcher.

Phase 2: I will screen record the online co-design workshops. All recordings will be stored according to all GDPR requirements and any audio will be transcribed only by myself, as the lead researcher.

Phase 3: I will collect quantitative data from up to 30 participants regarding their experiences of the intervention, any changes in physical activity levels and the acceptability/feasibility of it in a local community context. I will also conduct semi-structured one-to-one interviews with up to 12 participants to allow participants to describe in their own words, their experiences of partaking in the intervention and the acceptability/feasibility of it in a local community context.

Documentation and metadata

What documentation and metadata will accompany the data?

Phase 1: Focus group data will be audio recorded and transcribed verbatim (excluding where pseudonyms are used and omission of identifying information) only by the lead researcher, before being deleted. The lead researcher will prepare the findings in Microsoft word and save the file according to the phase of research, focus group number and date of interview as follows: Phase 1-FG1-DD.MM.YYYY. All data will then be uploaded to NVivo, in which it will be subject to Framework Analysis. At this stage, 20% of pseudonymised data will be shared with a second researcher (JKL) but will remain the responsibility of (and in possession of) the lead researcher. NVivo allows for additional comments from a second researcher to be recorded via the use of 'memos' – these will automatically be dated and the author noted.

Phase 2: Video recordings of the co-design workshops will be viewed and audio transcribed verbatim (excluding where pseudonyms are used and omission of identifying information) only where necessary and only by the lead researcher. All data from the workshop tasks will be collated and stored in Microsoft Word only by the lead researcher according to phase of research, type of data (screen recording: SR, transcribed text: TT or task outcome: TO), workshop number and date of workshop as follows: Phase 2 -TT-WS1-DD.MM.YYYY.

Phase 3: TBC in accordance with the development of research plan.

Ethics and Legal Compliance

How will you manage any ethical issues?

Phase 1 & 2: All focus groups and co-design workshops will be facilitated be the lead researcher, who has completed online ethics training and who will have received ethical approval from the University Ethics Committee before conducting any data collection (ethics review number ER28012805). Participants will be provided with detailed information sheets and consent forms prior to participation to allow informed consent to be sought. Participants will sign a consent sheet that will be linked by a code to the interview data but securely stored separately to ensure anonymity is preserved. Participants will be made aware of a standard withdrawal period and advised of the withdrawal process. During transcription, data will be pseudonymised and any

personally identifying features will be removed. Some geographical locations may need to be preserved as these may be directly relevant to the research focus. (E.g. local parks, physical activity centres)

Phase 3: TBC in line with development of research programme and future ethics application.

How will you manage copyright and Intellectual Property Rights (IPR) issues?

There are no anticipated issues regarding copyright and Intellectual Property Rights.
Storage and Backup

How will the data be stored and backed up during the research?

Data will be stored and backed up in compliance with the requirements outlined by Sheffield Hallam University's Ethics procedures. Project data and documentation will be held on the SHU Research Store (Q:\ Research) and will be accessible only to the lead researcher. All will be backed up on a daily basis and will be encrypted before being stored. At project close down relevant data relating to this project will be either securely archived or destroyed.
Focus group data will be temporarily stored on password protected digital recorders but there will be no personally identifying information attached outside of the content of the discussions. Data will be transcribed then deleted from the recording device at the first available opportunity and will be stored in an encrypted format.

How will you manage access and security?

All data will be stored on the SHU Research Store (Q:\ Research) and will be accessible only to the lead researcher. Despite collaboration/partnership with Sheffield City Council and with Sheffield United Community Foundation only findings will be shared and not data.
Selection and Preservation

What data are of long-term value and should be retained, shared, and / or preserved?

All raw and processed data will be deposited in the SHU Research Data Archive (SHURDA) before the end of the research project. The data will be retained in the archive for a period of 10 years after the completion of this PhD programme of research. When depositing the data, no further changes to data formatting will be required as all necessary actions will have been conducted as the research progresses.

What is the long-term preservation plan for the dataset?

All raw and processed data will be made available to legitimate researchers or practitioners after any agreed embargo period has expired. This approach to open

access will ensure the legacy of the project by enabling follow-up and/or longitudinal studies to be compared with these initial raw data sets.

Data Sharing

How will you share the data?

All data will be deposited into SHU's Data Archive (SHURDA) at the end of the project. For preservation purposes, as much data as possible will be stored in open formats (e.g. .txt and .csv). Where this is not possible, the software used to create them will be documented (e.g. Analysis .nvp files created using NVivo version 12). Pseudonymised data will only be shared with a second researcher for triangulation purposes but this will remain in the possession of the lead researcher. Data will not be shared with collaborators or partners, only findings will be shared.

Are any restrictions on data sharing required?

No raw data will be shared, given the potential of voice and/or visual recognition, thus threatening pledges of anonymity of data, which will be given to all contributors to the research. While a robust approach to ensuring consent is received from all respondents in the study, should some respondents refuse permission, these data will be removed before depositing the data in the SHURDA archive. The responsibility for ensuring extraction of data from those declining will be with the lead researcher.

Responsibility and Resources

Who will be responsible for data management?

The lead researcher, Maddy Leather will assume responsibility for implementing and reviewing data management throughout the course of project. This will be supported by Director of Studies, Maddy Arden and PhD Supervisor, Laura Kilby, where necessary.

What resources will you require to deliver your plan?

Access to the Research Store (Q:\ Research).
Use of password protected digital recorders.
Access to Microsoft Teams.

Appendix 15: Coding framework for focus groups

Construct	Possible examples	Does not include[12]
Physical capability		
Effects of the menstrual cycle	• References to the negative impact of the menstrual cycle on motivation to be active • References to the negative impact on PA of changes in body image associated with the menstrual cycle • References to the negative impact on PA of lethargy associated with the menstrual cycle	• Mental exhaustion generally and its impact on PA – categorise as 'mental exhaustion/fatigue' under 'reflective motivation' • Being motivated to be active based on a belief that it might improve pre-menstrual symptoms – use 'beliefs that PA improves physical health and fitness' under 'reflective motivation' • References to physical exhaustion more generally – categorise as 'physical exhaustion' under 'physical capability' • References to being more active when pre-menstrual, to combat feelings of perceived menstrual fatness – categorise as 'being pre-menstrual' under 'reflective motivation'
Effects of being older age	• References to finding PA more challenging with age • References to PA having more adverse effects with older age • Reference to how much easier PA was when younger,	• References to physical exhaustion more generally – categorise as 'physical exhaustion' under 'physical capability' • References to having specific injuries, health concerns/conditions that may or may not be

[12] In 'Does not include' column: The word 'use' indicates a category that is already in use within this coding framework. The word 'categorise' indicates a category that is not present within this coding framework, but which may be present within other coding frameworks for other studies within this thesis.

	compared to being of older age	associated with older age – categorise as 'injuries/health problems/concerns' under physical capability' • References to the increasing responsibilities that come with ageing – use 'roles and responsibilities that restricts available time for PA' under 'physical opportunity
Psychological capability		
Planning/ scheduling	• Reference to proactively planning or scheduling in PA • References to organising, structuring or restructuring time to enable participation in PA	• Reference to the person's schedule, timetable or daily routine – use 'fixed schedules' under 'physical opportunity' or categorise as 'fixed routines' under 'behavioural regulation'
Social opportunity		
Being observed during PA	• References to not wanting to be seen being active • References to feeling too self-conscious to be active whilst being active	• References to men being in the space during PA, without mentioning observing element – use 'male presence during PA' under 'social opportunity' • References to being active with others together, without mentioning being observed – use 'activity with others' under 'social opportunity'
Activity with others	• References to preferring group fitness classes • References to enjoying PA because it doubles up as social time • References to feeling safer or more comfortable being active with others	• References to being encouraged to be active by other people in an exercise class – categorise as 'activity-related social support' under 'social opportunity'
Male presence during PA	• Reference to not wanting to engage in	• References to the actual availability of single sex spaces for promoting

	PA whilst men are present • Reference to not wanting to be seen by men whilst engaging in PA • Reference to only being comfortable to engage in PA in women-only spaces and settings	women's PA – categorise as 'single sex spaces' under 'physical opportunity'
Social norms	• Reference to what 'everybody' thinks about PA • Reference to generally held ideas about PA being acceptable or not • References to specific types of PA being considered acceptable or not within society • References to whether or not PA is normal within one's social circle	• References to the social responses from others based on being active – categorise as 'social sanctions' under 'social opportunity' • References to stigma or disapproval received from others because of PA participation – categorise as 'stigma/social disapproval' under 'social opportunity' • References to the anticipation of stigma from others based on Pa participation – categorise as 'anticipated stigma' under 'reflective motivation'
Physical Opportunity		
Roles and responsibilities that restrict available time for PA	• Reference to being unable to engage in PA due to being a mother • Reference to being unable to engage in PA due to being a wife • Reference to being unable to engage in PA due to having household responsibilities • Reference to being unable to engage in PA due to paid work	• Reference to the impact of being from a certain culture or religion on PA – categorise as 'cultural and religious expectations and requirements' under 'social opportunity' and/or 'religious beliefs' under 'reflective motivation' • References to fixed routines/schedules that do or don't account for PA - categorise as 'fixed routines under 'psychological capability or 'fixed schedules' under 'physical opportunity'

	roles and responsibilities • Reference to being unable to engage in PA due to having to fulfil dual roles and second shifts associated with undertaking paid work alongside domestic, household and/or caring responsibilities	• References to a perceived lack of time that is not linked to fixed roles and responsibilities – use 'perceived lack of time' under 'reflective motivation'
Unsafe environment	• References to specific aspects of the environment that are unsafe – e.g. traffic • References to the level of crime that falls under the category of 'violence against women and girls' locally • Referenced to unsafe infrastructure – e.g. alleyways	• Perceptions of environmental safety that are not necessarily founded in any objective truth – categorise as 'perceptions of safety' under 'reflective motivation • Perceptions of the general safety for women to engage in PA – categorise as 'perceptions of safety' under 'reflective motivation • References to infrastructure that does not enable PA outside the context of safety (e.g. mentioning lack of cycle paths meaning access is difficult but not discussing personal safety whilst cycling or potential safety implications of cycling in traffic) – categorise as 'infrastructure that is not supportive of PA' under 'physical opportunity' • References to male presence making women feel uncomfortable in gym settings, if no mention of personal safety issues – use 'male presence' under 'social opportunity'
Roles and responsibilities	• Reference to having to be active due to being a mother	• Reference to the impact of being from a certain culture or religion on PA – categorise

that necessitate PA	• Reference to having to be active to fulfil household responsibilities • Reference to having to be active whilst undertaking paid work roles and responsibilities	as 'cultural and religious expectations and requirements' under 'social opportunity' and/or 'religious beliefs' under 'reflective motivation' • References to fixed routines (e.g. school run) that account for/include PA - categorise as 'fixed routines under 'psychological capability'
Weather	• References to it being easier to active in certain weather • Reference to certain weather making it difficult to be active • Reference to being more/less active during certain seasons due to the weather • References to it being unsafe to be active because of the weather	• References to the availability of spaces with appropriate aircon, to accommodate the weather – use 'facility and equipment availability, convenience and appropriateness' under 'physical opportunity' • References to not having the right clothing to be active in certain weather – categorise as 'not having appropriate clothes or equipment' under 'physical opportunity'
Covid-19	• References to the impact of the covid-19 pandemic on PA • References to the impact of Covid-19 associated lockdowns on PA	• Reference to the impact of having the illness, Covid-19 on physical ability to be active – categorise as 'injuries/health problems or concerns' under 'physical capability' • References to the psychological impacts of having the illness, Covid-19 (e.g. brain fog) – categorise as 'not having the mental skills' under 'psychological capability'
Facility & equipment availability, convenience and	• References to there being plenty of places locally to go and be active	• References to the expectations or requirements that are placed on women, which make local spaces inappropriate – categorise beneath 'social opportunity'

appropriateness	• References to there not being places to go and be active • References to there being PA opportunities locally that are appropriate for the individuals personal needs • References to having facilities that are on a route that is frequently taken (e.g. between work and home) • References to facilities appropriately accommodating for the weather (e.g. by having air con) • References to facilities allowing modest dress codes	(e.g. 'cultural and religious expectations and requirements') • References to male presence making a PA space unappealing – use 'male presence during PA' under 'social opportunity' • References to women only facilities – categorise as 'single sex spaces' under 'physical opportunity' • Reference to the requirement for a single sex space, based on religious values – use 'cultural and religious expectations and requirements' under 'social opportunity' and/or 'religious beliefs' under 'reflective motivation' • References to the timing of PA being convenient or not – categorise as 'timing and scheduling of activity/activity spaces' under 'physical opportunity'
Not owning a vehicle	• References to engaging in active travel due to not having a vehicle • References to not being able to attend PA spaces due to not owning a vehicle • References to having less available time due to not owning a vehicle, as other forms of travel take up more time • References to not owning a vehicle meaning the only available option for access is public transport	• References to the cost of public transport – use 'cost' under 'physical opportunity' • References to not having accessible spaces to be active – use 'facility & equipment, convenience, availability & appropriateness' under 'physical opportunity' • References to the timetabling of public transport links – categorise as 'public transport timetabling' under 'physical opportunity' • References to not being able to afford a vehicle – categorise as 'lack of money' under 'physical opportunity'

Cost	• References to requiring PA that is low cost or free • References to being more likely to engage in PA following a financial commitment • References to being more active, to avoid the cost of public transport • References to not being able to be active due to the cost of engagement	• References to being on low income –categorise as 'lack of money' under 'physical opportunity • References to being financially incentivised for participating in PA – categorise as 'financial incentives' under 'automatic motivation'
Fixed schedules	• References to aspects of a schedule that impact PA and that are outside of one's control • References to working hours during which PA spaces are closed • References to having shorter working hours, that allow for PA on certain days	• References to the act of maintaining active routines through behavioural regulation – categorise as 'fixed routines' under 'psychological capability' • References to being able to deliberately plan PA in – use 'planning/scheduling' under 'psychological capability'
Reflective Motivation		
Sedentary hobbies	• References to having competing goals in the form of sedentary hobbies (e.g. reading, playing video games), that get in the way of PA	• References to having a sedentary job – categorise under 'fixed schedules' under physical opportunity' and/or use 'roles and responsibilities that restrict available time for PA' under 'physical opportunity'
Pursuit of other goals that involve being active	• References to enjoying doing things that inherently involve being active (e.g. enjoying sightseeing, which involves walking)	• References to having roles and responsibilities that necessitate PA – use 'roles and responsibilities that necessitate PA' under 'physical opportunity'

	• References to undertaking PA as a byproduct of achieving other things that are the primary goal of the activity	
Willingness to try/conscious effort	• References to making a conscious effort to engage in PA • References to being willing to try new things in respect of PA • References to deciding to engage in PA regularly	• References to the act of planning PA in – use 'planning /scheduling' under 'psychological capability' • References to prioritising Pa over other things – use 'prioritising PA' under 'reflective motivation'
Anticipated stigma	• References to expecting to experience stigma upon returning to PA after a hiatus • References to expecting to experience stigma whilst engaging in PA • References to expecting to experience stigma because of general engagement in PA • References to expecting to experience stigma in respect of physique/ bodyweight whilst engaging in PA • References to expecting to experience stigma based on engaging in PA in a way that suits religious or cultural needs	• Actual stigma around women's PA – categorise as 'stigma and social disapproval' under 'social opportunity' • Negative social responses to engagement in PA – categorise as 'social sanctions' under 'social opportunity' • The emotional response to anticipated stigma – categorise as 'nerves, anxiety and apprehension' or use 'mood/affect and 'mental health' under 'automatic motivation'

Belief that it is unsafe to engage in PA	• References to a belief that engaging in PA generally is unsafe • References to a belief that engaging in PA outdoors is unsafe • References to believing that it is unsafe to undertake PA in a certain area • References to certain types of PA being unsafe to engage in	• References to actual features of the environment that are objectively unsafe) e.g. crime rates) – use 'unsafe environment' under 'physical opportunity • References to a belief that Pa will hurt or result in pain – categorise as 'belief that PA hurts' under 'reflective motivation'
Belief that PA improves appearance	• References to people who engage in PA being more attractive • References to PA improving skin • References to PA improving physique	• References to having weight loss goals – categorise as 'desire for weight loss/management' under 'reflective motivation'
Belief that PA positively impacts other health behaviours	• References to PA improving eating behaviour • References to feeling drinking is more under control during times of increased PA • References to smoking less when being more active	• References to PA positively impacting other aspects of physical health, that are not behavioural – use 'belief that PA improves physical health and fitness' under 'reflective motivation' or 'belief that PA supports holistic health and wellbeing' under 'reflective motivation'
Belief that PA burns off energy and relieves stress	• Reference to using PA based on a belief that it helps to burn off excess energy • Reference to using PA based on a belief that it is an effective form of stress relief	• References to the actual mood enhancing/stress relieving effects of PA – use 'mood enhancing effects' under 'automatic motivation'
Belief that PA improves physical health and fitness	• Reference to using PA based on a belief that it will promote good health	• References to having experienced actual improvements in physical health and fitness as a consequence of PA –

	• Reference to engaging in specific PA based on a belief that it will promote certain aspects of physical fitness or health	categorise beneath 'positive consequences of PA' under 'automatic motivation' • References to a belief that exercise helps recovery from injury or illness – categorise as 'belief that exercise helps recovery' under 'reflective motivation'
Belief that PA hurts	• References to being dissuaded from being active based on a belief that PA will result in pain • References to being more likely to engage in PA based on am belief that it will elicit aches and pains (thereby meaning it is considered effective) • References to a belief that engaging in PA will be challenging, regardless of whether this is perceived as positive or negative	• Belief that it is dangerous to engage in PA – use 'belief that it is unsafe to engage in PA' under 'reflective motivation' • References to having experienced actual pain, struggle or injury during PA – categorise as 'pain, struggle or injury from PA' under 'automatic motivation' • Reference to not having the appropriate skills required to undertake PA – categorise as 'lack of [physical or mental] skill' accordingly under [physical or psychological] capability' • References to a belief that one does not have the physical skills required to undertake PA safely – categorise as 'low self-efficacy' under 'reflective motivation'
Low identification with activity participants	• References to PA being for people who are 'not like me' • References to PA being suitable for people of ethnicities other than my own • References to not feeling like one fits in in PA spaces/settings	• Lack of exposure to active people – categorise as 'lack of exposure to active people' under 'social opportunity'
Shared sisterhood and sense of belonging	• References to feeling like one fits in within	• References to enjoying being active with others regardless of supportiveness of

	specific or general PA settings or spaces • References to feeling that others in PA spaces or settings are 'like me' • References to feeling like 'we're all in it together' during PA	relationship –categorise as 'activity with others' under 'social opportunity'
Automatic Motivation		
Slow/little/no progress	• References to not seeing results from PA • References to desired results from PA happening too slowly • References to not improving at PA quickly enough • References to becoming demotivated due to lack of progress	• References to being motivated by small improvements – categorise as 'positive consequences of PA' under 'reflective motivation' • References to losing interest in PA itself – use 'apathy' under 'automatic motivation'
Exhaustion	• References to the experience of being exhausted following PA • References to being exhausted as a consequence of an active daily routine	• References to being too physically exhausted to be capable of PA – categorise as 'physical exhaustion' under 'physical capability' • References to believing that PA is difficult/challenging – use 'belief PA hurts/is difficult/is vigorous' under 'reflective motivation'
Sense of accomplishment	• References to feeling like one has achieved something positive by being active • References to being proud because of PA-related achievements	• References to enjoying the activity – use 'fun and enjoyment' under 'automatic motivation'
Improvements in self-esteem	• References to feeling better about oneself because of PA engagement	• References to feeling more confident at undertaking PA – use 'self-efficacy' under 'reflective motivation'

	• References to feeling better about oneself immediately following PA • References to feeling better about oneself during more active times of life	• References to a belief that PA would result in improvements in self-esteem – categorise as 'belief PA improves self-esteem' under 'reflective motivation'
Fun & enjoyment	• Reference to enjoying participation in PA • Reference to finding it fun to be active with certain people • References to finding PA inherently enjoyable • References to finding specific types of PA inherently enjoyable • References to finding it fun to be active in certain settings	• The impact of other people on the amount of fun and enjoyment had whilst being active –categorise as 'activity-related social support' under 'social opportunity' • The impact of certain aspects of PA on fun and enjoyment (e.g – impact of including burpees on fun and enjoyment) –categorise as 'aspects of available activity types' under 'physical opportunity'
Mood/affect and mental health	• References to not being active during times of low mood • References to being more active during times of low mood • References to mental health impacting PA	• References to PA impacting mental health – use 'mood enhancing effects' under 'automatic motivation' • References to being active based on a belief that PA will improve mood – categorise as 'belief PA improves mood' under 'reflective motivation'

Appendix 16: “How might we…” questions used for Co-design Workshop 1

In the context of physical activity how might we…

Physical capability

Effects of the menstrual cycle (Barrier)

… work around the menstrual cycle?

… manage/deal with any of the physical symptoms associated with the menstrual cycle?

Effects of being of older age (Barrier)

… manage/deal with the physical issues associated with getting older?

Psychological capability

Ability to engage in planning/scheduling (Facilitator)

… improve our ability to engage in planning/scheduling?

… make it easier to plan physical activity in around other things?

… make it easier to schedule activity with others?

… make it easier to schedule activity alone?

Social opportunity

Being observed during physical activity (Barrier)

… avoid being observed by others during activity?

… overcome negative feelings we experience when being observed during activity?

Activity with others (Facilitator)

… make it so that the highest number of people have the opportunity to attend?

… make it so that the highest number of people would like to attend?

Male presence during activity (Both)

… make it so that some people can be active with males present whilst others don’t have to?

… encourage more males to be present whilst we are being active?

… create spaces where no males are present whilst we are being active?

Social norms (Both)

… encourage the wider world to believe that physical activity is for women?

... encourage women like us to believe that physical activity is for people like them?

Physical opportunity

Roles and responsibilities that restrict available time for physical activity (Barrier)

... weave more physical activity into other things we have to do that usually get in the way of being active? (e.g. work/study/caregiving)

Unsafe environment (Barrier)

... make our environment more safe for women? (where we work, live or travel?)

Facility and equipment availability, convenience & appropriateness (Both)

... make sure that you have facilities and/or equipment to be active which are appropriate for you and the activity you might want to do?

... make sure that you have facilities and/or equipment to be active which are convenient for you and the activity you might want to do?

Not owning a vehicle (Both)

... make the most of not owning a vehicle, to help us to be more active?

Cost (Both)

... keep active without having to spend large amounts of money (you may want to consider things like travel, access to spaces and/or equipment)?

Having routines which do/don't account for and/or include physical activity (Both)

... work around our routines that make it difficult to fit activity in?

... make the most of our routines which help us to fit in activity?

Reflective motivation

Pursuit of other goals that involve being active (Facilitator)

... make the most of pursuing other goals which involve being active?

... make more time to pursue other goals which involve being active?

... be more active in our pursuit of other goals? (What goals might we be able to pursue and be active at the same time? How can we change the way we pursue other goals so that we can be more active?)

Willingness to try/conscious effort (Facilitator)
… encourage women to be more willing to be active?

Anticipating negative social judgement
… reduce women's expectation that being active might result in social disapproval from others

Belief that it is unsafe to engage in physical activity (Barrier)
… make physical activity more safe for women?
… help women to feel more safe engaging in PA?

Belief that physical activity improves appearance (Facilitator)
… help women to believe that PA will improve their appearance?
… avoid making women feel bad about themselves if we follow an ethos of using activity to change appearance?

Belief that being active positively impacts other health-related behaviours (Facilitator)
… help women to believe that being active will positively impact other health-related behaviours (such as smoking, eating… and even safe sex!)

Belief that physical activity burns off energy and relieves stress (Facilitator)
… help women to believe that being active burns off energy and stress?

Belief that PA will improve health and fitness (Facilitator)
Help women to believe that PA will improve their physical health and fitness?

Belief that physical activity will hurt (Both)
… reduce women's concern that physical activity might be painful?

Level of identification with people who take part in physical activity (Both)
…help women to identify more with people who participate in physical activity (either specific sports/activities, or being an active person generally)?

Automatic motivation
Slow/little/no progress (Barrier)
… help women celebrate all progress, no matter how small?

Exhaustion (Barrier)
… limit the impact of being exhausted on women's motivation to be active?

Sense of accomplishment (Facilitator)
… help women to feel a greater sense of accomplishment through being active?

Mood enhancing effects (Facilitator)
… help women to finish PA feeling in a great mood?

Improvements in self-esteem (Facilitator)
… help women to gain self-esteem through being active?

Enjoyment (Facilitator)
… make physical activity more enjoyable for women?

Mood and mental health (Both)
… limit the negative impact our mood or mental health has on our physical activity?
… make the best out of the positive impact our mood or mental health has on our physical activity?

Appendix 17: Co-design workshop 1 suggestions mapped against all criteria

Suggestion	*COM-B components addressed*	*Specific barriers/facilitators addressed*	*A*	*P*	*Ef*	*A*	*S*	*Eq*	*Coer*	*Educ*	*Enab*	*Envi*	*Ince*	*Mode*	*Pers*	*En. re*	*Trai*	*Suggested by*	*Endorsed*	*To include*	*Justifications*
Code of conduct agreed on first session	Social opportunity, reflective motivation	Social norms [B&F], anticipating negative social judgement [F]							X	X								Urban	No	?	
Peer pressure to force people to attend	Social opportunity	Activity with others [F]							X									Rural	No	No	Not appropriate to use coercion and is not satisfactory in terms of APEASE
Education, statistics & information to promote positive beliefs	Social opportunity, Reflective motivation	Social norms [B&F] Beliefs in positive consequences of PA [F]							X	X								Both	No	?	
Offer flexible activity options (suggestions include walking instead of swimming, low impact options such as pilates/yoga, seated options)	Physical capability, automatic motivation	Effects of the menstrual cycle [B], Effects of ageing [B], enjoyment [F]								X	X						X	Both	Yes x3	Yes	Spans a range of COM-B components and barriers/facilitators, fulfils APEASE criteria, spans a range of positive

																				intervention functions, was suggested by both groups within co-design and was endorsed during co-design
Have knowledge of your menstrual cycle	Physical capability, psychological capability	Effects of the menstrual cycle [B], ability to engage in planning/scheduling [F]															Urban	No	No	Not practicable in the context of a PA intervention
Peer support by helping to create weekly schedules and showing access to good planning tools (e.g. how to use google calendar),	Psychological capability	Ability to engage in planning/scheduling [F]							X	X						X	Both	No	?	
Incorporate activity into daily routines (e.g. walking on lunch break, standing desks, housework, running with a buggy, wearing weights, walking	Psychological capability, physical opportunity	Ability to engage in planning/scheduling [F], Routines [B&F], roles and responsibilities that restrict available time for activity [B]							X	X						X	Rural	No	Yes	Covers a range of COM-B components and unique barriers and facilitators, fulfils all APEASE criteria

the dog on the school run)																				
One-to-one personal training for all participants	Social opportunity	Being observed [B]							X	X						X	Urban	No	No	Not practicable in the context of this PhD
Have a go/first hand experience	Social opportuniy, reflective motivation, automatic motivation	Being observed [B], beliefs about positive consequences [F], enjoyment [F], sense of accomplishment [F]											X	X			Urban	Yes	No	Not a practicable suggestion as this isn't a part of intervention design
Online classes	Physical opportunity	Roles and responsibilities that restrict available time for PA [B], facility and equipment availability and convenience [B&F], now owning a vehicle [B&F]							X	X	X					X	Both	No	Yes	Covers a range of barriers under physical opportunity which can be one of the hardest COM-B components to manipulate
Activities that can be done at home without equipment	Physical opportunity	Cost [B&F], facility and equipment availability and convenience [B&F], now							X	X						X	Rural	Yes	Yes	Creates physical opportunity, fulfils APEASE, and covers a range of appropriate

		owning a vehicle [B&F]																		intervention functions
Timetabling, diaries and group diaries	Psychological capability, physical opportunity, social opportunity	Ability to engage in planning/scheduling [F], Routines [B&F], activity with others [F]								X	X		X				Both	Yes x2	Yes	Spans a range of COM-B components and barriers/facilitators, fulfils APEASE criteria, spans a range of positive intervention functions, was suggested by both groups within co-design and was endorsed during co-design
Explore options to cut down other sedentary hobbies/commitments	Reflective motivation	Pursuit of other goals which involve being active [F]								X							Urban	No	No	Potential negative side effects and not equitable
Support to overcome mental barriers	Reflective motivation, automatic motivation	Conscious effort/willingness to try [F], mood/affect and mental health [B&F]								X							Rural	Yes	No	Not practical and potential negative side effects (would require a mental health professional)

Progress pictures/videos (health e.g. posture)	Reflective motivation, automatic motivation	Belief PA improves physical health and fitness [F], sense of accomplishment [F]							X	X		X	X	X			Urban	No	?	
Transformation pictures/videos (appearance)	Reflective motivation, automatic motivation	Belief PA improves appearance [F], sense of accomplishment [F]							X	X		X	X	X			Both	No	?	
Have a range of goals	Automatic motivation	Slow/little/no progress [B], Sense of accomplishment [F]							X	X		X		X			Urban	Yes	Yes	Fulfils APEASE criteria, makes the intervention more inclusive, addresses automatic motivation which is particularly difficult to address
Testimonials and anecdotes (from "people like me")	Reflective motivation	Beliefs in positive consequences of PA [F], level of identification with activity							X			X	X	X			Both	Yes	?	

		participants [B&F]																		
Provide role models (local people in the community with whom women can identify)	Social opportunity, Reflective motivation	Social norms [B&F], level of identification with activity participants [B&F], anticipating negative social judgement [B]							X	X	X		X				Rural	Yes x3	?	This is a good idea and is endorsed but is this incorporated into intervention design or does this come from being a part of the intervention?
Help with goal setting (e.g. couch to 5k)	Reflective motivation, automatic motivation	Beliefs in positive consequences of PA [F], sense of accomplishment [F]							X	X		X				X	Rural	Yes	Yes	Fulfils APEASE criteria and drives motivation
Promotional material (e.g. Tiktok) to prompt kids to bring a Mum/Auntie etc. and to convey positive message	Reflective motivation	Anticipating negative social judgement [B]									X		X	X			Rural	Yes	?	
Create a group-based cascade model for 'personal trainers' in the community	Reflective motivation	Level of identification with activity participants [F], beliefs in positive							X	X	X		X			X	Rural	Yes	No	Fantastic idea but not practicable in the context of this PhD - this will be

		conseqences [F]																		included for future direction (hopefully for me!)
Encourage good "sleep hygiene"	Automatic motivation	Exhaustion [B]							X	X							Urban	No	?	
Empowerment	Reflective motivation	Anticipating negative social judgement [B]								X							Urban	Yes	No	Not an actionable, practicable suggestion
Make goals achievable	Reflective motivation, automatic motivation	slow/little/no progress [B], Sense of accomplishment [F]							X	X		X					Rural	No	Yes	Fulfils APEASE criteria, covers a range of intervention functions and likely to be extremely important for motivation
Taster sessions to explore different activities	Automatic motivation	Enjoyment							X	X	X					X	Urban	Yes	?	This may be difficult to practically run but I love the idea.
For GP's and other practitioners like mental health workers to be aware and make links with services promoting access	Reflective motivation, social opportunity, automatic motivation	Beliefs in positive consequences of PA [F], social norms [B&F], mood and mental health [B&F]							X	X	X					X	Rural	Yes	No	Excellent idea but not praticable in the context of this PhD

to PA or incorporate PA into their work																				
Promote positive beliefs about the impact of PA on mood	Reflective motivation, automatic motivation	Beliefs in positive consequences of PA [F], mood and mental health [B&F]							X								Rural	No	?	
Flexible access to facilities and flexible time, flexible payment options (so can miss a session without worrying about cost)	Physical capability, physical opportunity	Effects of the menstrual cycle [B], cost [B&F]								X							Urban	No	?	Sort of incorporated via online classes and integrated approaches but not as a unique intervention feature, dependent on too many variables which are beyond the scope of this PhD to address
3 weeks on, 1 week off	Physical capability	Effects of the menstrual cycle [B]								X							Urban	No	No	Not going to work for a group intervention as menstrual cycles are not all in line

Facilities for time of the month (sanitary products, paracetamol, appropriate bathroom facilities)	Physical capability	Effects of the menstrual cycle [B]								X	X						Both	No	?	
Local locations	Physical opportunity	Facility and equipment availability, convenience and appropriateness [B&F]								X							Rural	No	?	Likely to be managed via online options due to varied locations of participants
Have the option of no mirrors	Social opportunity	Being observed [B]								X							Urban	No	?	Dependent on activity and venue availability/cost
Accessibility (in terms of price, access, venue and activity)	Physical capability, physical opportunity, social opportunity	Effects of being of older age, [B] Facility and equipment availability, convenience and appropriateness [B&F], cost [B&F], activity with others [F]								X	X						Urban	No	Yes	This may be achieved via online methodology
On demand/flexible scheduling for separate groups	Physical capability, psychological capability,	Effects of the menstrual cycle [B], ability to								X	X					X	Urban	No	Yes	Fulfils APEASE criteria and covers a

(in-person classes recorded and streamed live as well as being recorded)	physical opportunity, social opportunity	engage in planning/scheduling [F], roles and responsibilities that restrict available time for activity [B], routines [B&F]																		range of COM-B components and intervention functions
Low cost/free	Physical opportunity	Cost [B&F]								X								Both	No	Yes	For service users
Cameras optional or only on group leader for streamed sessions	Social opportunity	Avoid being observed [B]								X								Both	Yes	Yes	Easy to achieve and endorsed during co-design
Have a group leader, facilitator or co-ordinator	Psychological capability, social opportunity, reflective motivation	Ability to engage in planning and scheduling [F], activity with others [F], social norms [B&F], routines [B&F], anticipating negative social judgement [B], level of identification with activity participants								X			X					Rural	No	Yes	In the context of this being my PhD, this fulfils APEASE criteria and many intervention functions but would also be difficult to avoid
"Ladies only sessions"	Social opportunity	Male presence [**B**&F]								X	X				X			Both	Yes	?	This seems to be important to the

																				participants but I have concerns about managing this in a transphobic climate
Physical barrier	Social opportunity	Avoid being observed [B]									X				X		Urban	No	?	Dependent on activity and venue
Be active with those you're caring for (e.g. walk to school)	Social opportunity, physical opportunity, automatic motivation	activity with others [F], social norms [B&F], roles and responsiblities [B&F], enjoyment [F]									X	X		X				Both	No	Yes	Green for all APEASE criteria, maybe doesn't have to be an integral feature but should be facilitated and encouraged
Go in groups/pairs	Social opportunity, physical opportunity, reflective motivation	Activity with others [F], social norms [B&F], not owning a vehicle [**B**&F], pursuit of other goals which involve being active [F], anticipating negative social									X	X	X	X				Both	Yes	Yes	Yes, fulfils a range of criteria for all tools for analysis, suggested by both groups for a range of things and is endorsed

		judgement [B], enjoyment [F], unsafe environment [B]																		
Run sessions in daylight hours	Physical opportunity, automatic motivation	Unsafe environment [B], exhaustion [F]								X								Rural	No	No	Not likely to be practicable in winter months when the intervention is planned to run
Security/cctv	Physical opportunity	Unsafe environment [B]								X								Rural	Yes	No	Not relevant and practicable in the context of this PhD
Make sure people know when and where you are going and when you will be back	Physical opportunity	Unsafe environment [B]								X								Rural	No	Yes	This will be encouraged and group plans should facilitate this
Using active travel	Physical opportunity	Routines [B&F], Roles and responsibilities [B&F]								X	X		X					Both	No	Yes	Fulfils criteria for all analysis tools
Use green spaces	Physical opportunity	Facility and equipment availability, convenience and								X								Rural	Yes x2	Yes	Incorporated but not mandatory

		appropriateness [B&F]																		
Share costs	Physical opportunity, social opportunity	Cost [B&F], activity with others [F]								X	X							Rural	No	No	Amber on all APEASE criteria - has the potential to be problematic
Recovering and rewarding yourself	Automatic motivation	Exhaustion [B]										X						Rural	No	Yes	Encouraged rather than enforced
Pre-empting injuries and limitations	Physical capability	Effects of the menstrual cycle [B], Effects of ageing [B]							X	X								Rural	No	Yes	Within reason - via use of PAR-Q
Make activity a by-product of other common interests (e.g. animals)	Reflective motivation	Pursuit of other goals which involve being active [F], sedentary hobbies [B]								X	X	X						Both	No	Yes	Green for all APEASE criteria, maybe doesn't have to be an integral feature but should be facilitated and encouraged
Short sessions	Physical cpability, physical opportunity, automatic motivation	Effects of ageing [B], roles and responsibiltiies [B], routines [B&F], sense of								X								Rural	No	Yes	Green for all APEASE criteria, maybe doesn't have to be an integral feature but

		accomplishment [F]																		should be facilitated and encouraged
Free caffeinated beverages	Automatic motivation	Exhaustion [B]																Rural	No	?	Dependent on whether in-person
Not comptetitive	Reflective motivation, Automatic motivation	Anticipating negative social judgement [B], Slow/little/no progress [B], Sense of accomplishment [F], improvements in self esteem [F], enjoyment [F]							X									Rural	No	?	Contradicts later suggestion of competitions and league tables - Green for all APEASE criteria - likely to be important for encouraging group cohesion to promote social opportunity
Develop a supportive social culture by joining up women with similar goals/ideas/ability	Social opportunity, reflective motivation	Social norms [B&F], level of identification with activity participants [B&F], anticipating negative social judgement [B]							X	X		X						Rural	Yes x2	Yes	Fulfils criteria for all analysis tools
Mindfulness, meditation and relaxation	Physical capability, reflective	Effects of the menstrual cycle [B],							X	X	X					X		Rural	No	Yes	Fulfils criteria for all analysis tools

	motivation, automatic motivation	beliefs in positive consequences [F], exhaustion [B]																		
No expectations/pressure	Reflective motivation	Anticipating negative social judgement [B]								X								Rural	No	Yes	Fulfils criteria for all analysis tools
Rewards/reinforcements (e.g. prize giving)	Automatic motivation	Sense of accomplishment [F]										X						Rural	No	Yes	Fulfils criteria for all analysis tools but need to discuss what this will look like in real-world terms (likely to be reinforcement rather than reward)
Competitions/league tables	Automatic motivation	Sense of accomplishment [F]										X						Rural	No	?	Need to discuss what this would look like in real-world terms (likely to be competitions rather than league tables)
Create schemes (e.g. 'cycle to work')	Physical opportunity, social opportunity	Cost [B&F], social norms [B&F]								X	X		X					Rural	No	?	Need to discuss what this would look like in real-world

																			terms - potentially not practicable in the context of this PhD
Group memberships - everybody signing up at the same time and working towards their goals together (developing a group identity)	Social opportunity, reflective motivation	Social norms [B&F], level of identification with activity participants [B&F], anticipating negative social judgement [B]									X		X				Urban	No	Yes	This is naturally incorporated by design of the group intervention which is designed by the group
Demonstration from "women like me" (seeing other women being active)	Social opportunity, reflective motivation	Social norms [B&F], level of identification with activity participants [B&F], anticipating negative social judgement [B]									X		X				Urban	No	Yes	This is naturally incorporated by design of the group intervention
Cancel all work plans/quit your job	Physical opportunity	Roles and responsibilities that restrict available time for PA [B]								X					X		Rural	No	No	Does not fulfil APEASE criteria

Appendix 18: Included and potential suggestions mapped against the taxonomy of BCT's (v1)

Behaviour change techniques

1. Information about social and environmental consequences [5.3]
2. Information about health consequences [5.1]
3. Provide info about others' approval [6.3]
4. Salience of consequences [5.2]
5. Goal setting (behaviour) [1.1]
6. Goal setting (outcome) [1.3]
7. Action planning [1.4]
8. Problem solving [1.2]
9. Graded tasks [8.7]
10. Review behaviour goals [1.5]
11. Review outcome goals [1.7]
12. Feedback on behaviour [2.2]
13. Reward (outcome) [10.10]
14. Credible source [9.1]
15. Generalisation of a target behaviour [8.6]
16. Self-monitoring of outcomes(s) of behaviour [2.4]
17. Focus on past success [15.3]
18. Feedback on outcome(s) of behaviour [2.7]
19. Mental rehearsal of successful performance [15.2]
20. Instruction on how to perform the behaviour [4.1]
21. Demonstration of the behaviour [6.1]
22. Prompts/cues [7.1]
23. Restructuring the social environment [12.2]
24. Behavioural contract
25. Behavioural practice/rehearsal [8.1]
26. Associative learning [7.8]
27. Social comparison [6.2]
28. Social support (practical) [3.2]
29. Identification of self as role model [13.1]
30. Anticipated regret [5.5]
31. Framing/reframing [13.2]
32. Self-talk [15.4]
33. Imaginary reward [16.2]
34. Identity associated with changed behaviour [13.5]
35. Reduce negative emotions [11.2]
36. Verbal persuasion about capability [15.1]
37. Vicarious consequences [16.3]
38. Non-specific incentive [10.6]
39. Non-specific reward 10.3

Suggestions

'Yes pile' Offer flexible activity options (suggestions include walking instead of swimming, low impact options such as pilates/yoga, seated options)	**Relevant BCTs (numbered as above)**
Incorporate activity into daily routines (e.g. walking on lunch break, standing desks, housework, running with a buggy, wearing weights, walking the dog on the school run)	7, 15, 19, 20, 22, 25, 37
Online classes	19, 20, 21, 25
Activities that can be done at home without equipment	15, 19
Timetabling, diaries and group diaries	7, 19, 28, 37
Have a range of goals	5, 6, 8, 9, 10, 11, 16, 17, 39
Help with goal setting (e.g. couch to 5k)	5, 6, 7, 8, 9, 10, 11, 16, 17, 22, 39
Make goals achievable	5, 6, 8, 9, 10, 11, 16, 17, 39
Accessibility (in terms of price, access, venue and activity)	
On demand/flexible scheduling for separate groups (in-person classes recorded and streamed live as well as being recorded)	20, 21, 37
Low cost/free	
Cameras optional or only on group leader for streamed sessions	
Have a group leader, facilitator or co-ordinator	3, 12, 13, 18, 19, 20, 21, 28
Be active with those you're caring for (e.g. walk to school)	7, 28,
Go in groups/pairs	28, 29,
Make sure people know when and where you are going and when you will be back	
Using active travel	7
Use green spaces	7
Develop a supportive social culture by joining up women with similar goals/ideas/ability	4, 5, 6, 28,
'Maybe pile' Code of conduct agreed on first session	
Education, statistics & information to promote positive beliefs	1, 4
Peer support by helping to create weekly schedules and showing access to good planning tools (e.g. how to use google calendar),	19, 28, 27
Progress pictures/videos (health e.g. posture)	1, 11, 27
Transformation pictures/videos (appearance)	1, 11, 27
Testimonials and anecdotes (from "people like me")	1, 2, 11, 27

Provide role models (local people in the community with whom women can identify)	3, 28
Promotional material (e.g. Tiktok) to prompt kids to bring a Mum/Auntie etc. and to convey positive message	28
Encourage good "sleep hygiene"	
Taster sessions to explore different activities	
Promote positive beliefs about the impact of PA on mood	1, 2, 4
Flexible access to facilities and flexible time, flexible payment options (so can miss a session without worrying about cost)	37
Facilities for time of the month (sanitary products, paracetamol, appropriate bathroom facilities)	
Local locations	19
Have the option of no mirrors	
"Ladies only sessions"	
Physical barrier	
Free caffeinated beverages	
Not competitive	28
Competitions/league tables	16, 18, 19
Create schemes (e.g. 'cycle to work')	7

Appendix 19: The goal-setting workbook used in the intervention

4-week physical activity pilot for women

with Maddy Leather

Participant number: _____.

Fitness testing log

Week 1 – Date of test:	
Sit and reach test (cm or inches?)	
Max no. of high knee steps in 1 min	
BPM immediately after (measured how?)	
Max no. of push-ups in 1 min (on knees or toes?)	
Max no. of full sit-ups in 1 min (toes supported?)	
Max no. of squats in 1 min (range of movement?)	

Week 4 – Date of test:	
Sit and reach test (cm or inches?)	
Max no. of high knee steps in 1 min	
BPM immediately after (measured how?)	
Max no. of push-ups in 1 min (on knees or toes?)	
Max no. of full sit-ups in 1 min (toes supported?)	
Max no. of squats in 1 min (range of movement?)	

Optional tracking log

Below is a space for you to track whatever you like throughout the programme at the end of each week, if you wish to. **This is entirely optional**. Below, I have put some suggestions for things you may want to track, there is also space for you to put your own goals – I expect you'll fill out 1-3 of these max, do not fill in any sections which you do not feel comfortable with or which you feel are not the focus of your time completing this programme.

Week 1 – Date:		
Goal	**Over past week**	**Goal for coming week**
No. days exercised		
Average no. steps per day		
No. exercise classes		
No. independent workouts		
No. days completed daily activity challenge		
Max squats in one minute		
No. days in a calorie deficit		
Min. g of protein per day		
Average no. hours sleep per night		
Weight (kg or stone & lbs)		
Chest measurement (cm or inches?)		
Waist measurement (cm or inches?)		
Hip measurement (cm or inches?)		
Glute measurement (cm or inches?)		

Week 2 – Date:		
Goal	**Over past week**	**Goal for coming week**
No. days exercised		
Average no. steps per day		
No. exercise classes		
No. independent workouts		
No. days completed daily activity challenge		
Max squats in one minute		
No. days in a calorie deficit		
Min. g of protein per day		
Average no. hours sleep per night		
Weight (kg or stone & lbs)		
Chest measurement (cm or inches?)		
Waist measurement (cm or inches?)		
Hip measurement (cm or inches?)		
Glute measurement (cm or inches?)		

Week 3 – Date:		
Goal	**Over past week**	**Goal for coming week**
No. days exercised		
Average no. steps per day		
No. exercise classes		
No. independent workouts		
No. days completed daily activity challenge		
Max squats in one minute		
No. days in a calorie deficit		
Min. g of protein per day		
Average no. hours sleep per night		
Weight (kg or stone & lbs)		
Chest measurement (cm or inches?)		
Waist measurement (cm or inches?)		
Hip measurement (cm or inches?)		
Glute measurement (cm or inches?)		

Week 4 – Date:		
Goal	**Over past week**	**Goal for coming week**
No. days exercised		
Average no. steps per day		
No. exercise classes		
No. independent workouts		
No. days completed daily activity challenge		
Max squats in one minute		
No. days in a calorie deficit		
Min. g of protein per day		
Average no. hours sleep per night		
Weight (kg or stone & lbs)		
Chest measurement (cm or inches?)		
Waist measurement (cm or inches?)		
Hip measurement (cm or inches?)		
Glute measurement (cm or inches?)		

SMART Goal Setting 1

Thinking about the 4-weeks of exercise classes, what would you like to achieve?

Initial Goal	Write your goal here.
S Specific	Your goal should be well defined, detailed and clear.
M Measurable	Is your goal measurable? You should be able to tell when you reach your goal.
A Achievable	Can you reach the goal, taking into account your available time, skills, and financial status?
R Realistic	Is your goal realistically achievable within the given time frame and with the available resources?
T Timely	Set a start and finish date for your goal.
	Start Date: _____Review Date_____
SMART Goal	Revise your goal based on the answers to the questions above.

Action Plan

What steps do you need to take to get you to your 4-week goal?
Potential Obstacles and Solutions

Action Items	How often will you do this?

Potential Obstacles	Potential Solutions

SMART Goal Setting 1 continued

Thinking about THIS WEEK what would you like to achieve?

Initial Goal	Write your goal here.
S Specific	Your goal should be well defined, detailed and clear.
M Measurable	Is your goal measurable? You should be able to tell when you reach your goal.
A Achievable	Can you reach the goal, taking into account your available time, skills, and financial status?
R Realistic	Is your goal realistically achievable within the given time frame and with the available resources?
T Timely	Set a start and finish date for your goal.
	Start Date: _____Review Date_____
SMART Goal	Revise your goal based on the answers to the questions above.

Action Plan

What steps do you need to take to get you to your goal this week?

Action Items	How often will you do this?	How often did you actually do this?

SMART Goal Setting 2

Thinking about the goal you set in session 1 for this week, fill out the table below

Question	Circle your answer	Reason why
Did you achieve your goal?	Yes Nearly No	
How difficult did you find working towards your goal?	Easy Medium Hard	
Does your 4-week goal need adjusting?	Yes No	

If you circled "Yes" to indicate that your goal does need adjusting, please indicate your new 4 week SMART goal here:

Next, look at the sheet from last week (Page 7) and indicate how often you completed each of the action items on your action plan

Thinking about your goal for the coming week:

Initial Goal	Write your goal here.
S Specific	Your goal should be well defined, detailed and clear.
M Measurable	Is your goal measurable? You should be able to tell when you reach your goal.
A Achievable	Can you reach the goal, taking into account your available time, skills, and financial status?
R Realistic	Is your goal realistically achievable within the given time frame and with the available resources?
T Timely	Set a start and finish date for your goal.
	Start Date: _____Review Date_____
SMART Goal	Revise your goal based on the answers to the questions above.

SMART Goal Setting 2 continued

Action Plan

What steps do you need to take to get you to your goal this week?

Action Items	How often will you do this?	How often did you actually do this?

Unexpected obstacles you encountered over the past week and actual or potential solutions

Unexpected Obstacles Encountered	Actual/Potential Solutions

Potential Obstacles and Solutions

Potential Obstacles	Potential Solutions

SMART Goal Setting 3

Thinking about the goal you set in session 2 for this week, fill out the table below

Question	Circle your answer	Reason why
Did you achieve your goal?	Yes Nearly No	
How difficult did you find working towards your goal?	Easy Medium Hard	
Does your 4-week goal need adjusting?	Yes No	

If you circled "Yes" to indicate that your goal does need adjusting, please indicate your new 4 week SMART goal here:

Next, look at the sheet from last week (Page 9) and indicate how often you completed each of the action items on your action plan

Thinking about your goal for the coming week:

Initial Goal	Write your goal here.
S Specific	Your goal should be well defined, detailed and clear.
M Measurable	Is your goal measurable? You should be able to tell when you reach your goal.
A Achievable	Can you reach the goal, taking into account your available time, skills, and financial status?
R Realistic	Is your goal realistically achievable within the given time frame and with the available resources?
T Timely	Set a start and finish date for your goal.
	Start Date: _____Review Date_____
SMART Goal	Revise your goal based on the answers to the questions above.

SMART Goal Setting 3 continued

Action Plan

What steps do you need to take to get you to your goal this week?

Action Items	How often will you do this?	How often did you actually do this?

Unexpected obstacles you encountered over the past week and actual or potential solutions

Unexpected Obstacles Encountered	Actual/Potential Solutions

Potential Obstacles and Solutions

Potential Obstacles	Potential Solutions

SMART Goal Setting 4

Thinking about the goal you set in session 3 for this week, fill out the table below

Question	Circle your answer	Reason why
Did you achieve your goal?	Yes Nearly No	
How difficult did you find working towards your goal?	Easy Medium Hard	
Does your 4-week goal need adjusting?	Yes No	

If you circled "Yes" to indicate that your goal does need adjusting, please indicate your new 4 week SMART goal here:

Next, look at the sheet from last week (Page 11) and indicate how often you completed each of the action items on your action plan

Thinking about your goal for the coming week:

Initial Goal	Write your goal here.
S Specific	Your goal should be well defined, detailed and clear.
M Measurable	Is your goal measurable? You should be able to tell when you reach your goal.
A Achievable	Can you reach the goal, taking into account your available time, skills, and financial status?
R Realistic	Is your goal realistically achievable within the given time frame and with the available resources?
T Timely	Set a start and finish date for your goal.
	Start Date: _____Review Date_____
SMART Goal	Revise your goal based on the answers to the questions above.

SMART Goal Setting 4 continued

Action Plan

What steps do you need to take to get you to your goal this week?

Action Items	How often will you do this?	How often did you actually do this?

Unexpected obstacles you encountered over the past week and actual or potential solutions

Unexpected Obstacles Encountered	Actual/Potential Solutions

Potential Obstacles and Solutions

Potential Obstacles	Potential Solutions

SMART Goal Setting 5

Thinking about the past week

Question	Circle your answer	Reason why
Did you achieve your goal?	Yes Nearly No	
How difficult did you find working towards your goal?	Easy Medium Hard	

Any other comments?

Thinking about the four week goal you set in session 1(Page 6)

Question	Circle your answer	Reason why
Did you achieve your goal?	Yes Nearly No	
How difficult did you find working towards your goal?	Easy Medium Hard	
Was your 4-week SMART goal appropriate?	Yes No	

Any other comments?

SMART Goal Setting 5 continued

Thinking about the future:

Initial Goal	Write your goal here.
S Specific	Your goal should be well defined, detailed and clear.
M Measurable	Is your goal measurable? You should be able to tell when you reach your goal.
A Achievable	Can you reach the goal, taking into account your available time, skills, and financial status?
R Realistic	Is your goal realistically achievable within the given time frame and with the available resources?
T Timely	Set a start and finish date for your goal.
	Start Date: _____Expected completion_____
SMART Goal	Revise your goal based on the answers to the questions above.

What steps do you need to take to get you to your goal?

Action Items	How often will you do this?	How often did you actually do this?

Potential Obstacles and Solutions

Potential Obstacles	Potential Solutions

Appendix 20: A proposed 12-step guide to undertaking co-design

Step 1: *Identify relevant stakeholders (then recruit and retain)*

Identifying relevant stakeholders will often begin (and may sometimes end) with identifying people for whom the final intervention is being designed. However, there will also potentially be a range of other key stakeholders that will have relevance for intervention design. In this thesis, participant retention across the different stages of co-design was poor and so whilst the importance of retention and recruitment of key stakeholders at all levels is recommended, the best methods for achieving this are unclear. These will however likely need to be targeted to match the demographic and key stakeholders should continue to be identified and recruited throughout the process, if appropriate (e.g. if knowledge gaps are identified that new stakeholders might be best placed to fill or if there are issues of attrition).

Step 2: *Identify barriers and facilitators to the target behaviour*

This can be achieved in a variety of ways. Co-designers may choose to achieve this via consultation of secondary data available within the literature, they may gather primary data from the target demographic via qualitative or quantitative data collection methods or, as was the case within this PhD programme of research, they may choose to use a combination of the two. It is likely best practice to combine the two.

Step 3: *Map barriers and facilitators to an acceptable theoretical framework*

To ensure that interventions remain empirically grounded, it is advisable to map barriers and facilitators to an acceptable framework for understanding that behaviour. In real-world settings (e.g. within the community and voluntary sector), it is entirely possible that an efficacious intervention, which addresses relevant barriers and facilitators could be designed without the inclusion of this step. It is however proposed that if this step cannot/will not be accomplished, then the identification of barriers and facilitators to the target behaviour in Step 2 is completed with members of the target group at a minimum, to ensure accuracy and relevance for the target demographic. The COM-B model and the TDF have been found useful for understanding barriers and facilitators to PA for women,

throughout this PhD programme of research and might be useful for others in this context.

Step 4: *Prioritise determinants for intervention design*

It is unlikely that any one intervention could address the entire range of barriers and facilitators to health-related behaviour for any participant group. As such, once barriers and facilitators have been identified and where possible, mapped onto an applicable framework, the next step in co-design should be to prioritise behavioural determinants. Prioritisation can be based on which barriers are most problematic and which facilitators are most helpful. Regarding divergent categories, there are two primary options: i) Co-designers may prioritise divergent categories with the most potential to be manipulated through intervention design, or ii) they may prioritise divergent categories that are most salient to the target demographic in the context of preventing or promoting the target behaviour. In this PhD research, this was achieved through the use of card sorting tasks, but co-designers are encouraged to be flexible in their approach and to aim to achieve this in ways that promote equity and inclusion and which are appropriate/relevant to the target demographic (e.g. in terms of developmental appropriateness).

Step 5: *Generate suggestions for practical recommendations for intervention options*

Once behavioural determinants that are to be addressed by the intervention have been identified, the next step should be to generate practical recommendations for ways this can be achieved. Practical recommendations can be contributed by stakeholders at all levels and little-to-no consideration needs to be made at this stage of the potential efficacy of these suggestions or of the practicalities involved in implementing them in a real-world setting. Examples of how this can be achieved include using 'How might we…' statements, mind-mapping, suggestion boxes and/or through traditional focus groups.

Step 6: *Assess suggestions against APEASE criteria to generate 'yes', 'no' and 'maybe' piles*

Once suggestions have been made, these should be assessed in terms of the likelihood that they will promote the target behaviour, the practicality of implementing them and the ethics associated with doing so. Here, it is strongly suggested that the APEASE

criteria offers an appropriate and flexible framework for achieving this, which is empirically grounded and easy to understand/implement. The APEASE criteria can be used to provide an assessment of the intervention and its component parts, which can be tailored in terms of intricacy in accordance with the requirements of key stakeholders. In this chapter, APEASE analysis was conducted using a three-point traffic light system, but this could be simplified to include a pass or fail system, or made more detailed by providing a percentage score out of 100. For more simple interventions, there might be scope for the overall intervention to undergo APEASE analysis, rather than each component part. The approach to APEASE analysis can be determined based on the time-constraints, the researcher/co-designer expertise, the complexity of the intervention and the potential risk associated with engaging in the target behaviour or not. Step 6 is considered a crucial prerequisite for the development of ethical interventions by conscientious researchers who operate with integrity so must therefore never be skipped.

Where component parts have been assessed in terms of APEASE, suggestions for intervention options can be sorted into 'piles' which can either be certainly included, possibly included or which should not be included in the final intervention design. Where two or more intervention options fulfil the APEASE criteria but cannot possibly or realistically be implemented simultaneously, these should be allocated to the 'maybe' pile and brought forward for further consideration. Co-designers should not forget to consider factors that might be pre-determined or externally controlled and which will therefore need to be allocated to the 'yes' pile. These features would benefit from APEASE analysis, but by their nature will need to take precedence over other intervention components that cannot be concurrently implemented. Failure to consider fixed intervention options at this stage is highly likely to result in a misrepresentation of the final intervention design to potential participants. This would be considered unethical and likely to negatively impact the relationship between co-design facilitators and other key stakeholders.

Step 7: *Corroborate and outline the certain features of the final intervention*

Based on the findings of the APEASE analysis conducted in Step 6, intervention options that have been allocated to the 'yes' pile can be corroborated such that a loose outline of at least some features of the intervention can be clarified. This outline should be clearly communicated in a way that is accessible to the target population, such that participants can feel well informed in later stages of co-design and provide the most relevant and helpful feedback.

Step 8: *Design and implement tasks that will help to clarify uncertain intervention options*

By this step, some features of the final intervention should have been clarified and a loose outline of the final intervention design should have begun to take shape. It is likely that at this stage, co-design approaches will start to vary more between workshops aiming to target different groups and behaviours, based on the findings from earlier steps. Personas are one approach that might be used to represent key features of the target demographic, particularly in respect of underrepresented populations although the potential ramifications of stereotyping must be considered. Organisationally, grouping uncertain intervention options in terms of themes was helpful, and this may or may not be done according to any framework that might have been implemented within the optional Step 3. Grouping activities according to the types of tasks that might be implemented to achieve clarification of uncertain features might be helpful for streamlining the time-consuming process of co-design. Specific activities that will be useful to achieve this clarification should be designed in relation to the specific needs identified and unbiased methods of analysis should be decided. Co-design facilitators are encouraged to design interactive and varied activities, but as is true for all stages of the co-design process, care should be taken to ensure these activities are appropriate for use with the target group. Co-designers are encouraged to use evidence-based activities where possible and appropriate, such as those discussed earlier within this chapter. Co-designers should not feel discouraged from also including their own novel and unique suggestions for activities that might achieve clarification of final intervention options. Any such activities should however be reported with transparency, such that fine detail is available in terms of the rationale, materials, content, procedure, results, analyses, outcomes and ease of implementation.

Step 9: *Repeat steps 7 & 8 as appropriate*

APEASE analysis will have taken place in Step 6. Thus, intervention options that have been brought forward at this stage can be considered acceptable for use in the final intervention design, unless participants explicitly disagree during co-design. As such, based on the findings of Step 8, Step 7 can be repeated until clarification of the intervention design is achieved.

Step 10: *Gather feedback from key stakeholders about the co-design process*

From a researcher perspective and for the benefit of the co-design field of research, gathering feedback from key stakeholders about their experience of engaging in the co-design process is of paramount importance. This is recommended to take place during or immediately after the co-design process and prior to any intervention commencing. However, if this is not possible and if participants are committed to engaging with the process of co-design and intervention, then this might be completed during the intervention or after the intervention is complete. It is acknowledged however, that for some co-design facilitators, the goal of co-design will be to develop health-related behavioural interventions and not to progress the field of research. This is entirely acceptable and co-design should not be gatekept by the research community and/or withheld from grassroots community intervention providers on this basis. As such, when financial budget and time are limited, Step 10 can be skipped where assessment of co-design as a methodology and contribution to the literature are not priorities, to ensure the maximum possible number of people can benefit from the co-design process and its outcomes.

Step 11: *Report the co-design process*

Considering the clear lack of well-reported co-design research and the goal of developing clear frameworks and taxonomies for co-design, reporting the co-design process in detail and with transparency is critical for the development of the field. During reporting, clear information will need to be provided about the target demographic, behaviour and context of the intervention under co-design. Additionally, the rationale for including any activities, the materials used, the content, the procedure, the results, the

methods of analyses, the outcomes and the ease or challenges associated with implementation, must be clearly reported. It is probable that a series of reports or publications will frequently be required to report the co-design process for complex interventions in the level of detail required.

Step 12: *Run the intervention*

The steps above propose one way that co-design of health-related behavioural interventions might occur up to the commencement of the intervention. Within all relevant contexts, running the intervention that has been designed will of course be the next step.

Within academic research, the very next steps will be to evaluate and report the intervention. In the relative short-term, this may also result in further engagement in an iterative process of adapting the intervention to improve its acceptability, feasibility and efficacy. If researchers can find ways to ethically run co-designed interventions as randomised controlled trials, then this would allow future researchers to achieve a longer-term goal of completing high quality systematic reviews that analyse the efficacy of co-designed interventions and compare this to the efficacy of interventions that have been developed using other approaches. Further systematic review will then need to assess the impact of integrating specific co-design activities and to understand participant's experiences of undertaking these activities. This would in turn facilitate the long-term development of a taxonomy of co-design activities and a "How to" co-design guide.

Appendix 21: The participant recruitment advert that was shared via social media

Sheffield Hallam University

Get active with other women for free



I am looking for:

- Healthy women
- Aged 18-65
- Living in the East Mids
- Not pregnant in the last year

To take part in:

3 exercise classes a week for 4 weeks
In Nottingham or online

This is part of my PhD so you would also be asked to complete questionnaires before, during and after the programme and may be asked to take part in an interview afterwards.

For more information, please contact Maddy Leather at:
ml3270@my.shu.ac.uk

Appendix 22: The PAR-Q

Physical Activity Readiness Questionnaire (PAR-Q) and You

Regular physical activity is fun and healthy, and increasingly more people are starting to become more active every day. Being more active is very safe for most people. However, some people should check with their doctor before they start becoming much more physically active.

If you are planning to become much more physically active than you are now, start by answering the seven questions in the box below. If you are between the ages of 15 and 69, the PAR-Q will tell you if you should check with your doctor before you start. If you are over 69 years of age, and you are not used to being very active, check with your doctor.

Common sense is your best guide when you answer these questions. Please read the questions carefully and answer each one honestly:

YES **NO** ☐☐ 1.

Has your doctor ever said that you have a heart condition and that you should only do physical activity recommended by a doctor?

Do you feel pain in your chest when you do physical activity?

In the past month, have you had chest pain when you were not doing physical activity?

Do you lose your balance because of dizziness or do you ever lose consciousness?

Do you have a bone or joint problem that could be made worse by a change in your physical activity?

Is your doctor currently prescribing drugs (for example, water pills) for your blood pressure or heart condition?

Do you know of any other reason why you should not do physical activity?

☐☐ 2. Check YES or NO:

☐ ☐ 3. ☐ ☐ 4. ☐ ☐ 5.

☐ ☐ 6. ☐ ☐ 7.

If you answered:	**YES to one or more questions**
	Talk to your doctor by phone or in person BEFORE you start becoming much more physically active or BEFORE you have a fitness appraisal. Tell your doctor about the PAR-Q and which questions you answered YES. • • You may be able to do any activity you want – as long as you start slowly and build up gradually. Or, you may need to restrict your activities to those which are safe for you. Talk with your doctor about the kinds of activities you wish to participate in and follow his/her advice.

	• • Find out which community programs are safe and helpful for you. •
NO to all questions	**Delay becoming much more active:**
If you answered NO honestly to all PAR-Q questions, you can be reasonably sure that you can: • • Start becoming much more physically active – begin slowly and build up gradually. This is the safest and easiest way to go. • • Take part in a fitness appraisal – this is an excellent way to determine your basic fitness so that you can plan the best way for you to live actively.	• • If you are not feeling well because of a temporary illness such as a cold or a fever – wait until you feel better; or • • If you are or may be pregnant – talk to your doctor before you start becoming more active. Please note: If your health changes so that you then answer YES to any of the above questions, tell your fitness or health professional. Ask whether you should change your physical activity plan.

Informed use of the PAR-Q: Reprinted from ACSM's Health/Fitness Facility Standards and Guidelines, 1997 by American College of Sports Medicine

Appendix 23: The Short Warwick Edinburgh Mental Wellbeing Scale

"Short Warwick Edinburgh Mental Wellbeing Scale (SWEMWBS) © NHS Health Scotland, University of Warwick and University of Edinburgh, 2008, all rights reserved."

The Short Warwick-Edinburgh Mental Well-being Scale (SWEMWBS)

Below are some statements about feelings and thoughts.

Please tick the box that best describes your experience of each over the last 2 weeks

STATEMENTS	None of the time	Rarely	Some of the time	Often	All of the time
I've been feeling optimistic about the future	1	2	3	4	5
I've been feeling useful	1	2	3	4	5
I've been feeling relaxed	1	2	3	4	5
I've been dealing with problems well	1	2	3	4	5
I've been thinking clearly	1	2	3	4	5
I've been feeling close to other people	1	2	3	4	5
I've been able to make up my own mind about things	1	2	3	4	5

"Short Warwick Edinburgh Mental Well-Being Scale (SWEMWBS)
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Appendix 24: Risk assessment for intervention

SCA Risk Assessment – Sherwood Community Centre – All Centre Users

For Parties and Events, additional Risk Assessments are required (see references within the document below)
For Dance/Exercise/Fitness/Cooking or activities using tools or other specialised equipment, Hirers must submit their own Risk Assessment, in addition to this document. This then acts as a supplementary RA.
In this instance, there is no need to complete the final section, as all additional measures should be contained in the supplementary RA.

Group's Name	*Active women research*	**Activity Type**	**Physical activity programme**
Group Leader's Name	*Maddy Leather*	**Position (within User Group)**	**PhD student and fitness instructor**
Date submitted	*Thursday 17th November*	**Date approved**	
Full Approval by	**Chair**		**Trustee**

All measures are on-going from the date of the Risk Assessment
Any fixtures which need repair should be reported immediately, in writing, to the Centre's Office or by email to sherwoodcommunitycentre@hotmail.com

- For regular bookings, Group Leaders must receive Fire and Safety Induction Training and must inform group members of the Safety information on display in all Room Notice Boards.
- For casual bookings, Staff or Volunteers admitting the group to the building will inform group leaders of the Safety Information on display in all Room Notice boards
- Members of Staff, Volunteers, Hirers/Group Leaders must be aware of their responsibilities and make their members aware of essential safety information.

What are the **RISKS?**	Who is **AT RISK**?	What is already being done to **reduce the risk?**	Additional measures needed to **minimise risk**.	**WHO** takes this action?	Resultant Risk level limited to **H/M/L**
Car Park and Grounds					
Slips, Trips and other accidents		Centre Users/Visitors to keep to footpaths and level surfaces, where possible.	Parents hold hands with young children when crossing the car park and only allow play on enclosed grassed areas.	All Users	Low

What are the **RISKS?**	Who is **AT RISK**?	What is already being done to **reduce the risk?**	Additional measures needed to **minimise risk**.	**WHO** takes this action?	Resultant Risk level limited to **H/M/L**
		On snowy or icy days, keep to flat areas where possible		Pedestrians	Low
			Staff (if on duty) to grit/salt all pedestrian routes. This is not possible at weekends. Weekend Users are advised to add their own measures to the last section of this Risk Assessment.	Staff	Low
			If there is an excessive snowfall, Staff will take the decision as to whether the Centre should be open	Staff	Low
			Staff to contact Group Leaders and local radio if Centre is to be closed	Staff	Low
			Group Leaders and Centre Users check Facebook and local radio. Group Leaders contact members of their group.	Group Leaders/ Centre Users	Low
Pedestrians could suffer injury if struck by cars **Car collisions**	All Centre Users	Arriving on foot or using public transport would reduce congestion in the car park, making it safer and more accessible for those with limited mobility or those for whom public transport is not available	Use pedestrian entrances, and avoid walking through car park, or keep to one side	All Users	Low
		Drive at walking pace (maximum 4 mph)	Be aware of any pedestrians (especially children) in the carpark, cars about to move out, (e.g., lights employed) or approaching the entrance/exit bottle neck	Drivers	Low
		Be aware that the Car Park is also used by dogwalkers accessing the woodland and meadow.	Drivers and pedestrians need to be aware that dogs may not be under control at this point.	Drivers, pedestrians	Low
		Parking spaces for visitors with disabilities available close to building.	Monitor car parking where possible	Drivers/ Group Leaders/Staff	Low

What are the **RISKS?**	Who is **AT RISK**?	What is already being done to **reduce the risk?**	Additional measures needed to **minimise risk**.	**WHO** takes this action?	Resultant Risk level limited to **H/M/L**
		Cars to be parked in marked bays. No parking in areas which would narrow the access to the Car Park or between front and back parking sections. Do not obstruct footpaths, doors or fire exits.	• Staff to check that cars are only parked in marked bays • If Driver cannot be identified to speak to, then leave parking notice on windscreen if appropriate, to indicate problem • When no Staff on site the Hirer is responsible for ensuring that their group members following correct parking procedure	Drivers/ Group Leaders/Staff	Low
		If no parking spaces are free, there is on-street parking within 5-10 minutes' walk	Group leaders to inform members, if this is likely to be necessary, on busier days	Group Leaders Drivers	Low
		Ensure handbrakes are engaged and left in gear if on the slope	This is particularly important if parked on a slope or in icy weather	Drivers	Low
Dogs causing accidents and fear		Dogs must be kept on leads, and are not allowed in the building or enclosed garden, unless Assistance Dogs.	See previous section (slips and trips)	All Users	Low
Signing in on Arrival and Signing Out on Departure					
If there is no record of people who are in the building, this may result in someone being left in the building in the event of a fire	ALL Users (Staff, Trustees, Tenants, Users, occasional visitors including Contractors)	Staff, Trustees, Group Leaders and all occasional visitors to sign the **Centre's Fire Register** on arrival and sign out on departure.		Staff, Trustees, Group Leader, occasional visitors	Low
		Group members to be registered in the agreed format within their group - this may vary for different groups. This becomes the Group's Fire Register, which must be carried by Group Leader in the event of fire or if group moves to a different part of the building.		Group Leader/ All attending	Low

What are the **RISKS?**	Who is **AT RISK**?	What is already being done to **reduce the risk?**	Additional measures needed to **minimise risk**.	**WHO** takes this action?	Resultant Risk level limited to **H/M/L**
General Good Housekeeping					
Slips, Trips and Falls	ALL Users, as above	Keep all floor areas clear (Deliveries to be stored away/collected by Office Users immediately)	Tenants reminded of deliveries awaiting collection	All Tenants, Staff	Low
		All spillages to be cleaned up immediately	Wet floor signs utilised following cleaning or spillages.	All Users, SCC Staff	Low
		Furniture, projectors, flipchart stands etc to set up correctly so that they don't block entrance/exit points or passages		All Users, SCC Staff	Low
		No trailing leads or cables.		All Users, SCC Staff	Low
Dogs causing injury or fear		Dogs are not allowed in the building except for Assistance dogs.	All Assistance dogs kept on lead or harness, kept with and under control by owner and not petted by others.	All Users	Low
Movement and storage of equipment		Everyone made aware of how to stack chairs, fold and store tables securely so that they don't fall and cause injury.	• Chair stack height limits not exceeded • Instructions (to be displayed) where chairs and tables are stored	All Users SCA Staff	Low
		Care should be taken when carrying furniture and equipment, (i.e., not to overload, use chair transporter)		All Users, SCA Staff	Low
Safeguarding of Children		Groups providing activities for children MUST have a **Safeguarding Policy**	Children to be closely supervised moving around the building, using toilets, changing workspaces, etc	Adults who are responsible for the children (family members/friends, Group Leaders)	Low
Safeguarding of Vulnerable Adults		Groups providing activities for Vulnerable Adults MUST have their own **Safeguarding Policy**	Vulnerable adults monitored moving around the building, accompanied by responsible adult if required.	Responsible adult	Low

What are the **RISKS?**	Who is **AT RISK**?	What is already being done to **reduce the risk?**	Additional measures needed to **minimise risk**.	**WHO** takes this action?	Resultant Risk level limited to **H/M/L**
Security of Building and General Safety					
Unauthorised entry by anyone not attending a supervised group	All Users	Whether or not SCA Staff are on the premises, Group Leaders must be vigilant in respect of safety of the building, and their User Group including monitoring the secure use of entrances and exits.		SCC Staff Group Leaders All Users	Low
		When the building is closed to the public, Group Leaders are responsible for manning the door(s) to allow access to their members only, and must not allow access to any other person	Group Members should arrive on time for their meetings. If late, they should have Group Leaders mobile number to arrange to be let in	Group Leaders and their members	Low
Violence, abusive and threatening behaviour		SCA CIO Zero-Tolerance Statement on display throughout the building	Incident and Anti-social Behaviour Log kept.	All Users, Trustees, Staff	Low
		The Hirer is responsible for the behaviour, actions and effective control of all who attend their function.	In the event of an Incident, within the Centre or Grounds, the Hirer must report this immediately to the Staff on duty who will complete an Incident Report Form in the Incident Log. If no member of Staff is on Duty the incident should be reported to SCC by email or in writing.	Group Leaders	Low
		CCTV is in use on the premises	• If non-urgent Police help is required, call 101 • If incident is serious, telephone 999	Users/ Staff	Low
Use of House Kitchen for provision of light refreshments					
Burns, spillages, accidents	All Users	No access to House Kitchen unless booking has been made and time-tabled	Those accessing the Small Hall must keep to the thoroughfare and not enter the Kitchen area itself.	All Users	Low
		No children allowed in Kitchen area.		All Users	Low

What are the **RISKS?**	Who is **AT RISK**?	What is already being done to **reduce the risk?**	Additional measures needed to **minimise risk**.	**WHO** takes this action?	Resultant Risk level limited to **H/M/L**
		No more than 2 people per User Group and 2 User groups allowed in the Kitchen at any one time, and keeping to designated spaces, according to timetable.	Drinks to either be served in meeting rooms, or served over the counter-top and taken directly to rooms, but groups should not congregate in the kitchen	Time-tabled Kitchen Users	Low
		Kettles or hot drinks to be kept away from the edge of worktops	All spillages to be wiped up immediately, wet-floor signs in place if required	All Users	Low
		The cooker is turned off by use of an isolation switch which is only accessible to Staff/Trustees. Therefore, the cooker can only be used if booked in advance (see below)	Kitchen Users to check that hot plates, oven and grill switches are turned to OFF, regardless of whether cooker has been booked, in case it has been left on by accident.	All Users	Low
		Crockery , cutlery to be returned to owner's storage cupboard immediately after use.		Kitchen Users	Low
		Kitchen Users to be appropriately dresses for kitchen work: no trailing sleeves, clothes protected by apron/overall if cooking, appropriate footwear, etc.		Kitchen Users	Low
User Accidents, burns, fire etc	Kitchen Users	A separate **Kitchen Risk Assessment** must be provided if the cooker is to be used		Kitchen Users, SCA CIO	Low
		Users to be aware of the location of Kitchen First Aid box, and the Incident log for completion in respect of an accident.	Kitchen First Aid box kept stocked and available	Kitchen Users, SCC Staff	Low
Parties and Events					
Parties		A separate **Party Risk Assessment** must be provided			
Events		A separate **Event Risk Assessment** must be provided			

What are the **RISKS?**	Who is **AT RISK**?	What is already being done to **reduce the risk?**	Additional measures needed to **minimise risk**.	**WHO** takes this action?	Resultant Risk level limited to **H/M/L**
FIRE RISK ASSESSMENT					
Burns, smoke inhalation and potentially fatal injuries in the event of a fire	All Users	All Group Leaders to be given a Fire Safety Induction, prior to their first meeting.	Induction information must be passed on to all Group members by Group Leader and adhered to by the Group	SCA CIO Group Leaders	Low
		General good housekeeping as detailed above	This includes ensuring there are no obstructions	SCA CIO All Users	Low
		Clear access to Fire Doors and along Fire Escape Routes must be maintained at all times		SCA CIO All Users	Low
		Room Capacities MUST NOT be exceeded.	• Maximum numbers displayed on doors, in display boards in each hireable space. • Staff to carry out random audit of rooms to make sure capacities are adhered to and rooms set up correctly.	SCA CIO Staff All Users	Low
		In the event of a fire, Group Leaders should ensure that all their group go directly to the Fire Assembly Area via the nearest Fire Exit and join them there, taking their Fire Register and checking that everyone is present	• Group leaders inform new members of Fire exits, and procedures, and remind the whole group regularly • If Staff are on duty, Group Leaders should report to Staff that their members are safe, and report any missing members	Group Leaders	Low
		There is a Fire Assembly point ON THE GRASS near the Pedestrian Entrance	Everyone must remain in the Assembly Area until the everyone's presence has been checked against the Fire Register. If it becomes unsafe, or if the Assembly area is full, Group Leaders should lead their	All Users	Low

What are the **RISKS?**	Who is **AT RISK**?	What is already being done to **reduce the risk?**	Additional measures needed to **minimise risk**.	**WHO** takes this action?	Resultant Risk level limited to **H/M/L**
			group to a place of safety, further away from the building. The grass in front of the adjacent houses is the nearest suitable space.		
			No one should leave the Assembly Area unless they have been checked against the Fire Register and told by their Group Leader they may leave	All Users	Low
			No one should go to their car or attempt to drive out of the grounds as this could cause an accident or prevent the Fire Engine from accessing the grounds safely	All Users	Low
			Do not stand on the Car Park, drive or anywhere which would block access for Fire Engines	All Users	Low
Potential causes of Fire		No barbecues on site, except for events where Trustees or Staff are supervising. Fires are not allowed under the terms of the Association's Insurance Policy.		All	Medium/Low
		Smoking and vaping are not permitted in the Centre or grounds	Notices displayed throughout site.	All	Low
		Candles, incense burners, gas burners indoor fireworks etc., must not be used in the building (See Party Risk Assessment)		All	Low
Additional measures from Group Leader which are specific to the Group's activity Please refer to Fire Induction for actions to take in the event of a Fire					
	Participants	No equipment being used, draw attention to obstacles. Control		Leader	Low

What are the **RISKS?**	Who is **AT RISK**?	What is already being done to **reduce the risk?**	Additional measures needed to **minimise risk**.	**WHO** takes this action?	Resultant Risk level limited to **H/M/L**
Participants colliding with each other or equipment / obstacles		numbers of people active in the space – ensure this does not exceed capacity.			
Collisions with non-participants	Participants & Non-participants	Unlikely due to side access for annex	Use designated areas only. Ensure area is free from other users, instructor to remain vigilant to those who may enter area. Halt session if required.	Leader	Low
Tripping and falling onto a hard surface	Participants	Make participants aware of dangers – e.g. tripping/slipping, ensure all participants have appropriate footwear.		Leader	Low
Muscular injury though excessive stress/strain. Injury though incorrect	Participants	Follow aerobic and mobilising warm up exercises. Offer appropriate alternatives. Follow governing body guidelines and adhere to safe practice. Reinforce	Assess participants form in-person and online where possible throughout the activity	Leader	Low

What are the **RISKS?**	Who is **AT RISK**?	What is already being done to **reduce the risk?**	Additional measures needed to **minimise risk**.	**WHO** takes this action?	Resultant Risk level limited to **H/M/L**
execution of activity.		safety messages. Group leader qualified and insured.			
Showing a negative physical response to exercise – overly heavy breathing, dizziness etc	Participants	PAR-Q form completed by all participants before joining, observe physical responses, first aid trained		Leader	Low
Twist/turn of joint eg ankle, knee, wrist.	Participants	Suitable warm ups and activities to be delivered by qualified group leader.	Double check about injuries at the start of each session	Leader	Low
Risk of injury or illness due to fire/smoke inhalation in the event of a fire	Participants	Fire escapes will be pointed out and fire safety arrangements discussed before each session	Group leader will take the fire safety induction as provided by the venue.	Leader	Low

What are the **RISKS?**	Who is **AT RISK**?	What is already being done to **reduce the risk?**	Additional measures needed to **minimise risk**.	**WHO** takes this action?	Resultant Risk level limited to **H/M/L**

I will ensure my Group are informed of the contents of this approved document, and that the group will adhere to the stipulations it contains.

Signed (Group Leader) *Madeleine Leather* Date 16th November 2022

Appendix 25: Interview guide for exit interviews

Interview guide phase 4

Introduction

State participant number and which group they are

Pre-participation questionnaire – pseudonym – fitness testing data

Reminder: Right to withdraw, uncomfortable discussing anything/want to skip a question, fine. Feel free to be honest and open but don't feel you have to say anything you don't want to. Can stop at any time to say something and/or ask for something to be removed afterwards.

Thank you for coming.

Background and icebreaker questions

Q1: I'd like to start by finding out a little bit about your physical activity behaviour shortly before the programme began, say in the 3 months before it began. Would you be able to tell me a little bit about that?
Prompts:
What types of things did you do?
How often did you do them?
Who did you do them with?
Where did you do them?

Q2: Okay, so that was before. What about now? What does your physical activity look like now and is it different from before? If so, how?
Prompts:
What types of things do you do?
How often do you do them?
Who do you do them with?
Where do you do them?

If there was a change,
Q3.1: What do you think contributed to that?
Prompts
Was the physical activity programme a key factor?

If there wasn't a change
Q3.2: Why do you think that is?
Prompts
Anything about the programme specifically?

Women's experience of engaging in the pilot intervention (structured around COM-B)

Q4: What aspects of the programme were most helpful?
Prompts:
Were there any specific parts of the programme that helped you:
- Feel more physically capable of being active *(fitter/stronger/effects of menstrual cycle/effects of ageing)?*
- to develop the mental skills needed to be active *(ability to engage in planning/scheduling)?*
-to feel that being active was for "women like you" (*activity with others/male presence/social norms/being observed)*
-to access physical activity opportunities to be active *(location/cost/fitting into fixed schedules)*
-to have positive beliefs about the consequences of being active
-to feel confident in your ability to be active
-to develop being active as a habit?
-to enjoy being active

Q5: Were there any parts of the programme that were unhelpful?
Prompts:
- Feel more physically capable of being active *(fitter/stronger/effects of menstrual cycle/effects of ageing)?*
- to develop the mental skills needed to be active *(ability to engage in planning/scheduling)?*
-to feel that being active was for "women like you" (*activity with others/male presence/social norms/being observed)*
-to access physical activity opportunities to be active *(location/cost/fitting into fixed schedules)*
-to have positive beliefs about the consequences of being active
-to feel confident in your ability to be active
-to develop being active as a habit?
-to enjoy being active

Insights into drop-out

Q6 Do you feel like you "completed" the programme (note: it's okay if you didn't!)?
Prompts:
How many exercise sessions did you do?
How many educational sessions did you do (positive consequences, goal setting)?
How many physical activity challenges did you attempt/complete?

<u>If you did</u>
Q7.1 Is there anything about the programme that you think might have made it more difficult for people to complete the programme?
Prompt:
Anything that you think should have been included to help prevent other people from dropping out?

<u>If you didn't participate in much of the programme or don't feel you completed it,</u>
Q7.2 was there anything specific about the programme that contributed to that?
Prompts
Anything that made it more difficult?

Anything that wasn't included that would have made it easier?

The Theoretical Framework of Acceptability

Q8 What was it like for you taking part in the programme?
Prompts:
Did you participate mainly online or in-person
Did you access any of the online classes in your own time?
Do you think you might in the future?
Did you enjoy the programme?

Q9 Do you feel the programme was a good fit with your personal value system?
Prompts:
To be active
To be a strong woman

Q10 How much effort did it take to be a part of programme?
Prompts:
Did the intervention ever feel like a burden at times?
Can you tell me more about that?
What things specifically?

Q12 Did you ever feel like you had to give up other things you enjoy to be a part of the programme?
Prompts:
- What things?
- How was that for you?
- Did it feel worth it?

Q13 Do you think the intervention was effective at increasing your physical activity?
<u>If yes:</u>
Q13.1 Do you think that positive impact on your physical activity will have a lasting impact?
Prompts:
In 1 month
In 3 months
In 6 months
In a year
Why do you think it would be that long?

Q12 Were there any negative side-effects you experienced as a result of taking part in the programme?

Q14 Do you feel like you understood what to do whilst taking part in the programme?
Prompts
Did you understand the instructions
Did you understand how everything worked

Q15 Do you have confidence that you are physically capable of being active?
Prompts:

As part of a group
Alone

Closing questions

Q16 What would you say to other women who might get the chance to take part in a similar programme?
Prompts:
Would you take part again, given the opportunity?

Q17 Anything else you'd like to add?

Thank you for your time.

Appendix 26: Consent form and demographic questionnaire for intervention

Q2.1 I have read the Information Sheet for this study and have had details of the study explained to me.

- ○ Yes (1)
- ○ No (Selecting 'No' means you are not eligible to take part in this study) (2)

Skip To: End of Survey If I have read the Information Sheet for this study and have had details of the study explained to me. = No (Selecting 'No' means you are not eligible to take part in this study)

Q2.2 I identify as female

- ○ Yes (1)
- ○ No (Selecting 'No' means you are not eligible to take part in this study) (2)

Skip To: End of Survey If I identify as female = No (Selecting 'No' means you are not eligible to take part in this study)

Q2.3
I am not currently pregnant and have not been pregnant within the last 12 months.

- ○ Yes (1)
- ○ No (Selecting 'No' means you are not eligible to take part in this study) (2)

Skip To: End of Survey If I am not currently pregnant and have not been pregnant within the last 12 months. = No (Selecting 'No' means you are not eligible to take part in this study)

Q2.4 I am between the ages of 18 and 65

- ○ Yes (1)
- ○ No (Selecting 'No' means you are not eligible to take part in this study) (2)

Skip To: End of Survey If I am between the ages of 18 and 65 = No (Selecting 'No' means you are not eligible to take part in this study)

Q2.5 My questions about the study have been answered to my satisfaction and I understand that I may ask further questions at any point.

- ○ Yes (1)
- ○ No (Selecting 'No' means you are not eligible to take part in this study) (2)

Skip To: End of Survey If My questions about the study have been answered to my satisfaction and I understand that I may as... = No (Selecting 'No' means you are not eligible to take part in this study)

Q2.6 I understand that I am free to withdraw from the study within the time limits outlined in the Information Sheet, without giving a reason for my withdrawal or to decline to answer any particular questions in the study without any consequences to my future treatment by the researcher.

- ○ Yes (1)
- ○ No (Selecting 'No' means you are not eligible to take part in this study) (2)

Skip To: End of Survey If I understand that I am free to withdraw from the study within the time limits outlined in the Inf... = No (Selecting 'No' means you are not eligible to take part in this study)

Q2.7 I agree to provide information to the researcher under the conditions of confidentiality set out in the Information Sheet.

- ○ Yes (1)
- ○ No (Selecting 'No' means you are not eligible to take part in this study) (2)

Skip To: End of Survey If I agree to provide information to the researcher under the conditions of confidentiality set out... = No (Selecting 'No' means you are not eligible to take part in this study)

Q2.8 I understand and consent to the fact that in-person exercise classes will be filmed and whilst I will not be visible on the recordings, myself and/or my name may be able to be heard on the video

- ○ Yes (1)
- ○ No (Selecting 'No' means you are not eligible to take part in this study) (2)

Skip To: End of Survey If I understand and consent to the fact that in-person exercise classes will be filmed and whilst I... = No (Selecting 'No' means you are not eligible to take part in this study)

Q2.9 I wish to participate in the study under the conditions set out in the Information Sheet

- Yes (1)
- No (Selecting 'No' means you are not eligible to take part in this study) (2)

Skip To: End of Survey If I wish to participate in the study under the conditions set out in the Information Sheet = No (Selecting 'No' means you are not eligible to take part in this study)

Q2.10 I consent to the information collected for the purposes of this research study, once anonymised (so that I cannot be identified), being used for any other research purposes.

- Yes (1)
- No (Selecting 'No' means you are not eligible to take part in this study) (2)

Skip To: End of Survey If I consent to the information collected for the purposes of this research study, once anonymised (... = No (Selecting 'No' means you are not eligible to take part in this study)

Q2.11 I understand that the information provided for this research will be fully anonymised and used for a PhD and may be presented in academic publications (e.g. journals and conferences).

- Yes (1)
- No (Selecting 'No' means you are not eligible to take part in this study) (2)

Skip To: End of Survey If I understand that the information provided for this research will be fully anonymised and used fo... = No (Selecting 'No' means you are not eligible to take part in this study)

Q2.12 I consent to data sharing, as outlined in the information sheet.

- Yes (1)
- No (Selecting 'No' means you are not eligible to take part in this study) (2)

Skip To: End of Survey If I consent to data sharing, as outlined in the information sheet. = No (Selecting 'No' means you are not eligible to take part in this study)

Q2.13 I consent to being contacted via whatsapp, to receive daily activity challenges and information about the programme.

- ○ Yes (1)
- ○ No (Selecting 'No' means you are not eligible to take part in this study) (2)

Skip To: End of Survey If I consent to being contacted via whatsapp, to receive daily activity challenges and information a... = No (Selecting 'No' means you are not eligible to take part in this study)

Q2.14 I consent to being contacted about the next phase of this study (and understand that this is not a commitment to take part).

- ○ Yes (1)
- ○ No (2)

Skip To: End of Survey If I consent to being contacted about the next phase of this study (and understand that this is not... = No

End of Block: Consent form

Start of Block: Pre-participation demographic questionnaire

Q3.1 What best describes your ethnic origin?

- ☐ White (1)
- ☐ Black/African/Caribbean (2)
- ☐ Asian (Indian, Pakistani, Bangladeshi, Chinese, any other Asian background) (3)
- ☐ Mixed two or more ethnic groups (4)
- ☐ Other (Arab or any others) (5)
- ☐ Prefer not to say (6)

Q3.2 What is the highest level of education you have completed?

- ○ Some Primary (1)
- ○ Completed Primary School (2)
- ○ Some Secondary (3)
- ○ Completed Secondary School (4)
- ○ Vocational or Similar (5)
- ○ Some University but no degree (6)
- ○ University Bachelors Degree (7)
- ○ Graduate or professional degree (MA, MS, MBA, PhD, JD, MD, DDS) (8)
- ○ Prefer not to say (9)

Q3.3 What was your total household income before taxes during the past 12 months?

- ○ Less than 20,000 pounds (1)
- ○ 20,000-39,999 pounds (2)
- ○ 40,000-59,999 pounds (3)
- ○ 60,000-99,999 pounds (4)
- ○ More than 100,000 pounds (5)

Q3.4 What is your postcode? (Note: This will only be used to identify how far you live from the venue, whether your local area is urban or rural and to see which income bracket your local area is in. Once these factors have been calculated, this information will be deleted).

_____

Q3.5 How old are you?

_____

Q3.6 Did you take part in any of the previous phases of research? (Please tick all that apply)

- ☐ Phase 1 - Focus groups (2)
- ☐ Phase 2.1 - Co-design workshop 1 (prioritising barriers and facilitators, "how might we..." statements) (3)
- ☐ Phase 2.2 - Co-design workshop 2 (Using personas, making choices) (4)
- ☐ No - this will be my first phase (5)

End of Block: Pre-participation demographic questionnaire

Sheffield Hallam University

Appendix 27: Debrief sheet for intervention

PILOTING A 4-WEEK PHYSICAL ACTIVITY PROGRAMME FOR WOMEN: DEBRIEF SHEET

Thank you for participating in this study. The aim of the study was to understand what the outcomes of the 4-week physical activity programme for women were and how women experienced their participation.

Research shows that women are less active than men and experience different barriers to participation in physical activity. This means that women are at risk of the negative health outcomes associated with being inactive. Lots of the research explores ways to encourage women who are suffering with ill health, or who are pregnant/have recently been pregnant, to be more active. However, there is less information available about women who are healthy. Prevention of ill-health is considered to be better option than curing ill health and one way of doing this is through being more active. For all of these reasons, the aim of my PhD has been to design a programme which gets healthy women active, to promote positive physical and mental health. This was a four phase project:

- **Phase 1** involved women having group discussions about what things were helpful and what tings created an obstacle to being active.
- **Phase 2** involved a series of workshops, in which we prioritised the things that were the most helpful or problematic, identified ways to overcome problems/use helpful factors to our advantage and then made decisions about what should be included in the final programme.
- **Phase 3** involved four weeks of exercise classes, daily activity challenges and some educational workshops to learn about goal setting and the positive consequences of being active.
- **Phase 4** involved one-to-one interviews, in which women who did or didn't complete the programme gave feedback about their experience of taking part, what worked and what didn't.

If you would like to withdraw your data from phases 3 and/or 4 of the study then this is fine, you can do so by emailing me - my email address can be found overleaf. This must however be done within one week of the date that this debrief form was sent to you. After this time, all of your information will have been made anonymous and it will no longer be possible for me to know who said what.

Sheffield Hallam University

What else might I need to know?
Please note, the University undertakes research as part of its function for the community under its legal status. Data protection allows us to use personal data for research with appropriate safeguards in place under the legal basis of ***public tasks that are in the public interest.*** *A full statement of your rights can be found at https://www.shu.ac.uk/about-this-website/privacy-policy/privacy-notices/privacy-notice-for-research. However, all University research is reviewed to ensure that participants are treated appropriately and their rights respected. This study was approved by UREC with Converis number ER47741740. Further information at https://www.shu.ac.uk/research/ethics-integrity-and-practice*

How do I contact you?
For more information or to withdraw your data, you can email me at m.leather@my.shu.ac.uk

Research Team Details:
If you have any questions or concerns about the research or your participation, you can also contact:
My Director of Studies - Professor Maddy Arden sslmma@my.shu.ac.uk
My Supervisor - Dr Laura Kilby dslk@my.shu.ac.uk

You should contact the Data Protection Officer if:	**You should contact the Head of Research Ethics Dr Mayur Ranchordas if:**
• you have a query about how your data is used by the University • you would like to report a data security breach (e.g. if you think your personal data has been lost or disclosed inappropriately) • you would like to complain about how the University has used your personal data DPO@shu.ac.uk	• you have concerns with how the research was undertaken or how you were treated hscmr@exchange.shu.ac.uk

Appendix 28: Coding framework for exit interviews

Construct	Possible examples	Does not include[13]
Physical capability		
Physical health	• Reference to the impact of past/current/chronic health problems or injuries upon PA (including family history) • Reference to engaging in PA following injury, as a means of aiding recovery • Reference to using PA to manage pain or symptoms from illness or injury • References to being healthy enough o undertake PA • References to being able bodied enough to undertake PA	• References to lack of physical fitness – categorise as 'lack of physical fitness' under 'physical capability' • References to psychological/emotional/ mental health problems or concerns such as depressed mood, apathy or poor motivation – categorise as 'poor mental health' under 'psychological capability' or 'apathy' under 'automatic motivation' • References to being advised to be active by professionals – use 'doctor's orders' under 'social opportunity' • Reference to the belief that engaging in PA will support recovery from illness or injury – use 'belief that exercise helps recovery' under 'reflective motivation' • References to being too much of an advanced exerciser (i.e. too fit), to benefit from certain PA – categorise as 'low effort levels required' under 'reflective motivation'
Achievability of the programme	• Reference to the programme suiting a person's physical skills • Reference to the programme suiting a person's physical fitness	• References to the programme being adaptable, to suit skills, fitness and abilities – use 'adaptability of the programme' under 'physical opportunity'

[13] In 'Does not include' column: The word 'use' indicates a category that is already in use within this coding framework. The word 'categorise' indicates a category that is not present within this coding framework, but which may be present within other coding frameworks for other studies within this thesis.

	• Reference to the programme suiting a person's physical ability	
Psychological capability		
Lack of psychological capability	• References to not having the mental skills needed to fit PA into schedules/routines • References to the having limitations in terms of mental skills required to fit PA in, based on a specific or general learning disability, neurodivergence etc. • References to not knowing how to undertake PA safely/appropriately/ to achieve goals etc. • References to forgetting to undertake PA, due to inherent forgetfulness	• References to lacking knowledge of the benefits of PA – categorise as 'lack of knowledge regarding PA' under 'psychological capability'
Educational elements of the programme	• Reference to gaining knowledge regarding PA, because of the intervention • References to developing mental skills through the instructional elements of the programme • References to developing better goal setting skills, because of the goal-setting support sessions	• References to features of the intervention, that provide the opportunity for education – use 'specific features of the intervention' under 'physical opportunity'
Proactive prioritisation	• Reference to restructuring one's life to accommodate the programme	• References to having routines that already routinely accommodate PA – categorise as 'fixed routines'

	• References to prioritising the programme over other roles and responsibilities • References to making extra efforts to ensure PA is completed before other tasks	under 'psychological capability' • References to having fixed schedules that already necessitate PA – categorise as 'fixed schedules' under 'physical opportunity'
Tweaking the programme to suit	• References to altering elements of the programme to better suit preferences • References to altering elements of the programme to better suit personal needs • References to altering the programme to accommodate for physical limitations (e.g. injuries) • References to altering elements of the programme to make it more time efficient	• References to having alternative exercises available as part of the programme – use 'specific features of the intervention' under 'physical opportunity'
Social opportunity		
The right social culture and atmosphere	• Reference to the intervention feeling like a non-judgemental space to be • References to the enjoying the atmosphere for in-person classes • References to feeling supported by other women undertaking the intervention	• References to having specific support from other women to be active – categorise as 'activity-related social support' under 'social opportunity' • References to having social support from outside of the programme, to facilitate engagement (e.g. childcare) – use 'wider social support' under 'social opportunity'
Wider social support	• References to being enabled to be active via the provision of childcare	• References to being encouraged by others in an exercise class – categorise as 'activity-related social

	• References to being driven in a car by a family member or friend, to take part in PA • References to being supported by work colleagues to manage workload in a way which allows time for PA	support' under 'social opportunity' • References to having an exercise professional that is supportive of PA within a gym setting –categorise as 'instructional support. Supervision, expertise and encouragement' under 'social opportunity' or use 'the specific instructor' under 'social opportunity' • References to the advice of medical professionals to be active – use 'doctor's orders' under 'social opportunity'
Inclusivity	• References to feeling like any woman could join the programme • References to feeling like the programme was suitable for diverse fitness levels • References to feeling like everybody was welcome to join the programme	• References to the specific social culture and atmosphere within the programme, which felt welcoming – use 'the right social culture and atmosphere' under 'social opportunity' • References to tweaking the programme to make it work with abilities – use 'tweaking the programme to suit' under 'psychological capability' • References to the programme being achievable/adaptable – use 'achievability of the programme' under 'physical capability' or a'daptability of the programme' under 'physical opportunity'
Altruistic reasons	• References to undertaking the programme to support the lead researcher • References to undertaking the programme to support other friends who were also undertaking the programme	• References to the emotional response associated with not undertaking the programme, because of altruistic motivations – use 'guilt' under 'automatic motivation' • References to the impact of the specific instructor on attendance – use 'the specific instructor' under 'social opportunity'

The specific instructor	• Reference to the importance of the specific instructor and her personal characteristics • Reference to maintaining programme engagement because of the specific instructor • References to liking the specific instructor and this motivating one to continue to engage	• References to engaging in the programme, to support the specific instructor – use 'Altruistic motivations' under 'social opportunity' • References to the importance of having a knowledgeable instructor generally – categorise as 'Instructional support, supervision, expertise and encouragement' under 'social opportunity'
No childcare	• Reference to not being able to undertake PA due to not having childcare • Reference to not being able to undertake PA due to inconsistent childcare • Reference to not being able to commit to PA because of long-term issues with childcare	• References to the impact that children themselves have on PA – use 'wider social support' under social opportunity' if helpful, or categorise as 'lack of wider social support' if unhelpful
Physical Opportunity		
Accessibility	• References to the convenience of the location of the exercise classes • References to availability of transport to get to the exercise classes • References to the ease of accessing the online classes/resources • References to the cost of the programme making it a viable opportunity	• References to the specific cost of public transport as a barrier to accessing the programme – categorise as 'cost of travel' under 'physical opportunity'
Adaptability of the programme	• References to the programme being	• Reference to the act of tweaking the programme

	adaptable, to suit individual fitness levels • References to being able to engage with the programme, because it can be adapted to suit different needs	oneself, to make it suit – use 'tweaking the programme to suit' under 'psychological capability' • Reference to the inclusivity of the programme for different levels of fitness or otherwise – use inclusivity' under 'social opportunity' • References to specific features of the intervention that are perceived as achievable or adaptable – use 'specific features of the intervention' under 'physical opportunity' • References to the programme being low impact and this suiting a person's physical skills, fitness or abilities – use 'achievability of the programme' under 'physical capability'
Specific features of the intervention	• References to specific features of the intervention that were appealing or not • References to the formal elements (exercise classes, daily challenges, goal-setting) • References to mirrors being helpful or not • References to specific exercises that were appealing or not • References to the specific formation of the classes being helpful or not • References to features of the room in which the classes took place • References to the usefulness of the	• References to the emotional responses associated with specific features of the intervention – categorise beneath 'emotion' under 'automatic motivation' • References to how reinforcing specific elements of the intervention are – categorise beneath 'reinforcement' under 'automatic motivation' • References to the importance of the social elements of the intervention – categorise beneath 'social opportunity'

	online anytime class library	
Timing of the sessions	• References to finding the time that exercise classes happened at easy to attend • References to finding the time that exercise classes happened at difficult or impossible to attend • Reference to finding the time of year helpful/unhelpful • Reference to finding the days of the week helpful/unhelpful • Reference to finding the time of day helpful/unhelpful	• References to the pace of the exercise classes – use 'specific features of the intervention' under 'physical opportunity'
Technical difficulties	• References to having issues accessing the online classes • References to having issues with the technology associated with WhatsApp • References to struggling to hear the instructor when joining online	• References to finding the technical skills associated with undertaking PA difficult – categorise as 'lack of physical skills' under 'physical capability'
Competing goals and priorities	• References to having priorities that sit above PA • References to having difficulty finding time to be active because of other priorities • Reference to PA not being a priority • References to struggling to prioritise PA over other things • Reference to the need to juggle many tasks, to allow time for PA	• References to the impact of traditional gender roles on women's PA – categorise as 'traditional gender roles' under 'reflective motivation' • References to the impact of adverse personal circumstances on available time to be active – categorise as 'adverse or challenging personal circumstances' under 'physical opportunity' • References to having daily schedules/routines that are unsupportive of PA – categorise as 'fixed schedules' under 'physical

	• Reference to the relative unimportance of women's PA as a form of health promotion, compared to the health needs or importance of health promotion for people they care for	opportunity' or 'routines that are unsupportive of PA' under 'psychological capability'
Reflective Motivation		
Activity-related goals	• References to finding having activity-related goals helpful • References to the importance of PA-related goal-setting for motivation • References to the impact of goal-setting on PA behaviour	• References to competing goals that get in the way of PA – use 'competing goals and priorities' under 'physical opportunity
No obligation	• References to the non-obligatory nature of the programme • References to the lack of obligation being helpful • References to the lack of obligation being unhelpful	• References to the presence or absence of guilt, because of the lack of obligation – categorise as 'guilt' under 'automatic motivation'
Conscious effort	• References to making a conscious effort to engage in PA • References to being willing to try new things in respect of PA • References to deciding to engage in PA regularly	• References to the act of planning PA in – categorise as 'planning /scheduling' under 'psychological capability' • References to prioritising PA over other things – categorise as 'prioritising PA' under 'reflective motivation'
Taking accountability	• References to it being a personal choice to be active or not	• References to accountability to others – categorise as 'accountability to others' under 'social opportunity'

	• References to feeling responsible for one's own health • References to having personal agency over PA behaviour	
Beliefs about capabilities	• References to how capable one feels of undertaking PA • References to how much confidence one has in one's own ability to engage in the programme • References to beliefs about capabilities to undertake specific exercises • References to beliefs about capabilities to undertake PA generally	• References to actual objective ability – categorise beneath 'physical capability'
Beliefs in positive consequences	• References to believing that PA will result in positive consequences • References to a belief that PA will improve mood • References to a belief that PA improves appearance • References to a belief that PA improves mental health • References to a belief that PA promotes health	• References to the actual experience of having had positive consequences because of PA participation – categorise beneath 'reinforcement' under 'automatic motivation' • References to having accurate knowledge about the benefits of PA – categorise beneath 'knowledge' under 'psychological capability'
Hiatuses	• References to the impact of having experienced some disruption to programme participation on attendance/engagement	• References to the guilt associated with taking a hiatus – use 'guilt' under 'automatic motivation' • References to the expectations that result from taking a hiatus – categorise beneath 'beliefs about

		capabilities' under 'reflective motivation
Automatic Motivation		
Fun & enjoyment	• Reference to enjoying participation in PA • Reference to finding it fun to be active with certain people • References to finding PA inherently enjoyable • References to finding specific types of PA inherently enjoyable • References to finding it fun to be active in certain settings	• The impact of other people on the amount of fun and enjoyment had whilst being active – categorise as 'activity-related social support' under 'social opportunity' • The impact of certain aspects of the intervention on fun and enjoyment (e.g – impact of including burpees on fun and enjoyment) – use 'specific features of the intervention' under 'physical opportunity'
Positive consequences	• References to being motivated to be active based on having experienced positive consequences from PA in the past (e.g. improved appearance, mood, health behaviours, health, mental health, sleep, self-esteem etc.)	• References to beliefs about the consequences of PA – categorise beneath 'beliefs about consequences' under 'reflective motivation'
Guilt	• Reference to feeling bad for taking time to engage in PA based on it being perceived as a selfish act • Reference to being driven to be active by a sense of guilt or feeling of obligation centred on physical health • Reference to feeling guilty for taking time out to be active, leaving others to fulfil roles and responsibilities that would typically be ours	• Reference to the actual roles and responsibilities that restrict available time to be active, without mentioning the associated emotional response – use 'traditional gender roles' under 'reflective motivation' for example

	• Reference to maternal guilt making it difficult to be active	
State of mind	• References to the impact of mood or mental state on PA • References to finding it harder to be active due to poor mental health • References to being motivated to be active because of poor mental health • References to not being in the mood to engage • References to being in the right head space to engage	• References to the emotional outcomes, from PA participation – categorise as that specific emotion under 'automatic motivation'

Appendix 29: A list of the 37 specific features of the pilot intervention that women outlined as helpful or unhelpful for promoting their engagement

Unhelpful
1. Burpees
2. Mirrors

Helpful
3. Access anytime (online library)
4. Alternative exercises Code of conduct
5. Daily challenges
6. Demographic similarity with other participants
7. Diversity of attendees
8. Exercise demonstrations
9. Fitness testing
10. Formal structure
11. Gentle tone of voice (written and verbal)
12. Goal-setting education
13. Goal-setting workbook
14, Instruction (Clear, simple language)
15. Instructor (Knowledgeable, relaxed, fun, non-judgemental)
16. In-person sessions
17. Lots of elements to choose from
18. Metaphorical toolkit
19. Mirrors
20. Music
21. No equipment needed
22. No men
23. No non-participating observers
24. No preparation required
25. Non-competitive
26. Online availability
27. Option to have camera off
28. Pace and difficulty of sessions
29. Regular contact
30. SMART goal-setting
31. Session format
32. Set times
33. Time to build relationship with the instructor
34. Tracking and monitoring progress
35. Well tailored/personal touch
36. You can do it alone
37. You can do it from home