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**THE DEVELOPMENT, DELIVERY AND EVALUATION OF A PHYSICAL  
ACTIVITY MAINTENANCE INTERVENTION**

Sarah E. Scott

A thesis submitted in partial fulfilment of the requirements of Sheffield Hallam  
University for the degree of Doctor of Philosophy

May 2014

## Abstract

The number of adults living with chronic health conditions and co-morbidities (e.g., diabetes and depression) is expected to rise by 2035 resulting in significant health and social care challenges (Department of Health, 2012). Supporting people with long-term conditions into better physical and mental health is a public health priority (NICE, 2009). One common approach used to manage or prevent a range of chronic health conditions is physical activity (PA). Evidence supports the short-term effects of PA interventions but a decline in PA levels occurs after an intervention ends (Foster, et al., 2012). Considering the lack of long-term effectiveness of interventions, this thesis explored the active ingredients of PA maintenance (e.g., determinants and behaviour change techniques [BCTs]) through the development, delivery and evaluation of a theory-based PA maintenance intervention. The intervention was developed using intervention mapping principles (Bartholomew, Parcel, Kok, & Gottlieb, 2006).

A scoping review explored the intervention components, theories, determinants and BCTs for PA maintenance across at least six months in clinical populations. Multiple theories, determinants and BCTs were found meaning the important components for intervention development were inconclusive. Research gaps were identified, which was addressed through a qualitative study (Study 1). Study 1 investigated the determinants and strategies for successful and unsuccessful maintenance in completers of physical activity referral schemes (PARS). Determinants included: congruence between outcome expectations, experiences and values; social support; and, overcoming barriers. Multiple cognitive-behavioural strategies for PA, condition management and coping were identified, including self-monitoring and pacing. Recommendations included interventions to adopt a person-centred integrative approach, such as motivational interviewing (Miller & Rollnick, 2013) and cognitive-behavioural techniques (MI-CB; Naar-King et al., 2013; Hogden et al., 2012).

A RCT pilot study was conducted (Study 2a) to test the efficacy and feasibility of the MI-CB intervention within a PARS setting. The MI-CB group maintained PA at six months post-PARS and enhanced barrier self-efficacy and physical outcome experiences but not social support, coping strategies or BMI compared to usual care. The intervention was largely feasible and generated excellent adherence rates (95%). A treatment fidelity (TF) framework was adopted (Study 2b) assessing fidelity of design, training, delivery, receipt and enactment (Bellg et al., 2004). Results indicated that the intervention provider was not proficient in delivering all MI-CB components (e.g., complex reflections). The findings suggested that on-going supervision was needed to ensure practitioner competence. The contrast between low fidelity to MI-CB delivery and intervention efficacy suggested other variables influenced intervention effectiveness, such as therapeutic alliance, intervention receipt and enactment. Outcomes from this thesis confirm that PA maintenance is a complex process in adults with chronic health conditions, involving multiple theoretical determinants and strategies. A large scale trial is warranted to compare the efficacy of MI-CB to single approaches, such as MI and CBT.

### **Candidate's Statement**

I declare that the work in this thesis was carried out in accordance with the regulations of the Sheffield Hallam University and is original except where indicated by the specific reference in the text. No part of the thesis has been submitted as part of any other academic award. The thesis has not been presented to any other education institution in the United Kingdom or overseas.

Any views expressed in the thesis are those of the author and in no way represent those of the University.

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Sarah E. Scott

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### **Published Material from this Thesis**

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### **Abbreviations**

BARSE	Barrier Self-efficacy
BCC	Behaviour Change Consortium
BCTs	Behaviour Change Techniques
BHF	British Heart Foundation
BMI	Body Mass Index
BPL	Barnsley Premier Leisure
BPS	British Psychological Society
CB	Cognitive-behavioural
CBT	Cognitive-behavioural Therapy
CEMI	Client Evaluation of Motivational Interviewing
CHAMPS	The Community Healthy Activities Model Programme for Seniors Scale
COPD	Chronic Obstructive Pulmonary Disease
CVD	Cardiovascular Disease
DoH	Department of Health
E-P-E	Elicit-Provide-Elicit method
GIS	Geographical Information Systems
GPS	Global Positioning Systems
HRQoL	Health Related Quality of Life
IPAQ	International Physical Activity Questionnaire
KASY	Keep Active South Yorkshire Trial
MET-minute	Metabolic Equivalent of Task per Minute
MI	Motivational Interviewing
MI-CB	Integrated Motivational Interviewing and Cognitive-Behavioural Techniques
MINT	Motivational Interviewing Network of Trainers
MISC	Motivational Interviewing Skills Code

MISTS	Motivational Interviewing Supervision and Training Code
MITI	Motivational Interviewing Treatment Integrity
MVPA	Moderate-Vigorous Intensity Physical Activity
NHS	National Health Service
NICE	National Institute of Health and Care Excellence
OARS	Open-ended questions, Affirmations, Reflections and Summaries
OERS	Outcome Expectations and Realisations for Physical Activity Scale
PA	Physical Activity
PARS	Physical Activity Referral Scheme
RCT	Randomised Controlled Trial
SM	Successful Physical Activity Maintainer
SMART	Specific, Measurable, Achievable, Realistic and Timely (Goal-setting)
SPAQ	Scottish Physical Activity Questionnaire
TF	Treatment Fidelity
TTM	Transtheoretical Model
UC	Usual Care
UK	United Kingdom
UM	Unsuccessful Physical Activity Maintainer
WHO	World Health Organisation

# **Chapter 1**

## **Thesis Introduction and Background: Physical Activity Maintenance**

## **Chapter 1: Thesis Introduction and Background: Physical Activity Maintenance**

### **1.1 Introduction**

This chapter provides an overview of the prevalence of physical inactivity and the importance of physical activity (PA) maintenance for promoting health benefits in adults with chronic health conditions. The chapter also outlines the context for the intervention conducted as part of this thesis; Physical Activity Referral Schemes (PARS) and provides the definition of PA maintenance used throughout the thesis. The methodological limitations of current PA interventions are discussed and future research directions, which this thesis will explore, are set-out. The chapter concludes with the purpose of the thesis, including the content, direction and structure.

#### ***1.1.1 The Impact of PA and Inactivity on Public Health***

Physical inactivity has been described as a pandemic negatively affecting the world's population as it contributes to major chronic health diseases, including cardiovascular disease (CVD), specific cancers, and type 2 diabetes (Lee et al., 2012). In the UK, inactivity accounts for 37% of CVD risk factors and costs the NHS an estimated £1.06 billion per annum with wider estimated costs of £9 billion per annum to society and the economy (Allender, Foster, Scarborough, & Rayner, 2007; Townsend et al., 2012). Specifically across Yorkshire and the Humber, inactivity produces costs of an average of £20 million per annum (UK Active, 2014). Inactivity contributes to premature deaths and evidence suggests that PA can help prevent or manage chronic conditions, including: CVD and associated risk factors, stroke, cancers, obesity, diabetes, and musculoskeletal conditions (DoH, 2011; Piepoli et al., 2010). Consequently, more needs to be done to promote PA at a local and national level (DoH, 2011).

#### ***1.1.2 PA Guidelines for Health Benefits***

To produce health benefits, the UK government guidelines (*cf.* DoH, 2011) recommend that adults should engage in an accumulation of at least 150 minutes of moderate activity across a week in short bouts of at least 10 minutes. One way of achieving this is to engage in 30 minutes of moderate activity on at least five days a week. Examples of moderate intensity activity are brisk walking and cycling. Alternatively, the government guidelines suggest that adults can achieve the same health benefits by engaging in 75 minutes of moderate-vigorous PA (MVPA) across a week



(DoH, 2011). MVPA is defined as running and swimming. It is also recommended that adults should undertake resistance training on at least two days a week to improve muscle and bone strength (DoH, 2011). Resistance-based exercise consists of exercising with weights or carrying heavy loads, such as groceries. Evidence supports that these activities can account for 30% or 27% reduction in all-cause mortality rates in 'healthy' adults and adults with chronic health conditions respectively (Schoenborn & Stommel, 2011; Warburton, Charlesworth, Ivey, Nettlefold, & Bredin, 2010). Specifically, it is recommended that adults accumulate the activity in short bouts across the day (i.e.,  $\geq 10$  minutes; Barr-Anderson, Au-Young, Whitt-Glover, Glenn & Yancey, 2011) because the 'law of diminishing returns' applies, suggesting that longer durations (i.e.,  $> 1$  hour) of exercise does not necessarily produce additional health benefits (Moore et al., 2012). Therefore, it is important that interventions and health professionals encourage adherence to the government PA guidelines to produce health benefits.

Despite clear recommendations and health benefits, not all adults are meeting the guidelines. Health Survey for England (2012) demonstrated that 67% men and 55% women achieved 150 minutes of moderate activity per week (Scholes & Mindell, 2012). Specifically across Yorkshire and the Humber, statistics suggest that an average of 30.42% of the population engages in less than 30 minutes of moderate activity per week (UK Active, 2014). In terms of the guidelines for muscle and bone strength, 34% men and 24% women engaged in resistance based exercises (Scholes & Mendell, 2012). What is more, when objective data is collected instead of self-reported data, the evidence reveals that adults are even less active as only 6% men and 4% women have been shown to be active (Health and Social Care Information Centre, 2013).

Additionally, the amount of PA one engages in declines across the lifespan from 48% and 31% active to 32% and 21% between men and women respectively from the age categories of 25-34 years to 55-64 years (DoH, 2004; Scholes & Mendell, 2012). This decline in PA can contribute to 'unsuccessful aging' as the risk of developing a chronic health condition is increased, in addition to poor physical function and overall health related quality of life (HRQoL; Archer, Paluck, Shook, & Blair, 2013). Furthermore, statistics suggest that those with chronic health conditions or disabilities are less likely than 'healthy' adults to engage in regular moderate PA (27.2% vs. 34.4%; Conn, Hafdahl, Brown, & Brown, 2008; Dishman & Buckworth, 1996; Marcus et al., 2000). Thus, the population most in need of PA and the associated health benefits are the least likely to be meeting the guidelines. One explanation for this is that illness,

itself, is a barrier to PA engagement (Busetto et al., 2009). With reduced physical function and quality of life, comorbidities are likely to develop, such as depression, anxiety and other physical illnesses, making it even harder to engage in activity (Schoenborn & Stommel, 2011). Therefore, interventions need to do more to promote PA in adults with chronic health conditions, whilst taking into consideration comorbidity.

### ***1.1.3 Physical Activity Referral Schemes for Adults with Chronic Health Conditions***

A common treatment option available to adults with chronic health conditions within the UK is Physical Activity Referral Schemes (PARS). A comprehensive description of PARS in general can be found elsewhere (BHF, 2010). Briefly here; PARS aims to support adults (aged 18 +) that are sedentary and have one or more stable conditions (e.g., stable angina, hypertension, chronic obstructive pulmonary disease [COPD], multiple sclerosis, depression, and back pain; Pavey et al., 2011). Individuals are generally referred (by a GP or health professional) to an exercise professional, often within a local authority leisure facility, for either free or reduced cost exercise sessions, usually available for 12-weeks. While best practice guidelines exist for the commissioning of PARS (*cf.* National Institute of Health & Clinical Excellence [NICE], 2006), no delivery framework exist and there is little evidence on the most effective interventions to be delivered to PARS participants (Pavey et al., 2011). As a result, the precise nature of service structure and delivery content varies greatly between providers (British Heart Foundation [BHF], 2010).

Within South Yorkshire, PARS are similar in that they offer 12-weeks of free or reduced cost gym membership to patients. Each patient has access to the gym, swimming pool, and group exercise classes and is provided with an exercise programme consisting of cardiovascular and resistance based exercises tailored to their health condition(s). This type of service is provided to all patients regardless of the health condition. The only difference lies with cardiac and pulmonary patients who are offered a group circuit (consisting of both cardiovascular and resistance based exercises) tailored to the health condition, although classes are optional. It is also important to note that PARS in South Yorkshire do not implement behaviour change strategies and do not promote long-term behaviour change, which is common within many PARS (Pavey et al., 2011).

The effectiveness of PARS has been questioned as evidence suggests that, while PARS can generate short-term increases in PA, they fail to promote long-term behaviour change (Harrison, Roberts, & Elton, 2004; Pavey et al., 2011). Additionally, PARS might be better at improving PA in certain conditions such as cardiac patients, as opposed to those with mental health conditions (Murphy et al., 2012). Given that PARS accepts referrals from individuals with a range of chronic health conditions and comorbidities, there is a clear need to understand the commonalities of effective PA maintenance promotion across health conditions (Piette, Richardson, & Valenstein, 2004). An understanding of the common factors for PA promotion can enhance services that target such a heterogeneous population.

Another reason for the lack of effectiveness has been concerned with the fact that PARS is largely exercised based rather than a psychological behaviour change intervention (Pavey et al., 2011). NICE recommend counselling and psychological approaches to promote PA behaviour change over purely exercise-based interventions in individuals with chronic conditions (NICE, 2009). Therefore, the influence of a psychological or counselling based intervention for PA promotion warrants further attention within a PARS setting.

#### ***1.1.4 The Importance of PA Maintenance***

To achieve health benefits that positively impact on a health condition, one must adopt PA as a lifestyle change and maintain it (DoH, 2011). Even if one initiates PA for a length of time (e.g., three months), a relapse or reduction in PA across as little as 10 days can reverse any improvements in health (Elley, Bagrie, & Arroll, 2006; Mujika & Padilla, 2000a; Sonne et al., 2010). Evaluations of PA interventions have provided evidence for their efficacy in promoting initial short-term increases in PA but are rarely effective beyond three to six months after intervention cessation (Buckworth & Dishman, 2002; Foster, Hillsdon, Thorogood, Kaur, & Wedatilake, 2012; Marcus et al., 2000; 2006; Muller-Riemenschneider, Reinhold, Nocon, & Willich, 2008). Consequently, NICE proposed research guidelines emphasising the need to develop effective interventions that promote PA maintenance post-intervention (NICE, 2006).

#### ***1.1.5 Defining PA Maintenance***

At present, there is no standardised definition for successful PA maintenance (Marcus et al., 2000). It is important to highlight the definition of maintenance that will



be used throughout this thesis. Typically, researchers agree that any individual who regularly engages in PA for at least six months has successfully maintained PA (e.g., Amireault, Godin, & Vézina-Im, 2012; Eakin, Lawler, Vandelanotte, & Owen, 2007; Fjeldsoe, Neuhaus, Winkler, & Eakin, 2011; Kroeze, Werkman, & Brug, 2006; Marcus et al., 2000; 2006). Specifically, PA maintenance is suggested to occur in two ways: (1) the individual adopts and maintains PA independently without external intervention; or, (2) if an intervention was delivered, the individual must maintain PA for at least six-months after the intervention ends (Amireault, et al., 2012; Marcus et al., 2000). Therefore, the definition of PA maintenance used within this thesis is those who have maintained PA for six months post-intervention. It must be noted that adults with chronic health conditions and disabilities might not be able to achieve the guidelines for PA (Tudor-locke et al., 2011) and therefore PA maintenance will be measured in accordance with the purpose and methods of each study. Overall, by exploring the factors that influence PA maintenance after an intervention, recommendations for future research and healthcare practice can be made.

#### ***1.1.6 Promoting PA Maintenance***

Although recommendations have been made to promote long-term PA, very little is known about the psychological and behavioural processes that support the behaviour change (Marcus et al., 2000; 2006). This gap within the PA literature is recognised at a governmental and policy level, which researchers are encouraged to explore to inform intervention development and provide guidance for healthcare professionals (NICE, 2008). A suggested factor that contributes to this knowledge gap is that interventions focus primarily on PA initiation rather than maintenance (Hutchison, Johnston, & Breckon, 2012). Instead, evidence suggests that the psychological and behavioural factors underpinning the initiation and maintenance phases differ (Rothman, 2000) and if PA maintenance is to be achieved then the specific factors associated with this phase must be targeted (Brug, Oenema, & Ferreira, 2005; Rothman, Baldwin, Hertel, & Fuglestad, 2011). This could help to explain the pattern of PA relapse three to six months after intervention cessation, which suggests that individuals struggle with the transition from PA initiation into PA maintenance (Foster et al., 2012). It is unclear, however, which factors to target to promote long-term PA, given that multiple theories and determinants exist (Biddle & Mutrie, 2008; Michie et al., 2005). Furthermore, specific guidelines for PA maintenance are often absent in

policy documents (e.g., NICE, 2011). Therefore, further research is needed to understand the mechanisms that influence PA maintenance, which can help develop more effective interventions and inform healthcare practice.

### ***1.1.7 Limitations of Current PA Interventions***

To advance knowledge and understanding of the mechanisms that promote PA maintenance, a number of methodological limitations with current PA interventions need to be addressed. First, current interventions are largely criticised for having a follow-up period that is too short to capture the maintenance phase (i.e.,  $\leq 6$  months post-intervention; Marcus, et al., 2000). Therefore, PA maintenance research is recommended to include a follow-up period of at least six months post-intervention (Marcus et al., 2000). Second, PA interventions largely focus on PA initiation assuming that any effects are transferable to the maintenance phase (Rothman et al., 2011). Marcus et al., (2000; 2006) recommended that research should focus on developing specific PA maintenance interventions by recruiting individuals who have already initiated PA to help identify the specific factors (e.g., determinants and strategies) for PA maintenance. Third, the evaluations of PA interventions (namely PA counselling interventions) are often criticised for a lack of measurement of psychological or cognitive variables (Breckon, Johnson, & Hutchison, 2008). Thus, the psychological mechanisms underpinning PA maintenance are less well known but are important facets of behaviour change (Breckon et al., 2008). Fourth, another aspect of evaluations that are less explored is the fidelity of PA interventions (Bellg et al., 2004; Breckon et al., 2008; Keller, Fleury, Sidam, & Ainsworth, 2009; Resnick et al., 2005). Implementation and evaluation of treatment fidelity (TF) can enhance understanding of the factors that contribute to intervention effectiveness or ineffectiveness; thus, preventing ineffective and costly interventions from being implemented in practice (Bellg et al., 2004). Moreover, it has been suggested that implementing a comprehensive TF framework assessing fidelity of design, delivery, receipt, enactment, and training can enhance the internal validity of PA interventions and help identify 'what works' (Breckon et al., 2008). Finally, evidence suggests that adults with a range of chronic health conditions and co-morbidities are the least researched population as they are often excluded from randomised controlled trials (van Spall, Toren, Kiss, & Fowler, 2007). Consequently, less is known about how to provide these individuals with appropriate healthcare and this lack of evidence prevents professionals and policy makers from taking informed

decisions about how best to promote PA in this population (Tinetti, Stephanie, & Studenski, 2011). Further research is needed to understand long-term PA behaviour change within a clinical population given that PA is a core component to treatment (Piepoli et al., 2010). By addressing the above methodological limitations, the effective (or ineffective) mechanisms for the PA maintenance phase can begin to be identified in adults with chronic health conditions.

## **1.2 Purpose of Thesis.**

This thesis aims to advance knowledge of the mechanisms influencing PA maintenance in adults with chronic health conditions. Such mechanisms concern the theory, determinants, strategies, intervention components and the five areas of treatment fidelity (i.e., design, training, delivery, receipt and enactment). To achieve this, a theory-driven PA maintenance intervention will be developed, delivered and evaluated within the context of PARS to assess PA maintenance (or relapse) across six months post-PARS. Intervention mapping is used to systematically guide the intervention development, implementation and evaluation (Bartholomew, Parcel, Kok, & Gottlieb, 2006). Briefly, intervention mapping consists of six steps, including: (1) conducting a needs assessment (e.g., exploration of the problem, theories, determinants and strategies); (2) identifying intervention objectives and change objectives (based on step 1); (3) identifying theoretical methods (e.g., self-monitoring from control theory) and practical strategies (e.g., self-monitoring of PA); (4) intervention development (e.g., materials); (5) consideration of the methods for intervention adoption and implementation; and, (6) intervention evaluation (outcomes and processes).

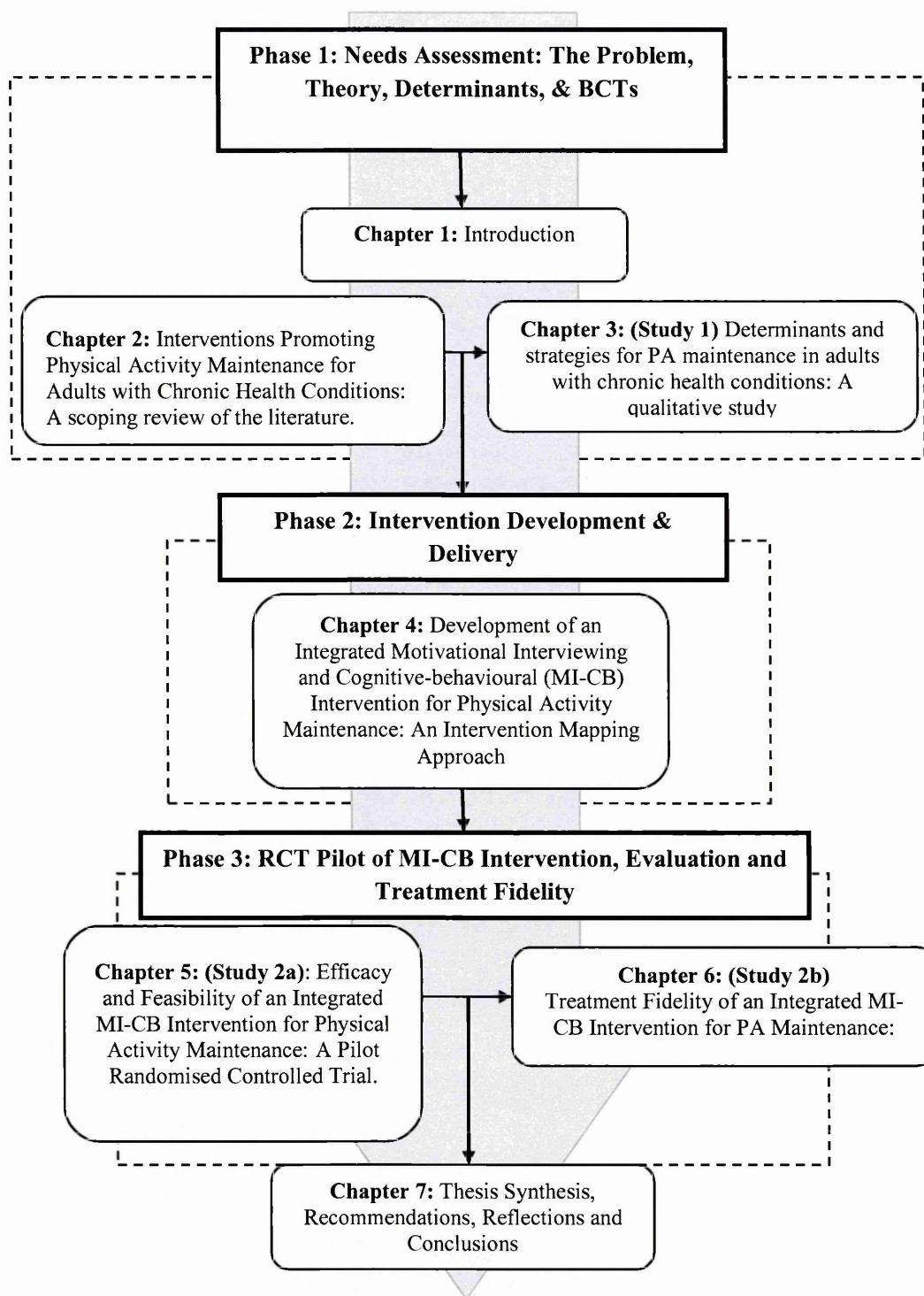
The methodological limitations outlined in section 1.1.6 will be addressed by: (1) identifying the effective intervention components, theories, determinants, and behaviour change techniques (BCTs) of PA maintenance studies employing a follow-up of at least six months (Marcus et al., 2000); (2) comparing the determinants and strategies that determine successful and unsuccessful PA maintenance in individuals post-PARS (Marcus et al., 2000); (3) designing and implementing a theoretically informed randomised controlled pilot study testing an intervention specifically targeting the maintenance phase, including the associated psychological determinants across six months post-PARS (Marcus et al., 2000; Rothman et al., 2011); (4) conducting a comprehensive evaluation of intervention outcomes, including behavioural (i.e., PA), psychological (e.g., self-efficacy), and epidemiological (e.g., weight) measures



(Breckon et al., 2008); and, (5) conducting a comprehensive evaluation of the five areas of TF (i.e., design, training, delivery, receipt and enactment) to identify 'what works' in the PA maintenance intervention (Bellg et al., 2004). By addressing the limitations of current PA maintenance interventions, this thesis will produce recommendations for future research and for practice for public health promotion, training, and health service development.

### **1.3 Thesis Structure**

The thesis is comprised of three studies, in addition to a scoping review and a methodological section outlining the intervention mapping process (Bartholomew et al., 2006). A structural diagram of this thesis is presented in Figure 1.1. Each study provides a unique contribution to knowledge within the field of PA maintenance and health promotion. The thesis was developed iteratively and so the results and conclusions from each chapter and study inform the subsequent chapter or study. Each chapter is written to be read as a standalone chapter, and so some overlap within the chapters will occur. In phase 1, the needs assessment is conducted and includes a scoping review (Chapter 2) of the intervention characteristics, theories, determinants, and behaviour change techniques (BCTs) of PA maintenance interventions employing a longitudinal follow-up of at least six months. The findings contribute to the rationale for chapter 3 and the focus on adults with a range of chronic health conditions rather than a single condition. Study 1 (Chapter 3) contributes to the knowledge of the determinants and strategies underpinning successful and unsuccessful PA maintenance in adults with multiple chronic health conditions after PARS completion. Collectively, these findings inform phase 2 of the thesis where the development and implementation of a pilot randomised controlled trial (RCT) intervention, which is outlined in accordance with the intervention mapping process in Chapter 4. The need for an integrative person-centred counselling (i.e., motivational interviewing) intervention with cognitive-behavioural techniques is realised during this phase. Chapter 5 evaluates the preliminary effectiveness and feasibility of an integrated motivational interviewing (MI) and cognitive-behavioural (CB) intervention (MI-CB) for PA maintenance (Study 2a). Then, Study 2b is outlined and explores the five areas of TF, which identifies the factors contributing to the successful and unsuccessful MI-CB intervention components (Chapter 6). Chapter 7 synthesises the results of the thesis and provides an overall summary, conclusions, reflections and future directions for research and practice.



**Figure 1.1** Structural diagram of the thesis.

## 1.4 Content of this Thesis

To elaborate on the chapter headings presented in Figure 1.1, a brief summary of each chapter is provided below.



#### ***1.4.1 Chapter 2: Promoting Physical Activity Maintenance for Adults with Chronic Health Conditions: A scoping review of the literature.***

A broad systematic scoping review adopting semi-quantitative analysis (Hutchison & Breckon, 2011) is conducted to explore the intervention components, theories, determinants, and BCTs for PA maintenance in adults with chronic health conditions (e.g., cardiovascular disease and diabetes). Included in the review are RCTs with at least a six months post-intervention follow-up or longitudinal prospective cohorts with duration of at least six months conducted between the years 2000 to 2013. The review also aims to identify research gaps within the literature, which provide justification for further research to explore the determinants and strategies underpinning successful and unsuccessful PA maintenance within adults with chronic health conditions (Study 1).

#### ***1.4.2 Chapter 3: Determinants and Strategies for Physical Activity Maintenance in Chronic Health Conditions: A qualitative study***

Results of the scoping review promoted an uncertainty of the theory, determinants and BCTs which effectively promote PA maintenance in adults with a range of chronic health conditions and co-morbidities. When the literature fails to explain how the behaviour in question is achieved in a given population, it is recommended to conduct an exploratory qualitative study during intervention development (Bartholomew et al., 2006). Chapter 3 details Study 1 and identifies the determinants and cognitive-behavioural (CB) strategies used within successful and unsuccessful PA maintenance at least six months after completion of PARS. This follows the recommendations of Marcus et al., (2000; 2006) for exploration of the factors underpinning PA maintenance. Semi-structured interviews are conducted and framework analysis (Ritchie & Spencer, 1994) is used to analyse the data to explore associations between determinants and strategies. Determinants are found such as overcoming barriers, social support and congruence is needed between outcome expectations, experience and values. Multiple strategies are also identified. The need for integrative person-centred counselling approaches to target the complex determinants for PA maintenance found within this study is presented, such as motivational interviewing (MI; Miller & Rollnick, 2013) combined with cognitive-behavioural (CB)

techniques (MI-CB), such as goal-setting and self-monitoring. Additional recommendations for future research and intervention development are proposed.

#### ***1.4.3 Chapter 4: Development of a Physical Activity Maintenance Intervention for Chronic Health Conditions***

Chapter 4 details the methods of the systematic development of a theory-based integrated MI-CB intervention for PA maintenance and forms Phase 2 of the thesis. This method section is discussed in accordance with the six steps of intervention mapping (Bartholomew et al., 2006) outlined previously. Multiple theoretical components are selected, such as expectancy-value theory (Janis, 1984) and social cognitive theory (Bandura, 1986) to inform the determinants (e.g., congruence between PA outcome expectations, experiences and values). Example methods of how MI-CB aims to change such theoretical determinants are outlined. A pilot RCT with a usual care control group is proposed for intervention evaluation, including an assessment of behavioural, psychological and epidemiological outcomes and processes (i.e., treatment fidelity). The RCT is called the Keep Active South Yorkshire trial. The advantages and limitations of intervention mapping and the development of the MI-CB intervention are discussed.

#### ***1.4.4 Chapter 5: Efficacy and Feasibility of an Integrated Motivational Interviewing and Cognitive-Behavioural Intervention for Physical Activity Maintenance: A Pilot Randomised Controlled Trial.***

Following the methods outlined in the previous chapter, Chapter 5 details Study 2a; the evaluation and feasibility of a pilot RCT of an integrated MI-CB intervention entitled the Keep Active South Yorkshire trial. The pilot study is a 12-week RCT with a six-month follow-up post-baseline delivered after completion of a 12-week PARS. The MI-CB intervention aimed to support the transition between PA initiation and adoption into the maintenance phase using the methods outlined in Chapter 4. Additionally, the chapter presents the results of the pre-intervention (0 months), post-intervention (3 months), and six-month follow-up evaluation data on behavioural factors (e.g., self-reported PA and pedometer data), psychological determinants (e.g., barrier self-efficacy, and outcome expectations and experiences) and epidemiological outcomes (e.g., weight). Feasibility data are also presented in line with guidelines for pilot studies (e.g.,

Lancaster, Dodd, & Williamson, 2004), such as feasibility of recruitment, efficacy of the randomisation procedure, intervention retention, adherence, suitability of measures, and estimation of sample size calculation for future large scale trials. The chapter discusses the potential efficacy and feasibility of the MI-CB intervention for promoting PA maintenance and the impact on psychological determinants. Limitations and recommendations for future research and practice are highlighted.

#### ***1.4.5 Chapter 6: Treatment Fidelity of an Integrated Motivational Interviewing and Cognitive Behavioural Intervention for PA Maintenance***

Chapter 6 presents the second part of phase 3 of the thesis (Study 2b) and details the five areas of TF: design, training, delivery, receipt, and enactment (Bellg et al., 2004; Breckon et al., 2008). Given that MI-CB intervention demonstrated efficacy for promoting self-reported PA and some determinants (e.g., barrier self-efficacy) but not for other determinants (e.g., coping strategies), this chapter explores the factors that contribute to successful and unsuccessful intervention components. The results reveal further insight with regards to developing effective interventions and propose that the common factors of psychological interventions (e.g., therapeutic alliance, intervention provider competence, on-going training, participant comprehension, satisfaction and enactment with intervention techniques) might be more important for PA maintenance than the theoretical determinants and BCTs (Messer & Wampold, 2002). The implications for future research, practice, and MI-CB refinements are discussed.

#### ***1.4.6 Chapter 7: Thesis Synthesis, Recommendations, Reflections and Conclusions***

Chapter 7 synthesises and discusses the key findings from the scoping review, Study 1, Study 2a, Study 2b, and the methods chapter (Chapter 4). The chapter consolidates the previous recommendations for future research and practice and provides further recommendations based on the collective data from the thesis. Key modifications of the MI-CB intervention are discussed in relation to the adoption and implementation of an integrative approach within PARS and other healthcare services. Reflections of the research and developmental process are provided, which are intended to help researchers and health professionals bridge the gap between theory and practice (Taylor, 2011). Limitations of the thesis are discussed and summative conclusions provided.

# **Chapter 2**

## **Promoting Physical Activity Maintenance for Adults with Chronic Health Conditions: A scoping review of the literature.**



## **Chapter 2: Promoting Physical Activity Maintenance for Adults with Chronic Health Conditions: A scoping review of the literature.**

### **2.1 Introduction**

The introduction to the thesis (Chapter 1) highlighted the negative impact of physical inactivity on health and demonstrated the importance of PA maintenance for achieving long-term health outcomes (*cf.* DoH, 2011). Specifically, it was suggested that PA can help manage and/or prevent a range of chronic health conditions (e.g., diabetes and CVD) if maintained in the long-term. Adults with chronic health conditions, however, are less likely to engage in or maintain sufficient PA to achieve health benefits (Marcus et al., 2000). Furthermore, a decline in PA after an intervention ends suggests that individuals struggle with the transition from PA initiation to PA maintenance (Foster et al., 2012). Interventions need to do more to promote long-term PA (NICE, 2006) yet the lack of knowledge about the mechanisms for promoting PA maintenance hinders the ability to design and deliver effective interventions (NICE, 2008). Therefore, the aim of this thesis is to contribute to the PA maintenance knowledge base by developing, delivering and evaluating a PA maintenance intervention using intervention mapping principles (Bartholomew et al., 2006).

This chapter presents the first part of the intervention mapping process: the needs assessment. While the previous chapter (Chapter 1) outlined the rationale for the focus on PA maintenance, this chapter presents the results of a scoping review, which aims to help better understand PA maintenance within adults with chronic health conditions. Consistent with intervention mapping, the review broadly covers four main areas needed to develop an intervention: (1) the characteristics of current PA maintenance interventions (e.g., intervention length, mode of delivery, and number of contacts); (2) evidence of theory underpinning PA maintenance; (3) the determinants and correlates of PA maintenance (e.g., socio-demographic factors, psychological factors and behavioural factors); and, (4) the behaviour change techniques (BCTs) underpinning maintenance. This chapter begins by providing a rationale for a scoping review before providing a brief outline of what is currently known (or not) about each of these areas within a PA setting. The results of the scoping review will be presented and discussed. The gaps within the literature will be considered and suggestions for future research and intervention development will be provided.

### ***2.1.1 Rationale for a Scoping Review***

A scoping review is a way of collecting and organising important background information which can be used to map the existing literature (Davis, Drey, & Gould, 2009). According to Armstrong, Hall, Doyle, & Waters (2011), there are a number of differences between a scoping review and a systematic review, which informed the decision to adopt a semi-quantitative scoping review within this chapter. First, although a scoping review can be systematic, the types of research questions are often more broad than a systematic review, which are used to identify existing research gaps and summarise research findings. Second, a scoping review can include a range of research designs and, thus, a quality assessment is not the initial priority compared to a systematic review. Third, as a result of the broad research questions, the data synthesis within a scoping review is less extensive and more qualitative/narrative compared to the quantitative nature of a systematic review. Given that there are four broad areas that need to be understood before a PA maintenance intervention can be developed (e.g., intervention design, theory, determinants and BCTs), studies with different research designs will be reviewed and analysed using a semi-quantitative approach (Hutchison & Breckon, 2011). A scoping review allows for this unlike a systematic review, which often includes only RCTs and focuses on effectiveness (e.g., Fjeldsoe et al., 2011). Additionally, an understanding of the existing literature is needed, including the gaps within the research. Therefore, to review the scientific evidence, and address a broad range of research questions, a scoping review is an appropriate method.

### ***2.1.2 Intervention Design Characteristics***

When developing an intervention, specific intervention characteristics (e.g., intervention duration and mode) need to be identified to enable the adoption and implementation of the intervention (Bartholomew et al., 2006). At present, little is known about the effectiveness of PA maintenance intervention characteristics, such as duration of intervention, duration of follow-up period, number of strategies employed, and mode of delivery (e.g., face-to-face). What is more, the scant literature that is available on effective intervention characteristics for PA maintenance is equivocal. For example, a systematic review reported that interventions were more effective if they were: conducted for at least six months, included six or more intervention strategies, employed follow-up prompts, and included face-to-face contact (*cf.* Fjeldsoe, Neuhaus, Winkler, & Eakin, 2011). In contrast, in a recent meta-analysis, Hobbs et al., (2013)

found no relationship between effectiveness and mode of intervention delivery (e.g., face-to-face) or number of contacts at one year follow-up. A reason for the inconsistent findings could be that Fjeldsoe et al., (2011) explored both PA and dietary behaviour changes but the authors argued that the factors that influence maintenance for diet and PA need to be explored separately. Additionally, both reviews included healthy and chronically ill adults but evidence suggests that adults with chronic health conditions need different interventions as they face different barriers to PA, such as illness (Piette & Kerr, 2006; Schoenborn & Stommel, 2011). Therefore, the effective intervention components could differ between these populations and for the maintenance of different health behaviours which warrants research to focus solely on PA maintenance for adults with chronic health conditions.

### ***2.1.3 Theory for PA Maintenance***

A large focus of the intervention mapping process is to ensure that the intervention is derived from theory (Bartholomew et al., 2006). Theory-derived interventions are found to be more effective than interventions without a theoretical underpinning (Michie & Abraham, 2004; Michie & Prestwich, 2010). A behaviour change theory should define the causal mechanisms which influence behaviour initiation, maintenance and cessation and specify the BCTs which regulate the hypothesised mechanisms or determinants of change (Michie & Abraham, 2004). Nevertheless, selecting a theory to inform an intervention is not easy because more than 20 theories, with multiple theoretical constructs, have been identified to exist (Michie, et al., 2005). Within PA research, the most widely used theories are social cognitive theory (Bandura, 1986) and the Transtheoretical model ([TTM] Prochaska & DiClemente, 1983) as previous evidence suggests (*cf.* Breckon, Johnston, & Hutchison, 2008; Hutchison, Johnston, & Breckon, 2012). To provide examples of behaviour change theories, social cognitive theory and the TTM will be briefly described below.

Social cognitive theory (Bandura, 1986) assumes that cognitions precede motivation and action. At the core of the theory are self-efficacy beliefs and outcome expectancies. Self-efficacy is defined as one's beliefs about one's ability to perform specific actions to achieve a desired outcome. Outcome expectancies are one's beliefs about the consequences of those actions. Overall, the theory predicts that behaviour will change if one has confidence in their actions, perceived control over the outcome and limited external barriers (Armitage & Connor, 2000). The theory also outlines



techniques to enhance self-efficacy, such as mastery, verbal persuasion and vicarious experience (Conner & Norman, 2005). Nevertheless, the theory is criticised for not specifically focusing on behavioural maintenance and, therefore, does not outline the mechanisms or strategies for this phase of behaviour change (Hutchison et al., 2012). Social cognitive theory has been described in detail elsewhere (*cf.* Conner & Norman, 2005).

Alternatively, the TTM (Prochaska & DiClemente, 1983) is a stage based model developed from multiple psychotherapeutic approaches. The theory has multiple constructs: stages of change, processes of change, decisional balance (i.e., the pros and cons of behaviour change), and temptation and confidence. The stage of change component of the theory has received the most attention within the PA literature (Hutchison, Breckon, & Johnston, 2009). The stages have a temporal dimension and include: pre-contemplation (i.e., has no intention of performing the behaviour), contemplation (i.e., intends to start the behaviour within six months), preparation (i.e., intends to take action within the next month and has made some preparatory behaviours), action (i.e., has performed the behaviour for less than six months) and maintenance (i.e., has engaged in the behaviour for at least six months). The strategies of change, known as the processes of change, are also outlined and divided into experiential and behavioural processes. The experiential processes include consciousness raising (e.g., increases awareness about consequences of behaviour using education, feedback, and media). The behavioural processes include stimulus control (e.g., re-engineering the environment to make conducive for behaviour change). The theory is described in detail elsewhere (Conner & Norman, 2005).

Unlike many other social cognition models, the TTM also outlines a maintenance phase but evidence suggests interventions underpinned by this theory only produce short-term effects and rarely produce long-term effects after an intervention has ended (Buchan, Ollis, Thomas, & Baker, 2012; Hutchison et al., 2009). A possible explanation is concerned with the fact that the TTM was originally developed for cessation of unhealthy behaviours (e.g., smoking) rather than the adoption of a healthy behaviour (e.g., PA). Cessation and adoption behaviours appear to require different hypothesised cognitive and behavioural mechanisms (Hutchison et al., 2012). Furthermore, evidence has highlighted that the transtheoretical model is rarely implemented fully and is, instead, reduced to the stages of change (Brug, Oenema, & Ferreira, 2005; Hutchison et al., 2009). Therefore, interventions based on the TTM are



unlikely to be effective if certain components of the theory are omitted and is applied to behavioural adoption, such as PA.

Instead of choosing one single theory to inform an intervention, it has been argued that multiple theoretical constructs are needed to explain the behaviour in question (Bartholomew et al., 2006; Brug et al., 2005). Particularly, it has been highlighted that a number of theories and constructs can distinguish between the PA initiation and maintenance phase to promote long-term PA (Amireault, Godin, & Vézina-Im, 2012). For example, Rothman's theory of health behaviour maintenance (2000) specifies that favourable outcome expectations influence behavioural initiation but behavioural maintenance is likely to require perceived satisfaction of the outcomes. The emerging evidence largely supports this theory (*cf.* Fleig, Lippke, Pomp, & Schwarzer, 2011; Rhodes & Plotnikoff, 2006; Rhodes, Plotnikoff, & Courneya, 2008; Sweet, Tulloch, Fortier, Pipe, & Reid, 2011; Williams et al., 2008). In addition to favourable outcome expectations, individuals must be able to manage/overcome threats, risks and barriers which prevent intentions from translating into behaviour; known as the intention-behaviour gap (*cf.* Sheeran, 2002). A number of theories and constructs have been used to address the intention-behaviour gap, such as relapse prevention (Marlatt & Donovan, 2005), and action and coping planning (Sniehotta, Schwarzer, Scholz, & Schüz, 2005). Such theoretical constructs aim to enable individuals to plan, cope, and solve high risk situations and barriers that would otherwise cause a lapse in behaviour. A criticism of applying such theories to PA maintenance is that each theory does not specify the precise mechanisms for this specific behavior. In response to this, a theory for PA maintenance was created based on the known mechanisms and constructs (e.g. self-efficacy, goal-setting and motivation) that support long-term PA (Nigg, Borrelli, Maddock, & Dishman, 2008). To date, however, there is little empirical evidence supporting such theory.

Overall, it is evident that PA maintenance is a complex process relying on a number of theories and theoretical constructs. The emergent complexity of PA maintenance, and the short-term effectiveness of the dominant social cognition models (e.g., TTM), means very little is known about the effective theoretical components for PA maintenance. Additionally, the majority of studies that explore theories employed in a PA setting mainly focus on healthy adults or PA initiation (e.g., Breckon et al., 2008; Buchan et al., 2012; Hutchison et al., 2009). Consequently, it is unclear which theories

or theoretical components contribute to long-term PA within adults with chronic health conditions and further research is needed.

#### **2.1.4 Determinants for PA Maintenance**

When designing interventions, it is important to select the appropriate theoretical determinants for the behaviour change in question and is often informed by behaviour change theories (Bartholomew et al., 2006). Given the multiple theoretical constructs that are involved in explaining PA maintenance, it follows that multiple determinants will also be involved. Nevertheless, reviews of the PA literature largely focus on initiation of PA (e.g., Trost, Owen, Bauman, Sallis & Brown, 2002) and are criticised for including cross-sectional studies or failing to differentiate from PA initiation and maintenance (van Stralen, De Vries, Mudde, Bolman, & Lechner, 2009). Consequently, few reviews draw conclusions regarding the effective determinants for PA maintenance, particularly in adults with chronic health conditions.

The reviews that have explored the determinants for PA maintenance have identified a number of categories of determinants (*cf.* Amireault, et al., 2012; van Stralen et al., 2009; van Stralen, Lechner, Mudde, de Vries, & Bolman, 2010). These categories are: socio-demographic (e.g., being married, male, older and a good health status), psychological (e.g., self-efficacy, realisation of outcome expectations, perceived benefits, decreased barriers, coping planning, and readiness to change and positive attitudes towards PA), behavioural (e.g., previous and current exercise behaviour), social (e.g., social support from an exercise professional) and environmental determinants (e.g., access to PA facilities; *cf.* Amireault, et al., 2012; van Stralen et al., 2009; van Stralen et al., 2010).

Nevertheless, the determinants found to be related to PA maintenance are inconsistent across reviews making it difficult to select specific determinants to inform interventions. For example, van Stralen et al., (2009) found the evidence to be ambiguous for outcome expectations, intentions, and self-efficacy. In contrast, Amireault et al., (2012) found such determinants to be predictive of PA maintenance. Specifically, increased outcome expectancies and increased perceived satisfaction predicted maintenance whereas increased outcome expectancies and decreased satisfaction predicted PA relapse. The fact that both reviews included 'healthy' and clinical populations could explain the inconsistent findings, especially as both reviews suggest that adults with poor health status are less likely to maintain PA. Additionally,

the reviews by van Stralen et al (2009; 2010) focused specifically on older adults (i.e., average of  $\geq 50$  years). Therefore, different determinants could contribute to PA maintenance depending on age and between 'healthy' and in a clinical population, which warrants a review without the inclusion of 'healthy' adults.

### ***2.1.5 Behaviour Change Techniques for PA Maintenance***

The effective behaviour change techniques (BCTs) that promote PA maintenance also need to be selected and implemented within an intervention to regulate the theoretical determinants of change (Abraham & Michie, 2008). A BCT is defined as an active ingredient of behaviour change (e.g., self-monitoring), which alters the determinants or mechanisms that regulates a behaviour (Michie et al., 2011a). The BCTs to promote a specific behaviour should be outlined by a behaviour change theory but this is not always the case, making it difficult to understand which techniques to implement (Brug et al., 2005). Additionally, many studies have been criticised for inadequately reporting BCTs and intervention components, thus making interventions non-replicable (Michie & Abraham, 2008).

To address this issue, the behaviour change taxonomy study was developed which aimed to strengthen the evaluation and reporting of intervention components (Michie, et al., 2011a). The study involved developing a taxonomy of reliable BCTs, which began with 26 techniques (Abraham & Michie, 2008) and refined to include 40 (Michie et al., 2011b) and then 93 techniques (Michie et al., 2013). Reviews have uncovered that techniques associated with control theory, such as self-monitoring, goal-setting, action planning, and feedback, encourage PA and dietary change (Michie, Abraham, Whittington, McAteer, & Gupta, 2009). In addition, relapse prevention, prompting practice, provision of instruction, and feedback have been found to be related to increased intervention effectiveness in obese adults and healthy patients in the short-term (Dombrowski et al., 2010; van Achterberg et al., 2010). Additionally, action planning, time-management, prompting self-monitoring of a behavioural outcome and planning social support/social change were associated with increased self-efficacy and PA initiation in obese adults (Olander et al., 2013). In the long-term, however, two reviews have suggested that only follow-up prompts/boosters and relapse prevention are related to PA maintenance (Fjeldsoe et al., 2011; Müller-Riemenschneider et al., 2008). Consequently, it is unclear whether additional strategies are related to PA maintenance.



Nevertheless, the taxonomy was developed using only 'healthy adults' and adults with chronic health conditions could require other techniques for PA maintenance such as condition management. Evidence suggests that the relationship between inactivity and poor condition management can lead to a cyclic pattern of functional decline (Plow, Finlayson, Motl, & Bethoux, 2012). For example, in adults with multiple sclerosis, poor fatigue management can lead to a decline in PA. Inactivity, can then lead to the onset of other health conditions or symptoms (e.g., depression), which, in turn, makes it more difficult to engage in PA (Plow et al., 2012). Therefore, it is likely that adults with chronic health conditions require condition management and PA strategies simultaneously to promote PA in addition to those outlined by the taxonomy (Michie et al., 2011b) and warrants further research.

## **2.2 Review Aims and Research Questions**

The primary aim of the scoping review was to understand the extent to which the existing literature explores PA maintenance in adults with chronic health conditions to develop a PA maintenance intervention. By exploring longitudinal studies and RCTs that focus on PA maintenance or include a long-term follow-up, four broad research questions are presented: (1) what are the intervention design characteristics of effective PA maintenance interventions?; (2) what theories are used in effective and ineffective interventions in terms of PA maintenance?; (3) what are the determinants that are associated with PA maintenance?; and, (4) what are the effective and ineffective BCTs that promote PA maintenance? The secondary aim was to identify any gaps within the literature and provide directions for further research.

## **2.3 Methods**

### **2.3.1 Search Strategy**

Structured searches of Medline, Web of Science, and PsychInfo were conducted for peer reviewed articles published between January 2000 and December 2013. An initial search was conducted in 2011 and was updated in 2013. The search terms were adapted from a previous review (*cf.* Fjeldsoe et al., 2011). One search included [physical activity] or [exercise] in the title and a combination of the following search terms in the abstract: [maintenance], [intervention], [follow-up], [adherence], and [long-term]. A second search included [physical activity OR Exercise] in the title AND [maintenance OR long-term] AND [correlates or determinants] in the abstract. Where

review articles were identified, backward search method was used to identify relevant reviewed articles and forward search methods were used to identify relevant subsequent articles. Where articles reported a trial name, forward and backward searching was conducted using Google Scholar to search for related articles. All searches were limited to adults  $\geq 18$  years, peer-reviewed scientific articles, and English language.

### **2.3.2 Study Inclusion Criteria**

The flow chart of article selection and exclusion is displayed in Figure 2.1. Studies were included if they directly explored PA/exercise maintenance across at least six months or evaluated a PA intervention with at least six months follow-up post-intervention (consistent with the definition employed within this thesis). Studies were included if the sample had a diagnosed chronic health condition (e.g., musculoskeletal or cardiovascular) or a diagnosed clinical risk factor (e.g., hypertension or impaired glucose intolerance) rather than being 'at risk' (e.g., a smoker). A number of study designs were included: randomised controlled trials, prospective pre-post cohorts and longitudinal prospective cohorts delivered across at least six months. Studies were included if they directly assessed PA as a primary outcome for at least two data-collection points. Intentions to behave or readiness were not accepted as measures of physical activity. For the RCTs, articles were included if they reported between-group differences for PA at all data collection points including post-intervention. Additionally, articles were excluded if they included samples with cognitive impairment, severe mental ill-health (e.g., chronic schizophrenia or personality disorders) or dementia. Only articles that were available electronically were selected.

#### **2.3.2.1 Definition of PA Maintenance**

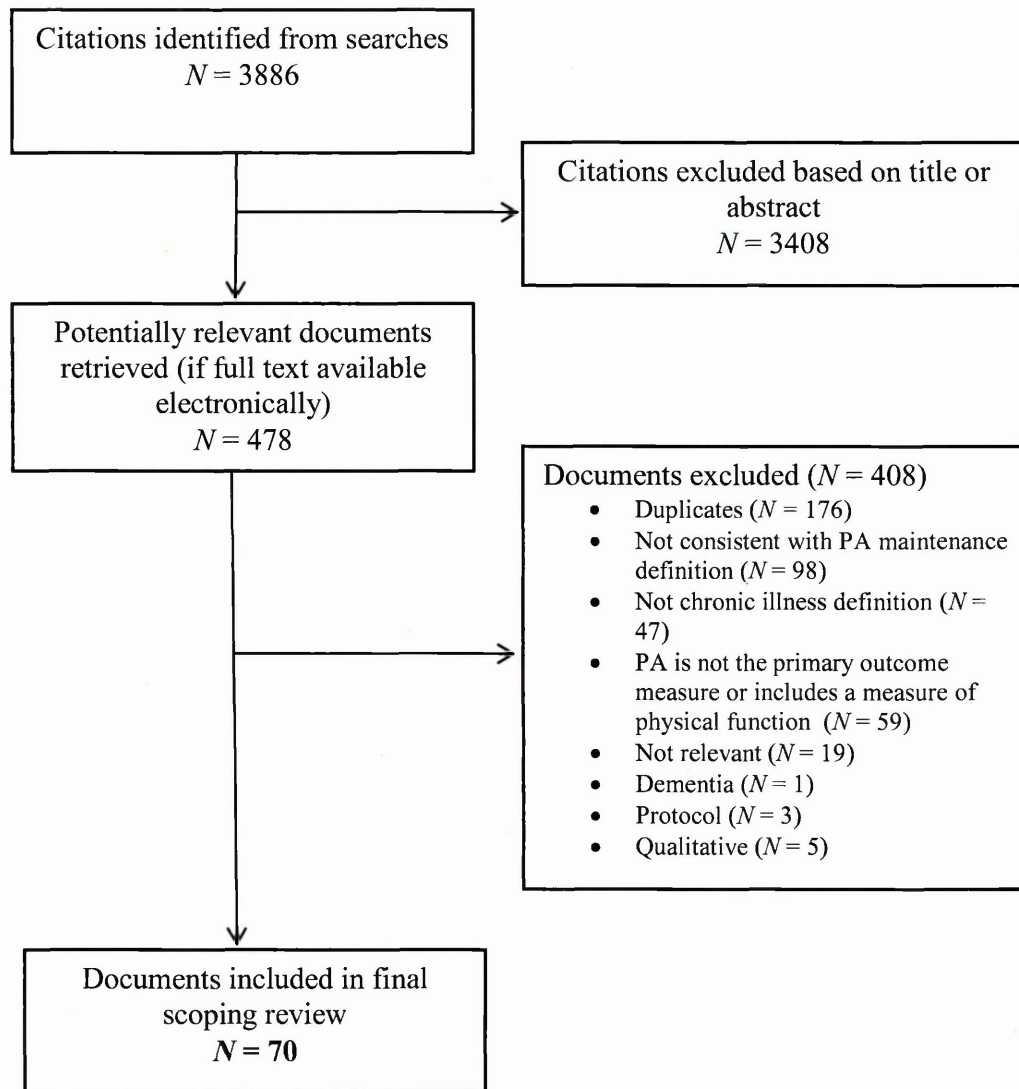
Previous research has indicated that PA declines to sedentary six months post-intervention (Buckworth & Dishman, 2002; Marcus et al., 2000). Recommendations have been made for research to assess PA maintenance for at least six months post-intervention (Marcus et al., 2000; 2006). Therefore, this scoping review defines PA maintenance as being a behaviour change which is maintained for six months or more after an intervention has been completed. Where longitudinal prospective cohorts were included in the review, the study needed to follow participants for at least six months. A categorical definition of maintenance was not adopted (i.e., maintenance of 10,000 steps per day or 1500 kcal per week) as previous reviews have found that studies use different

PA measures which are not comparable (Fjeldsoe et al., 2011). Additionally, for the purpose of this review, intervention effectiveness is also defined as a significant difference between control and experimental conditions at the longest follow-up point within RCTs.

### **2.3.3 Procedure**

All relevant publications were scanned for eligibility and hard copies obtained for included studies. Given that this review consisted of a broad range of research designs adding to the variability of results, a descriptive and semi-quantitative approach was adopted and has been used within other scoping reviews (Hutchison & Breckon, 2011). This approach adds an objective, systematic and analytical point of view to what would otherwise be a subjective narrative literature review. Each study or intervention was coded with a bibliography number (*cf.* Table 2.1). Bibliography numbers were used to identify the variables of interest within this review, which were: (1) sample characteristics, including sample size, health condition, study length, study design, and gender; (2) intervention design, including intervention duration, length of follow up, number of contacts, interventionist and whether PA maintenance was achieved at follow-up; (3) theoretical content; (4) effective and ineffective determinants or correlates; and, (5) BCTs.

For intervention design, theoretical content and BCTs, studies were included in the data extraction process if they were a randomised controlled trial design. The 40 item taxonomy of BCTs (Michie et al., 2011b) was used to identify strategies employed in interventions. Articles were independently coded by the authors SS and RC. Any disagreements were discussed until agreement was reached. Disagreements occurred due to the ambiguity of the reported BCTs (e.g., "enhanced self-efficacy"). Therefore, it was decided to code only the strategies that could be explicitly linked to the taxonomy. Percentage agreement reached 86.21%. Strategies not covered by the taxonomy were checked against the previous taxonomy (i.e., Abraham & Michie, 2008) and additional techniques were noted. To identify the PA determinants, effective interventions achieving maintenance at the longest follow-up point and longitudinal prospective cohorts were included.



**Figure 2.1.** Flow chart of article selection and exclusion from database search

## 2.4 Results

Table 2.1 displays all articles, trial names or description, source, and country of origin. A total of 70 peer-reviewed articles were included within the review, of which 54 were individual trials or studies. All studies reported on the behavioural outcomes related to successful or unsuccessful physical activity in the long-term. The majority of studies were conducted in the USA (33.33%), Canada (14.81%) and the UK (12.96%). Few studies were conducted in Japan, Spain, and Italy (1.85% each). The sample



characteristics (Table 2.2), intervention design (Table 2.3), theoretical components (Table 2.4), effective and ineffective determinants (Table 2.5), and effective BCT's (Table 2.6) and ineffective BCTs (Table 2.7) are outlined below.

**Table 2.1.** Bibliography of Included Articles in the Scoping Review

<b>Bibliography Number</b>	<b>Name or Description of Project</b>	<b>Related Publications</b>	<b>Source</b>	<b>Country</b>
1	Physical activity across the lifespan (8 years)	Hirvensalo, Litunen, & Rantanen (2000)	Scandinavian Journal of Medicine & Science in Sports	Finland
2	Predictors of adherence to exercise class in Primary care	Damush, Stump, Saporito et al., (2001)	Preventive Medicine	USA
3	Community Healthy Activities Model program for Seniors (CHAMPS II)	Stewart, Verboncoeur, McLellan et al., (2001)	The Journals of Gerontology Series A: Biological Sciences and Medical Sciences	USA
4	Nurse based counselling on walking for exercise in primary care	Dubbert, Cooper, Kirchner et al., (2002)	Journal of Gerontology: <i>MEDICAL SCIENCES</i>	USA
5	Predictors of exercise in Fibromyalgia	Oliver & Cronan (2002)	Preventive Medicine	USA
6	Long-term efficacy of behavioural counselling approach	Di Loreto, Parlanti, Fanelli et al., (2003)	Diabetes care	Italy
7	Green Prescription: Counselling patients in general practice	Elley, Kerse, Arroll et al., (2003) Lawton, Rose, Elley et al., (2008)	British Medical Journal (BMJ)	UK & New Zealand
8	The Finnish Diabetes Prevention Study (DPS)	Lindstrom, Louteranta, Mannelin et al., (2003) Lindstrom, Ilanne-Parikka, Peltonen et al., (2006) Lindstrom, Peltonen, Eriksson et al., (2008; 2013)	Diabetes care Lancet Diabetologia Diabetes care	Finland
9	Lifestyle self-management in Type 2 Diabetes	Clark, Hampson, Avery et al., (2004)	British Journal of Health Psychology	UK
10	Physical activity counselling in Type 2 Diabetes	Kirk, Mutrie, MacIntyre et al., (2004)	American Journal of Preventative Medicine	UK

<b>Bibliography Number</b>	<b>Name or Description of Project</b>	<b>Related Publications</b>	<b>Source</b>	<b>Country</b>
11	WISEWOMAN project: Cardiovascular disease risk reduction	Stoddard, Palombo, Troped et al., (2004)	Journal of Women's Health	USA
12	Clinic based weight management program	Riebe, Blissmer & Greene et al., (2005)	Preventive Medicine	USA
13	Predicting exercise in during and after cardiac rehabilitation	Scholz, Sniehotta, & Schwarzer (2005)	Journal of Sport & Exercise Psychology	Germany
14	PACE Intervention: Physician-based Assessment and Counselling	van Sluijs, van Poppel, Twisk et al., (2005a; 2005b)	Health Education Research American Journal of Public Health	Netherlands
15	Relapsers and maintainers after cardiac rehabilitation	Luszczynska & Sutton (2006)	Rehabilitation Psychology	UK
16	CHANGE intervention: change habits by applying new goals and experiences	Moore, Charvat, Nahida et al., (2006)	Annals of Behavioural Medicine	USA
17	TEACH study: Tracking Exercise After Cardiac Hospitalisation	Reid, Morrin, Pipe et al., (2006) Hunt-Shanks, Blanchard & Reid (2009)	European Journal of Cardiovascular Prevention & Rehabilitation Psychology, Health & Medicine	Canada
18	Interviewer assistant intervention in orthopaedic outpatient rehabilitation	Tulloch, Reida, D'Angeloa et al., (2009) Sweet, Tulloch, Fortier et al., (2011) Ziegelmann, Lippke & Schwarzer (2006)	Psychology & Health Annals of Behavioural Medicine Psychology & Health	Germany
19	1 day therapeutic workshop for PA	Amati, Barthassat, Miganne et al., (2007)	Patient Education and Counselling	Switzerland
20	Patient-motivated prevention	Babazono, Kame, Ishihara et al (2007)	Disease Management and Health Outcomes	Japan

Bibliography Number	Name or Description of Project	Related Publications	Source	Country
21	ADAPT: Activity, Diet and Blood Pressure Trial	Burke, Beilin, Cutt et al., (2007; 2008) Burke, Mansour, Mori et al., (2008)	Journal of Clinical Epidemiology Health Education Research	Australia
22	FRESH START Trial: Diet and PA trial for cancer survivors: mailed print materials	Demark-Wahnefried, Clipp, Lipkus et al (2007) Mosher, Lipkus, Sloane et al., (2013)	Journal of Clinical Oncology	Canada
23	Exercise consultation on exercise after cardiac rehabilitation phase III	Hughes, Mutrie & Macintyre (2007)	Psycho-Oncology European Journal of cardiovascular Prevention & Rehabilitation	UK
24	Correlates of exercise maintenance in coronary artery disease patients ( 18 months)	Leung, Ceccato & Stewart et al., (2007)	Journal of Behavioural Medicine	Canada
25	ACTION Trial: The Activity Promotion Trial	Vallance, Courneya, Plotnikoff et al., (2008a;2008b) Vallance, Courneya. Taylor et al., (2008) Vallance, Plotnikoff, Karvinen et al., (2010)	Medicine & Science in Sports & Exercise Annals of Behavioural Medicine American Journal of Health Behaviour	Canada
26	Physical activity one year after cardiac rehabilitation program	Arrigo, Brunner-LaRocha, Lefkovits et al., (2008)	European Journal of cardiovascular Prevention & Rehabilitation	Switzerland
27	Lifestyle intervention including counselling for obese endometrial cancer patients	von Gruenigen, Courneya, Gibbons et al., (2008)	Gynaecological Oncology	USA
28	Counselling and exercise after cardiac rehabilitation	Mildestvedt, Meland & Eide (2008)	Scandinavian Journal of Public Health	Norway
29	Telephone counselling for PA in breast cancer survivors	Pinto, Rabin, Papandonatos et al.,(2008)	Support Care Cancer	USA

Bibliography Number	Name or Description of Project	Related Publications	Source	Country
30	Adherence to exercise trial with weekly telephone calls in chronic pulmonary disease	Steele, Belza, Cain et al., (2008)	Archives of Physical Medicine & Rehabilitation	USA
31	Weight loss intervention for postmenopausal obese women	Wang, Lyles, You et al., (2008)	Medicine & Science in Sports & Exercise	USA
32	Pedometer cased intervention for PA after cardiac rehabilitation	Butler, Furber, Phongsaven et al (2009)	Journal of Cardiopulmonary Rehabilitation and Prevention	Australia
33	MoVo-LISA: motivation and volition, theory based intervention	Gohner, Seeling & Fuchs (2009) Fuchs, Gohner & Seelig (2011) Fuchs, Seelig & Gohner (2012)	Applied Psychology: Health & Wellbeing Journal of Physical Activity & Health Psychology & Health	Germany
34	DARE trial: Diabetes, Resistance and aerobic exercise- determinants for long-term PA in Type 2 Diabetes	Sweet, Fortier, Guerin et al (2009)	Psychology, Health & Medicine	Canada
35	Beyond Good Intentions: Proactive coping and PA in Type 2 Diabetes	Thoolen, de Ridder, Bensing et al., (2009)	Psychology and Health	Netherlands
36	PREPARE Program: Pre-diabetes Risk Education and Physical Activity Recommendation and Encouragement ( Educational program)	Yates, Davis, Gorley et al (2009)	Diabetes Care	UK
37	Longitudinal predictors of PA in cardiac rehabilitation programme	Dohnke, Nowossandek & Muller-Fahrnow (2010)	Research in Sports Medicine: An International Journal	Germany
38	Gender differences in exercise adherence after a cardiac event	Dolansky, Stepanczuk, Charvat et al (2010)	Research in Gerontological Nursing	USA
39	The Logan Healthy Living Program	Eakin, Reeves, Winkler et al (2010)	Health Psychology	Australia
40	FIT and Strong!	Hughes, Seymour, Campbell (2010)	American Journal of Health Behaviour	USA

<b>Bibliography Number</b>	<b>Name or Description of Project</b>	<b>Related Publications</b>	<b>Source</b>	<b>Country</b>
41	Internet based PA intervention	Hurkmans, van den Berg, Runday et al (2010)	Rheumatology	Netherlands
42	Longitudinal study into PA and stages of change in Type 2 Diabetes	Plotnikoff, Lippke, Johnson et al., (2010)	Annals of Behavioural Medicine	Canada
43	Vitalum Trial: tailored print and telephone motivational interviewing intervention	van Keulen , Mesters, Ausems et al (2011)	Annals of Behavioural Medicine	Netherlands
44	Maintenance after cardiac rehabilitation Phase II including telephone support	Pinto, Goldstein, Papandonatos et al (2011)	American Journal of Preventative Medicine	USA
45	Physical Activity coaching in rheumatoid arthritis	Sjöquist, Brodin, Lampa et al., (2011)	Musculoskeletal Care	Sweden
46	HELP Trial: Health Exercise for Lymphoma Patients	Courneya, Stevinson, McNeely et al (2012)	Psycho-Oncology	Canada
47	Longitudinal change in psychosocial constructs	Kosma, Ellis & Bauer (2012)	Disability and Health Journal	USA
48	Follow up of exercise and behaviour change trial	Mutrie, Campbell, Barry et al., (2012)	Journal of Cancer Survivorship	UK
49	Group intervention in primary health care	del Rey-Moya, Castilla-Alvarez, Pichiule-Castaneda et al., (2012)	Journal of Clinical Nursing	Spain
50	REEF: Research to Encourage Exercise for Fibromyalgia	Ang, Kalth, Bigatti et al (2013)	Clinical Journal of Pain	USA
51	Implementation intervention in obese older adults	Belanger-Gravel, Godin, Bilodeau et al (2013)	Psychology & Health	Canada
52	Booster sessions for PA in rehabilitation	Fieig, Pomp, Schwarzer et al (2013)	Rehabilitation Psychology	Germany
53	Longitudinal Changes in PA in multiple sclerosis	Motl, McAuley & Sandroff (2013)	Physical Therapy	USA
54	Telephone counselling support for cancer patients	Pinto, Papandonatos, Goldstein (2013)	Psycho-Oncology	USA



### 2.4.1 Sample Characteristics

A summary of the sample characteristics ( $n = 54$ ) are provided in Table 2.2. The overall sample size of the studies was 18,416 and ranged from 25 to 1674, with the majority of studies (31.48%) reporting a sample size range of 200 to 500 ( $M = 341.04$ ,  $SD = 378.59$ ). The age range of the sample was 45.7 to 74 ( $M = 57.89$ ,  $SD = 6.44$ ). The majority of studies were conducted with men and women (90.74%) or women only (11.11%) but no studies explored PA maintenance within male only samples. The majority of studies were conducted with cardiovascular patients (27.78%). Diabetes (16.67%) and primary care patients (16.67%) were the next main researched groups. The least explored health condition in relation to long-term PA outcomes was neuromuscular conditions (1.85%) and respiratory conditions (1.85%). The majority of studies were RCTs with usual care or a comparison group as the control (59.26%). The least employed study designs were a matched randomised trial (1.85%), cluster randomised controlled trials (1.85%) and a pilot study (1.85%). Overall, the study duration (including follow-up) of all trials was between 7 and 12 months (61.11%). Fewer studies reported study duration of over a year (33.33%).

**Table 2.2.** Sample Characteristics of Scoping Review

Characteristic	Bibliography Number	Total Number of Studies (%)	
Study Design			
Randomised Controlled Trial	3, 8, 9, 10, 11, 14, 16, 18, 20, 21, 22, 23, 25, 26, 27, 28, 29, 30, 32, 33, 35, 36, 39, 41, 44, 45, 46, 48, 50, 51, 52, 54	32	(59.26)
Matched Randomised Trial	6	1	(1.85)
Cluster Randomised Controlled Trial	7	1	(1.85)
Multiple Arm Randomised Trial	4, 40, 43	3	(5.55)
Prospective Cohort Pre & Post Test Design	5, 12, 31, 49	4	(7.41)
Longitudinal Prospective Cohort	1, 2, 13, 15, 17, 24, 34, 37, 38, 42, 47, 53	12	(22.22)
Pilot Study	19	1	(1.85)



Characteristic	Bibliography Number	Total Number of Studies (%)	
Health Condition			
Cardiovascular Patients	11, 13, 15, 16, 17, 21, 23, 24, 26, 28, 32, 37, 38, 43, 44	15	(27.78)
Diabetes (Type 1, Type 2 or Impaired Glucose Tolerance)	6, 8, 9, 10, 34, 35, 36, 39, 42	9	(16.67)
Obese Patients	12, 17, 31, 49, 51	5	(9.26)
Respiratory Conditions	30	1	(1.85)
Cancer (incl. survivors)	22, 25, 27, 29, 46, 48, 54	7	(12.96)
Musculoskeletal Conditions	5, 18, 33, 40, 41, 45, 47, 50	8	(14.81)
Primary Care Patients	1, 2, 3, 4, 7, 14, 19, 20, 52	9	(16.67)
Neuromuscular (e.g., multiple Sclerosis)	53	1	(1.85)
Study Length			
0 - 6 months	2, 42, 50	3	(5.55)
7 - 12 months	3, 4, 9, 10, 11, 13, 14, 15, 16, 18, 19, 20, 21, 23, 25, 26, 27, 29, 30, 32, 33, 34, 35, 36, 37, 38, 43, 44, 46, 47, 49, 51, 54	33	(61.11)
13- 18 months	5, 24, 31, 39, 40, 52	6	(11.11)
19 - 24 months	6, 7, 12, 17, 22, 26, 41, 45	8	(14.81)
Sample Size (at follow-up)			
< 20		0	(0)
20 - 50	19, 27, 31, 54	4	(7.41)
51 - 100	10, 20, 23, 29, 36	5	(9.26)
101 - 200	3, 4, 12, 15, 26, 30, 32, 35, 41, 44, 46, 47, 48, 49, 51	15	(27.78)
201 - 500	2, 6, 13, 16, 18, 21, 25, 26, 33, 34, 37, 38, 39, 40, 45, 50, 53	17	(31.48)
501 - 1000	1, 5, 7, 8, 9, 17, 22, 24, 52	9	(16.67)
> 1000	11, 42, 43	3	(5.55)
Gender			
Both	1, 2, 3, 4, 5, 6, 7, 8,9, 10, 12, 13,14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 26, 30, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 50, 51, 52, 53, 54	49	(90.74)
Female Only	7, 11, 29, 31, 48, 49	6	(11.11)
Male Only	-	0	(0)

#### ***2.4.2 Intervention Design Characteristics***

Thirty-seven interventions were included in the data extraction process for intervention design characteristics, the results of which are summarised in Table 2.3.

##### ***2.5.2.1 Intervention Length.***

The length of the main intervention (i.e., components delivered to all participants) ranged from a single session to 18 months. The majority of studies reported intervention duration of between 1 and 3 months (35.14%) with fewer studies reporting duration of less than one month (13.51%) and no studies reporting duration of over 18 months. There was no clear pattern between length of intervention and effectiveness between treatment groups at follow-up because interventions with one-off sessions and a duration of 13-18 months were both effective.

##### ***2.5.2.2 Length of Follow-ups.***

After intervention completion, the follow-up period ranged between 6 months to 13 years (Bibliography number 8). The majority of studies reported follow-up periods of between 6 and 12 months (78.38%) and fewer studies reported intervention follow-up periods longer than 1 year (18.92%). There was no clear pattern between length of follow-up post intervention and intervention effectiveness as interventions with a follow-up of six months or 24-months were both effective.

##### ***2.5.2.3 Number of Contacts.***

The number of contacts ranged from 1 to 36. The intervention with 36 contacts consisted of supervised exercise sessions three times a week for 12 weeks (Bibliography number 48). The majority of studies reported either less than 5 contacts (37.84%) or between 11 and 19 (29.73%). Few studies included over 20 contacts (8.11%). Interventions appeared more effective as the frequency of intervention contacts increased.

##### ***2.5.2.4 Interventionist.***

The main interventionists delivering the interventions were largely trained professionals, such as healthcare professionals (e.g., nurses; 35.14%) or trained

research staff (29.33%). Psychologists and social workers (5.41%) and nutritionists (2.70%) were the least reported professionals to deliver the interventions. Five studies vaguely reported interventionist characteristics or did not state at all (13.51%). Interventions appeared more effective if delivered by a health professional or trained research staff than a psychologist or social worker.

#### *2.5.2.5 Mode of Intervention Delivery.*

Thirteen different modes of intervention were delivered including a combination of face-to-face, telephone support, home-based support, mailed information, internet, and group support. The majority of studies used face-to-face support in conjunction with telephone follow-ups (18.92%), group-based and face-to-face support (13.51%) or telephone only support (13.51%). The least employed format was internet support (2.70%), only face-to-face support (2.70%), those implementing a home-based modality (2.70%) or more than three modalities in total (2.70%). Interventions appeared more effective if they included a face-to-face, group-based, telephone contact, or were a combination of these. Interventions were least effective if they included internet only, mail only, or were telephone and home delivered.

#### *2.5.2.6 Interventions Including Maintenance Phases or Maintenance Strategies*

A total of 21 interventions specifically included a maintenance phase or discussed long-term PA with participants (56.76%). Sixteen interventions focused specifically on PA initiation and did not discuss PA maintenance or include a maintenance phase (43.24%).

#### *2.5.2.7 Interventions Achieving Maintenance at Follow-up.*

The majority of studies reported that intervention effects at the end of the intervention were sustained at follow-up compared to the control group (70.27%).

**Table 2.3.** Intervention Characteristics in Scoping Review

Characteristic	Bibliography Number (N = 37)	Total Number of Studies (%)	Total Number Achieving Maintenance (%)
<b>Length of follow-up Post-intervention</b>			
6 months	3, 4, 10, 18, 25, 27, 29, 32, 39, 44, 46, 50, 51	13 (35.14)	10 (76.92)
7 - 12 months	9, 11, 14, 16, 20, 21, 23, 26, 30, 33, 35, 36, 41, 43, 45, 54	16 (43.24)	10 (62.5)
13- 18 months	40, 52	2 (5.41)	1 (50.0)
19 - 24 months	6, 28	2 (5.41)	1 (50.0)
> 24 months	7, 8, 22, 48	4 (10.81)	3 (75.0)
<b>Duration of main intervention before any booster</b>			
One off session (i.e., 1 hr)	11, 23, 36	3 (8.11)	3 (100)
< 1 month	6, 20, 26, 28, 33	5 (13.51)	4 (80)
1 - 3 months	14, 16, 18, 29, 30, 32, 35, 40, 46, 48, 50, 51, 54	13 (35.14)	8 (61.54)
4 - 6 months	3, 7, 9, 10, 21, 25, 27, 44, 52	9 (24.32)	7 (77.78)
7 - 12 months	4, 22, 39, 41, 43, 45, 52	7 (18.92)	4 (57.14)
13 - 18 months	8	1 (2.70)	1 (100)
> 18	-	0 (0)	0 (0)

Characteristic	Bibliography Number (N = 37)	Total Number of Studies (%)	Total Number Achieving Maintenance (%)
<b>Frequency of intervention contacts</b>			
Does not specify	11, 41	2 (5.41)	1 (50)
1-5	7, 10, 14, 20, 23, 25, 26, 28, 32, 33, 36, 43, 51, 52	14 (37.84)	10 (51.43)
6-10	6, 8, 9, 18, 22, 35, 50	7 (18.92)	4 (57.14)
11-19	3, 16, 21, 27, 29, 30, 39, 40, 44, 45, 54	11 (29.73)	8 (72.73)
≥20	4, 46, 48	3 (8.11)	3 (100)
<b>Interventionist</b>			
Trained research staff/educator	3, 11, 23, 27, 29, 36, 43, 50, 51, 52, 54	11 (29.73)	8 (72.72)
Healthcare professionals	4, 6, 7, 10, 14, 16, 20, 21, 26, 30, 33, 35, 45	13 (35.14)	10 (76.92)
Exercise specialist	7, 40, 41, 46, 48, 50	6 (16.22)	4 (66.66)
Nutritionist	8	1 (2.70)	1 (100)
Interventionist (does not state)	9, 18, 22, 25, 32	5 (13.51)	2 (40)
Psychologist/Social worker	28, 33	2 (5.41)	1 (50)
<b>Mode of Intervention Delivery</b>			
Face-to-face	8, 10	2 (5.41)	2 (100)
Group-based	16, 36, 46, 48	4 (10.81)	4 (100)
Group-based + Face-to-face	3, 11, 26, 35, 51	5 (13.51)	4 (100)
Internet	41	1 (2.70)	0 (0)
Telephone counselling	32, 44, 45, 52, 54	5 (13.51)	3 (60)



Characteristic	Bibliography Number ( <i>N</i> = 37)	Total Number of Studies (%)	Total Number Achieving Maintenance (%)
<b>Mode of Intervention Delivery</b>			
Face-to-face + Telephone counselling	4, 6, 9, 14, 18, 23, 50	7 (18.92)	4 (57.14)
Face-to-face + Telephone + Mail	7, 27	2 (5.41)	2 (100)
Face-to-face + Home-based	20	1 (2.70)	1 (100)
Telephone + Home-based Face-to-face	30	1 (2.70)	0 (0)
Face-to-face + Group + Telephone	21, 28, 40	3 (8.11)	2 (66.67)
Mail/Print-based	22, 25	2 (5.41)	0 (0)
Telephone + Mail	29, 39, 43	3 (8.11)	3 (100)
Face-to-face + Telephone + Mail + Group	33	1 (2.70)	1 (100)
<b>Theory</b>			
Yes	3, 10, 16, 18, 20, 21, 22, 23, 25, 27, 28, 33, 35, 36, 39, 40, 43, 44, 54	19 (51.35)	15 (78.95)
No	4, 6, 7, 8, 9, 11, 14, 26, 29, 30, 32, 41, 45, 46, 48, 50, 51, 52	18 (48.65)	11 (57.89)

Characteristic	Bibliography Number (N = 37)	Total Number of Studies (%)	Total Number Achieving Maintenance (%)
<b>Interventions including maintenance or maintenance strategies</b>			
Yes	3, 4, 8, 9, 10, 14, 16, 21, 23, 26, 27, 28, 29, 30, 32, 33, 39, 40, 44, 50, 54	21 (56.76)	15 (71.43)
No	6, 7, 11, 18, 20, 22, 25, 35, 36, 41, 43, 45, 46, 48, 51, 52	16 (43.24)	11 (68.75)
<b>Maintenance achieved (at follow-up)</b>			
Yes	3, 4, 6, 7, 8, 10, 11, 16, 18, 20, 21, 23, 26, 27, 29, 32, 33, 35, 36, 39, 40, 43, 44, 46, 48, 52	26 (70.27)	-
No	9, 14, 22, 25, 28, 30, 41, 45, 50, 51, 54	11 (29.73)	-

### **2.4.3 Theories Influencing PA Maintenance**

A total of 37 RCTs were included in the data extraction process to identify the main theories that underpin intervention design and delivery and are summarized in Table 2.4. Results revealed that just over half the sample (51.35%) described the intervention components in relation to a theory. Those that did include a theoretical element ( $n = 19$ ), 78.95% achieved successful maintenance at follow-up compared to a control group. Table 2.4 is divided to display the theories that were included in interventions that achieved successful maintenance ( $n = 15$ ) and unsuccessful maintenance ( $n = 4$ ). Those that achieved successful maintenance described a total of 17 different theories. The majority of the sample included multiple theoretical components (60%), social cognitive theory (40%), the relapse prevention model (35.71%) and the stages of change component of the TTM (33.33%). The processes of change of the TTM were only included in 1 trial. Studies that found unsuccessful maintenance at follow-up ( $n = 4$ ) included four different theories or multiple theoretical components, including social cognitive theory (Bandura, 1986), stage of change (TTM; Prochaska & DiClemente, 1983), theory of planned behaviour (Ajzen, 1991) and self-determination theory (Deci & Ryan, 2004).

**Table 2.4.** Theories Employed for Physical Activity Maintenance

Characteristic	Bibliography Number	Total Number of Studies (%)	
<b>Theory-based studies (N=37)</b>			
Yes	3, 10, 16, 18, 20, 21, 22, 23, 25, 27, 28, 33, 35, 36, 39, 40, 43, 44, 54	19	(51.35)
No	4, 6, 7, 8, 9, 11, 14, 26, 29, 30, 32, 41, 45, 46, 48, 50, 51, 52	18	(48.65)
<b>Theory (Successful maintenance; N=15)</b>			
Social cognitive theory	3, 21, 27, 36, 39, 44	6	(40.0)
Transtheoretical model (stages)	10, 20, 23, 40, 44	5	(33.33)
Transtheoretical model (process)	10	1	(6.67)
Relapse prevention	10, 16, 23, 27, 35	5	(35.71)
Social problem solving	16	1	(6.67)
Self-efficacy theory	16	1	(6.67)
Expectancy- value theory	16	1	(6.67)
Model of selection & optimisation	18	1	(6.67)
Health belief mode	21	1	(6.67)
Decisional balance	21	1	(6.67)
Theory of planned behaviour	21	1	(6.67)
Implementation intentions	36	1	(6.67)
Leventhal's common sense model	36	1	(6.67)
Social ecological model	39	1	(6.67)
I-change model	43	1	(6.67)
Control theory	43	1	(6.67)
Multiple theories	10, 16, 21, 23, 27, 33, 36, 39, 44	9	(60.0)
<b>Theory (Unsuccessful maintenance; (N =4)</b>			
Social cognitive theory	22, 54	2	(50.0)
Transtheoretical model (stages)	22, 54	2	(50.0)
Theory of planned behaviour	25	1	(25.0)
Self-determination theory	28	1	(25.0)
Multiple theories	22, 54	2	(50.0)

#### **2.4.4 Determinants of PA Maintenance**

Included in the data selection process were the longitudinal prospective cohort studies, pre and post-test design studies, and 21 RCTs which reported determinants of successful long-term PA. A total of 28 studies were included (51.85%). Table 2.5 summarises the results and separates the determinants found to be related, and not related, to PA maintenance. Ten demographic correlates, 40 psychological determinants, one behavioural determinant, and six health related variables were identified.

##### *2.4.4.1 Socio-demographic Correlates.*

Age and gender were the most studied correlates and results revealed that younger adults ( $n = 3$ ) and males ( $n = 4$ ) were more likely to achieve maintenance than females ( $n = 1$ ) and older adults ( $n = 2$ ). Those with higher education were also more likely to achieve maintenance than those with lower education status ( $n = 2$ ). Work status ( $n = 2$ ) and family income ( $n = 1$ ) appeared equivocal.

##### *2.4.4.2 Psychological Determinants.*

A large amount of determinants were explored across studies ( $n = 40$ ) making the results difficult to interpret. Overall, 21 determinants were found to influence PA maintenance without any evidence against them, including self-efficacy, social support (from friends), perceived satisfaction with outcome, increased pros and decreased cons, perceived behavioural control, proactive coping, cognitive self-management strategies, stages of change, and increased experiential and behavioural processes. Specifically, self-efficacy (general/unspecified) was the most frequently explored determinant ( $n = 8$ ), with exercise self-efficacy ( $n = 2$ ), maintenance self-efficacy ( $n = 3$ ) and barrier self-efficacy ( $n = 2$ ) all being related to PA maintenance. Exceptions were found for response ( $n = 1$ ) and recovery ( $n = 3$ ) self-efficacy where results were inconsistent. There were findings for and against seven other determinants, including general self-efficacy (75%), social support (50%), outcome expectations (66.67%), action planning (66.67%), perceived exercise barriers (50%), decreased depression or anxiety (50%), and strength of intentions (60%). The remaining 10 determinants were found not to influence PA maintenance, including social support from family, implementation intentions, volitional intention shielding, perceived severity and vulnerability, and self-concordance.



#### *2.4.4.3 Behavioural Determinants.*

Only 1 behavioural determinant was found to be related to PA maintenance; past sport/activity engagement ( $n=5$ ; 80%). Generally, the more past activity one engaged in, the more likely they were to continue to exercise in the present or future.

#### *2.4.4.4 Health-related Determinants.*

Out of the six health-related determinants explored, three were related to PA maintenance: higher diabetes risk score at baseline ( $n=1$ ), physical health quality of life ( $n=1$ ), and being a non-smoker ( $n=2$ ). The remaining determinants were either equivocal or unrelated to PA maintenance: illness or injury ( $n=4$ ), mental health quality of life ( $n=1$ ), and improved chronic disease status ( $n=3$ ).

**Table 2.5.** Determinants for Physical Activity Maintenance

Determinant	Bibliography Number ( <i>N</i> = 28)		
	Related to maintenance	Not related to maintenance	Total Number of Studies (% related to maintenance)
<b>Demographic</b>			
Age			
- Younger adults	5, 17, 38		3 (100)
- Older adults	3, 8		2 (100)
Gender		17	1 (0)
- female	3		1 (100)
- male	21, 24, 38, 44		4 (100)
Married	15	24	2 (50)
Increased Education	5, 17		2 (100)
Work status		24	1 (0)
- unemployed	5		1 (100)
Family Income		24	1 (0)
<b>Psychological</b>			
Social Support (friends)	4		1 (100)
Social support (relatives)		21	1 (0)
Social Support (general/unspecified)	5, 15	24, 33	4 (50)
Increased exercise outcome expectations	2, 17	33	3 (66.67)
Increased Self-efficacy (unspecified)	12, 21, 35, 36, 38, 42	2, 17	8 (75)
Exercise self-efficacy	5, 53		2 (100)
Maintenance self-efficacy	13, 15, 37		3 (100)
Barrier self-efficacy	17, 34		2 (100)
Response efficacy		17	1 (0)
Recovery self-efficacy	15, 37	13	3 (66.67)
Autonomous motivation	34		1 (100)
Strength of Intentions	33, 37, 46	13, 17	5 (60)
Increased perceived behavioural control	46		1 (100)
Implementation intentions		33	1 (0)

<b>Determinant</b>	<b>Related to maintenance</b>	<b>Not related to maintenance</b>	<b>Total Number of Studies (% related to maintenance)</b>
Volitional intention shielding		33	1 (0)
Action Planning	18, 52	13	3 (66.67)
Perceived satisfaction	52		1 (100)
Habit strength	52		1 (100)
Self-concordance		33	1 (0)
Stages of change ( i.e., action and maintenance)	10, 29		2 (100)
Increased self-determined motivation	17		1 (100)
Perceived severity		17	1 (0)
Vulnerability		17	1 (0)
Decreased perceived exercise barriers	24	21	2 (50)
Increased Experiential processes	10, 12, 42, 47		4 (100)
Increased Behavioural processes	10, 12, 42, 47		4 (100)
Decreased cons	12		1 (100)
Increased Pros	42, 47		2 (100)
Coping planning	18		1 (100)
Attribute cause of ill-health to own behaviour	24		1 (100)
Depression and/or Anxiety	38	24	2 (50)
Coping strategies		21	1 (0)
Beliefs about exercise		21	1 (0)
Profile of mood states		29	1 (0)
Psychological distress	32		1 (100)
Cognitive self-management strategies	32, 35		2 (100)
Proactive coping	35		1 (100)
Perceived knowledge of illness	36		1 (100)
Perceived effectiveness of exercise	36		1 (100)

Determinant	Related to maintenance	Not related to maintenance	Total Number of Studies (% related to maintenance)
<b>Behavioural</b>			
Past sport/activity engagement	1, 15, 17, 24	13	5 (80)
<b>Health related</b>			
Diabetes risk scores	8		1 (100)
Illness and Injury		4	1 (0)
Physical health quality of life	4		1 (100)
Mental health quality of life		4	1 (0)
Improved chronic disease status/health status	1, 17	2	3 (66.67)
Non-Smoker	2, 24		3 (100)

#### 2.4.5 BCTs Associated with PA Maintenance

The BCTs associated with successful ( $n = 27$ ) and unsuccessful PA maintenance ( $n = 11$ ) in intervention trials are summarised in Table 2.6 and Table 2.7 respectively. A total of 33 techniques were identified (28 from taxonomies and five additional strategies). For the studies achieving PA maintenance, the number of techniques employed within each intervention ranged from three to 12, with the majority employing seven strategies (34.62%). The most frequently used strategies were: providing information on the consequences of the behaviour in general (50%), goal setting for the behaviour (80.77%), barrier identification (57.69%), self-monitoring of the behaviour using pedometers or diaries (57.69%), action planning (42.31%), and plan social support/change (42.31%). The most infrequent strategies employed included goal setting of an outcome (3.85%), intention formation (3.85%), modelling behaviour (3.85%), and stress management (3.85%). Strategies deemed to be specific maintenance strategies, such as relapse prevention and follow-up prompts/boosters (Fjeldsoe et al., 2011) were found in some effective studies. Twelve studies used follow-up prompts or boosters (46.15%), which were either part of a specific maintenance phase or focused on encouraging long-term PA. Only six studies employed relapse prevention (23.08%). Additional strategies that were not in the taxonomy or could not be accurately defined due to a lack of information provided were: counselling (unspecified), developing an exercise programme, providing specific exercise education and tips, providing chronic condition self-management, self-efficacy enhancement, exercise skills training, and decisional balance sheet.

In the ineffective trials, the number of techniques employed ranged from six to 12. Some strategies that were found to be most frequently employed in the effective trials were also most frequently employed within the ineffective trials. These included: goal setting of behaviour (100%), providing information on the consequences in general (90.01%), barrier identification (81.82%), action planning (54.54%), follow-ups or boosters (54.54%), providing instruction on how to perform the behaviour (45.45%), and providing feedback on the performance (45.45%).

**Table 2.6.** The Behaviour Change Techniques Associated with Physical Activity Maintenance

Characteristic	Bibliography Number (N = 26)	Total Number of Studies (%)	
<b>Number of Behaviour Change Techniques</b>			
Not reported in available article	46	1	(3.85)
3	11, 26	2	(7.69)
4	8	1	(3.85)
5	20, 44, 48	3	(11.54)
6	33	1	(3.85)
7	4, 7, 16, 18, 23, 29, 35, 43, 52	9	(34.62)
8	6, 36	2	(7.69)
9	10	1	(3.85)
10	39	1	(3.85)
11	3, 21, 27, 40	4	(15.38)
12	32	1	(3.85)
<b>Behaviour Change Techniques</b>			
Provide information about behaviour-health link	10, 36	2	(7.69)
Provide information on consequences of the behaviour <i>in general</i>	6, 7, 21, 23, 27, 32, 35, 36, 39, 40, 43, 48, 52	13	(50)
Provide information on consequences of the behaviour to the <i>individual</i>	10, 20, 21, 43	4	(15.38)
Goal setting (behaviour)	3, 4, 6, 7, 8, 10, 16, 18, 20, 21, 23, 27, 29, 32, 33, 35, 36, 39, 40, 48, 52	21	(80.77)
Goal setting (outcome)	18	1	(3.85)
Prompt review of behavioural goals	6, 10, 18, 20, 23, 52	6	(23.08)
Graded-tasks	3, 6, 21, 27, 29, 43	6	(23.08)
Barrier-identification/problem solving	3, 6, 10, 16, 18, 20, 21, 23, 29, 32, 33, 35, 36, 39, 40	15	(57.69)
Provide instruction on how to perform the behaviour	3, 20, 26, 32, 36, 40	6	(23.08)
Action planning	3, 4, 6, 18, 33, 35, 36, 39, 40, 43, 52	11	(42.31)
Self-monitoring of behaviour	3, 4, 6, 16, 21, 26, 27, 29, 32, 33, 35, 36, 39, 43, 44	15	(57.69)
Prompt practice	3, 4, 8, 21, 29, 35	6	(23.08)
Provide normative information about others behaviour	4	1	(3.85)



<b>Behaviour Change Techniques</b>	<b>Bibliography Number (N = 26)</b>	<b>Total Number of Studies (%)</b>	
Plan social support/social change	6, 8, 10, 11, 16, 23, 26, 32, 39, 40, 48	11	(42.31)
Prompt identification as a role model/position advocate	16	1	(3.85)
Model/Demonstrate the behaviour	40	1	(3.85)
Prompt rewards contingent on effort or progress towards behaviour	4, 29, 32, 40, 44	5	(19.23)
Provide information on when and where to perform the behaviour	7, 48	2	(7.69)
Provide feedback on performance	7, 21, 27, 32, 35, 39, 44	7	(26.92)
Prompt intention formation	33	1	(3.85)
Prompt focus on past success	52	1	(3.85)
Prompt generalisation of target behaviour	21	1	(3.85)
Provide general encouragement	21, 36	2	(7.69)
Stress management	3, 27	2	(7.69)
Motivational Interviewing	7, 18, 39, 40, 43	5	(19.23)
Use of follow-up prompts/boosters	4, 7, 10, 20, 21, 23, 27, 32, 39, 40, 44, 52	12	(46.15)
Relapse prevention	10, 16, 18, 23, 27, 32	6	(23.08)
<b>Additional Techniques</b>			
Counselling (not specified)	3, 4, 8, 11, 16, 27, 29, 32	8	(30.77)
Chronic condition self-management	3, 39	2	(7.69)
Exercise advice or education (where information is vague)	7, 10, 11, 16, 27, 32, 44	7	(26.92)
Decisional balance sheet	33	1	(3.85)
Exercise plan	48	1	(3.85)

**Table 2.7.** The Behaviour Change Techniques Employed in Ineffective Intervention

Characteristic	Bibliography Number (N = 11)	Total Number of Studies (%)	
<b>Number of Behaviour Change Techniques</b>			
6	45	1	(9.09)
7	9, 28, 41	3	(27.27)
8	22, 30	2	(18.18)
9	25, 50	2	(18.18)
10	-	0	(0)
11	14, 51	2	(18.18)
12	54	1	(9.09)
<b>Behaviour Change Techniques</b>			
Provide information on consequences of the behaviour <i>in general</i>	9, 22, 25, 28, 30, 41, 45, 50, 51, 54	10	(90.01)
Provide information on consequences of the behaviour to the <i>individual</i>	14, 22, 45	3	(27.27)
Goal setting (behaviour)	9, 14, 22, 25, 28, 30, 41, 45, 50, 51, 54	11	(100)
Prompt review of behavioural goals	45, 51	2	(18.18)
Graded-tasks	50, 54	2	(18.18)
Barrier-identification/problem solving	9, 14, 22, 25, 28, 30, 45, 51, 54	9	(81.82)
Provide instruction on how to perform the behaviour	25, 30, 41, 50, 54	5	(45.45)
Action planning	9, 28, 41, 50, 51, 54	6	(54.54)
Self-monitoring of behaviour	25, 30, 41, 45, 51, 54	6	(54.54)
Provide normative information about others behaviour	25	1	(9.09)
Plan social support/social change	14	1	(9.09)
Model/Demonstrate the behaviour	30,41, 50	3	(27.27)
Prompt rewards contingent on effort or progress towards behaviour	22, 54	2	(18.18)
Provide information on when and where to perform the behaviour	25, 51	2	(18.18)
Provide feedback on performance	9, 14, 22, 51, 54	5	(45.45)
Prompt social comparison	22, 28	2	(18.18)
Prompt intention formation	25, 50, 51	3	(27.27)
Provide general encouragement	14, 22, 30, 51	4	(36.36)

Characteristic	Bibliography Number (N = 11)	Total Number of Studies (%)	
Motivational interviewing	9, 50	2	(18.18)
Use of follow-up prompts/boosters	9, 14, 28, 30, 54	5	(45.45)
Relapse prevention	14, 30, 50, 54	4	(36.36)
Counselling (not specified)	14, 28, 51, 54	4	(36.36)
Exercise advice or education (where information is vague)	14, 25, 41, 54	4	(36.36)
Exercise plan	41	1	(9.09)

#### **2.4.6 Studies Not Included in Main Data Extraction Process**

Two studies were not included in the main data extraction process because they were not RCTs and did not explore determinants of PA maintenance (Bibliography number 19 & 49). The first study was a small pilot of a one-day therapeutic patient education workshop for adults with a range of health conditions (Bibliography number 19). The techniques used were mainly motivational interviewing, providing information on consequences (general), and planning social support. The intervention was underpinned by multiple theoretical components (e.g., health belief model and stages of change). The session was delivered mainly in groups and workshops by a nurse and physician but also included one-to-one sessions. Results indicated that 39% of those who were sedentary at baseline became active and a significant reduction in BMI was achieved at one year.

The second study was a group intervention delivered in a primary health care setting to improve obese women's adherence to an exercise class at one year (Bibliography number 49). The intervention consisted of 21 exercise sessions across seven weeks and was delivered by nurses. An exercise plan was developed (e.g., action planning) and heart rate was monitored. No other BCTs were specified and the intervention was not underpinned by theory. Results indicated that the percentage of women adhering to an exercise class at one year increased from 11 to 41% as did the number of sessions attended.

## **2.5 Discussion**

The aim of this chapter was to scope the literature and assess the extent to which the scientific evidence explores PA maintenance within adults with chronic health

conditions. In accordance with intervention mapping (Bartholomew et al., 2006), the review was interested in four broad factors pertinent to PA maintenance intervention design: (1) intervention characteristics; (2) theory; (3) determinants; and, (4) BCTs. Each section will be discussed in detail below.

### ***2.5.1 PA Maintenance Intervention Characteristics***

During the intervention mapping process, intervention developers need to plan specific intervention characteristics (e.g., intervention duration and mode) to enable the adoption and implementation of the intervention (Bartholomew et al., 2006). This review demonstrated that the length of interventions were mainly between one and three months, with a six to 12 month follow-up period post-intervention. The majority of interventions reported significant effects between treatment groups at their longest follow-up point, consistent with previous research (Fjeldsoe et al., 2011). Therefore, there was no clear pattern between length of intervention or follow-up and intervention effectiveness. Both shorter interventions (e.g., Stoddard, Palombo, Troped, Sorensen, & Will, 2004) and longer interventions (e.g., Lindström et al., 2013) were effective, suggesting intervention components other than intervention duration could contribute to intervention effectiveness.

The review also revealed that interventions were effective if they included: more intervention contacts, face-to-face, telephone or group sessions, and were delivered by a trained health professional or researcher. These findings are consistent with previous reviews (Fjeldsoe et al., 2011; Hobbs et al., 2013), although this study adds to that by indicating that group sessions and telephone delivery (or a combination of these) are also effective modes of delivery. Given that evidence suggests that methods, such as telephone delivery, are cost-effective (Eakin, Lawler, Vandelanotte, & Owen, 2007), interventions should aim to include such modes of delivery. Furthermore, the fact that the intervention providers should be trained professionals supports previous research suggesting that training and competence in intervention technique delivery is important for intervention effectiveness (Moyers, Martin, Manuel, Hendrickson, & Miller, 2005). Therefore, future interventions would benefit from ensuring adequately trained professionals deliver the interventions, employing a combination of face-to-face, telephone or group based sessions and including more contacts over time.

The results also revealed that approximately half of the interventions did not focus on PA maintenance at all (e.g., Babazono, Kame, Ishihara, Yamamoto & Hillman,

2007). This supports previous research suggesting that interventions largely promote PA initiation with the incorrect assumption that such factors will also promote PA maintenance (Rothman et al., 2011; van Stralen et al., 2009). The studies that did focus on PA maintenance did so by either including a specific maintenance phase that included discussions around long-term lifestyle change and/or relapse prevention in addition to a PA initiation phase (e.g., Hughes et al., 2010). Nevertheless, there was only a marginal difference in effectiveness between the studies that did include PA maintenance strategies and those that did not. This suggests that other factors play a role in determining whether PA interventions are effective in the long-term.

To better understand the factors for PA maintenance, previous research has argued the need to develop interventions that specifically promote just the maintenance phase so to disentangle any effects from the PA initiation phase (Marcus et al., 2000; 2006; van Stralen et al., 2009). Within this review, no study explored just the PA maintenance phase. To date, only one study has developed such an intervention for older 'healthy' adults who had initially increased their PA levels and found that PA was maintained at 24 months (Sherwood et al., 2010). Nevertheless, the intervention did not include adults with chronic health conditions and so could not be generalisable to clinical populations. Therefore, further research is needed to develop a specific PA maintenance intervention within adults with chronic health conditions to disentangle the specific factors that promote PA maintenance.

### ***2.5.2 Theory for PA Maintenance Interventions***

Developing theory-based interventions is a central component of intervention mapping (Bartholomew et al., 2006) and so one aim of this review was to uncover the potential theoretical components that promote PA maintenance in a clinical population. Results were largely inconclusive due to the large range of theories (i.e., 17 different theories) employed within studies. Social cognitive theory and the TTM were two of the most frequently used theories, consistent with previous PA research (Breckon et al., 2008; Hutchison et al., 2012). Nevertheless, these theories were also found to be employed in ineffective interventions within this review, which reduces the certainty of whether they contributed to intervention effectiveness.

Besides from these, multiple theories were largely employed in any one study, confirming that multiple theories are needed to explain the PA maintenance process



(Amireault, et al., 2012; Brug et al., 2005). Nevertheless, the predominant use of multiple theories in interventions could be prevalent due to uncertainty around how to promote PA maintenance (Hutchison et al., 2012). In such circumstances, it is recommended to select multiple theories (Michie, Johnston, Francis, Hardman & Eccles, 2008); however, it is still unclear which theories to use. Furthermore, the studies did not specify which theoretical components were employed. For example, if the social cognitive model was used, it was unclear whether the components employed were concerned with outcome expectations or self-efficacy (or both). Therefore, future research needs to ensure the specific theoretical components are specified within the reporting of intervention content, not just the overarching theory.

It is suggested that theoretically driven interventions are more effective than those without theory (Michie & Abraham, 2004). This review contradicts this assumption as the amount of effective interventions was only marginally higher for those employing a theory compared to those without theory, and is consistent with previous reviews (Greaves et al., 2011). One explanation could be that theories are only useful if they specifically outline the mechanisms for the behaviour in question (Brug et al., 2005). Given that theories are criticised for not outlining the mechanisms for PA maintenance (Hutchison et al., 2012), this could account for intervention ineffectiveness. Particularly, it has been suggested that the theories could be incorrectly implemented in interventions because they do not adequately outline the BCTs for behaviour change or maintenance (Brug et al., 2005). Another explanation lies with the inadequate reporting of interventions found in this review and previous reviews, which threatens the replication and evaluation of interventions (Breckon et al., 2008; Michie & Abraham, 2008). This suggests that theories could have been implemented in studies but were not reported; thus, biasing the results. Consequently, researchers need to ensure they are employing theory-based interventions and adequately reporting them to accurately assess the effective theoretical mechanisms for PA maintenance.

### ***2.5.3 Determinants for PA Maintenance Interventions***

Another aim of this review was to identify the theoretical determinants that influence PA maintenance so that it is clear which determinants to target within interventions. This study revealed that 57 determinants were linked to successful PA maintenance, making the results difficult to interpret and understand which



determinants to apply in interventions. Determinants were categorised into demographics, psychological, behavioural and health-related factors consistent with previous reviews (Amireault, et al., 2012; van Stralen et al., 2009). There were no studies within this review, however, that explored environmental determinants for PA maintenance and this is an area for future research to explore.

In terms of socio-demographic determinants, a number of articles in this review found that younger adults, males, and those highly educated were more likely to maintain PA than their counterparts (e.g., Burke et al., 2008; Leung, Ceccato, Stewart, & Grace, 2007; Oliver & Cronan, 2002). Van Stralen et al., (2009) found similar results except that they found that older adults were more likely to maintain PA than younger adults. Nevertheless, interventions need to do more to promote long-term PA in females and those with low socio-economic status and overcome the barriers to interventions associated with age.

A number of psychological determinants were identified in the review. Studies largely assessed self-efficacy, which was found to be related to PA maintenance, including: maintenance self-efficacy (Scholz, Sniehotta, & Schwarzer, 2005), exercise self-efficacy (Oliver & Cronan, 2002), recovery self-efficacy (Luszczynska & Sutton, 2006) and barrier self-efficacy (Tullock et al., 2009). This is consistent with previous research and a meta-analysis, which specifies that self-efficacy is an important component of PA maintenance (Amireault et al., 2012; Olander et al., 2013). Nevertheless, specific types of self-efficacy could be less beneficial for PA maintenance than others, such as response self-efficacy, which was not related to PA maintenance in this review (Tullock et al., 2009). Such findings are consistent with previous research suggesting that different types of self-efficacy (e.g., maintenance and recovery self-efficacy) influence PA maintenance or relapse in adults with chronic health conditions (Luszczynska & Sutton, 2006). Additional psychological determinants such as coping, decreasing cons of exercise, stage of change and cognitive self-management strategies were also found to promote PA maintenance. In contrast, outcome expectations, intentions, and social support from family were not related to PA maintenance. Such findings are consistent with previous reviews (van Stralen et al., 2009; 2010) but not others (Amireault et al., 2012). Consequently, further research is needed to explore the role of psychological determinants for PA maintenance, given that much of the results are inconclusive.

The review also identified behavioural and health-related determinants, such as past exercise engagement (Hirvensalo, Litunen & Rantanen, 2000), physical quality of life (Dubbert, Cooper, Kirchner, Meydrech, & Bilbrew, 2002) and being a non-smoker (Damush, Stump, Saporito, & O. Clark, 2001), which were related to PA maintenance. In contrast, improving mental health quality of life and increased injury (Dubbert et al., 2002) or reducing chronic disease status (Damush et al., 2001) were either inconsistent or unrelated to PA maintenance. This is surprising as previous research suggests that illness and chronic disease is a barrier to PA (Brawley, Rejeski, & King, 2003; Schoenborn & Stommel, 2011) and would imply that improving such health-related determinants could increase PA engagement. It was suggested, however, that such findings could be associated with the recruitment bias towards more physically able adults with chronic health conditions (Damush et al., 2001). Therefore, further research is needed to understand the barriers that adults with chronic health conditions face when engaging in PA.

#### ***2.5.4 BCTs for PA Maintenance***

When designing interventions, it is also important to identify the BCTs to implement to change the determinants associated with a specific behaviour (Bartholomew et al., 2006, Abraham & Michie, 2008). During the inter-coder process when coding studies using the taxonomy, it was realised that many studies reported techniques that were ambiguous and led the coders (SS and RC) to second guess, leaving the process open to interpretation and error (e.g., "self-efficacy enhancement"; Moore et al., 2006). As a result, it is clear that intervention components need to be clearly reported consistently in accordance with the taxonomy to aid PA intervention replication (Michie et al., 2011b).

Twenty-eight BCTs were identified that could be coded in accordance with the 40-item taxonomy (Michie et al., 2011b). Such BCTs were consistent with previous reviews, suggesting that goal-setting for behaviour, self-monitoring, and action planning were largely employed in effective studies (Michie et al., 2009). BCTs such as providing information on the consequences in general, barrier identification, and social support were also largely employed. This suggests that multiple BCTs could be associated with long-term PA but ineffective studies were also found to deliver these

BCTs, limiting the certainty of the effective BCTs. Further research is needed to explore the effective strategies specifically for PA maintenance.

Five additional strategies were also found (although infrequently reported), which could not be categorised according to the taxonomies (Abraham & Michie, 2008; Michie et al., 2011b). These were specific to exercise promotion (e.g., exercise plans) and chronic condition self-management or counselling. The actual content of the exercise plans, condition management or type of counselling was not reported and has been previously recognised as an issue with the reporting of PA interventions (Breckon et al., 2008). Nevertheless, this review provides some evidence that PA maintenance interventions targeting adults with chronic health conditions could benefit from techniques that include both condition management and exercise planning (Plow et al., 2012).

Previous research has suggested that PA maintenance strategies are largely follow-up prompts and relapse prevention (Dombrowski et al., 2010; Fjeldsoe et al., 2011; Müller- Riemenschneider et al., 2008). In this study, less than half of the effective studies included follow-up prompts and only six studies included relapse prevention. Additionally, over half of the ineffective studies employed follow-up prompts and none employed relapse prevention, rendering the results questionable. This further suggests interventions are not specifically employing the known BCTs for long-term PA and instead focus on PA initiation, with the expectation that such strategies will also produce long-term effects (Rothman et al., 2011).

Furthermore, the number of BCTs employed within an effective study ranged from three to twelve, with the majority employing seven or more BCTs, although ineffective studies also included seven or more BCTs. This suggests that the increased number of BCTs is not associated with intervention effectiveness and supports previous research (Dombrowski et al., 2010; Hobbs et. al., 2013). In contrast, Fjeldsoe et al., (2011) found that increased number of BCTs was associated with effectiveness but also included a shorter follow-up period post-intervention (e.g., 3 months) compared to this review and others (Dombrowski et al., 2010; Hobbs et. al., 2013). Thus, intervention effectiveness could be more concerned with the number of BCTs employed across time rather than frequency itself. Alternatively, the effectiveness of techniques could be determined by factors such as the quality of the relationship (i.e., therapeutic alliance) or

intervention provider characteristics (Peck, 2010) but such factors were not considered in any of the reviews.

### ***2.5.5 Research Gaps and Recommendations for Future Research***

This scoping review identified that multiple theories, determinants and BCTs have previously been used in an attempt to promote PA maintenance and that the results from these studies are inconclusive in terms of ‘what-works’ within interventions. Therefore, the effective elements for interventions to promote PA maintenance remain unclear. A number of gaps within the literature, however, have been identified which, if addressed, are likely to contribute to practice in this emerging area. These are categorised into four main areas which are discussed below;

First, the review highlights that the majority of studies focused on older adults, cardiovascular disease or diabetic patients. Few studies focused on adults with multiple health conditions or single conditions, such as neuromuscular or pulmonary diseases. Furthermore, no study was reported exploring just male participants with any health conditions. In light of a recent mandate stating that by 2035 the number of adults living with chronic health conditions is expected to rise (BHF, 2012), it is argued that future health services need to incorporate the intervention or treatment ingredients that can be generalised across conditions (Piette, Richardson, & Valenstein, 2004). Therefore, further research is needed on the least researched populations, such as multiple health conditions and male participants, to further understand the generalisable ingredients that promote PA maintenance.

Second, interventions largely targeted PA maintenance by adding a specific maintenance phase onto the end of an initiation phase making it difficult to differentiate the successful theories, determinants and BCTs for PA maintenance from those associated with PA initiation. Following previous recommendations (Marcus et al., 2000; 2006) it is suggested that future research should focus on adults that have already initiated PA and explore the determinants and strategies for maintenance. Similarly, it is recommended that interventions are developed specifically for PA maintenance and not as an adjunct to PA initiation interventions (Marcus et al., 2000; Sherwood et al., 2008).

Third, the majority of studies in this review focused on successful maintenance but rarely unsuccessful maintenance. Previous research has suggested that both successful and unsuccessful PA maintainers should be explored to truly assess the



factors that contribute to the complexity of long-term PA and warrants future research to compare the two behaviours (Marcus et al., 2000; Sweet et al., 2011).

Finally, the complexity of linking theoretical components to determinants and the associated BCTs that promote behaviour change could not be assessed by this review. If the link between the theoretical components, determinants and BCTs are not clearly understood then interventions are at risk of applying ineffective components, which can be costly in terms of time and resources (Brug et al., 2005). During the intervention mapping process, when the factors needed to develop an intervention cannot be identified from the evidence, a qualitative study is suggested (Bartholomew et al., 2006). Therefore, research could benefit from exploring this link between theoretical determinants and strategies, by particularly using qualitative framework analysis that explores associations between themes and encourages evidenced based or theoretical mapping and interpretation for intervention development (Ritchie & Spencer, 1994).

## **2.6 Limitations**

A number of limitations within this review need to be highlighted. The complexity of defining PA maintenance means that previous researchers have used different definitions compared to that used within this review (*cf.* Fjeldsoe et al., 2011; Hobbs et al., 2013; Marcus et al., 2000). This could make it difficult to compare the results across studies. Additionally, previous research has acknowledged the inadequate reporting of intervention descriptions within articles (Michie & Abraham, 2008), which was also found in this review. This means that the articles in this study could have used theories, BCT's or intervention characteristics that were not reported or were not coded due to ambiguity. If this is the case, specific intervention components will not have been included in this review, thus biasing the results. It is also acknowledged that there could be studies that were eligible for inclusion within the review but were not included due to the specific search terms and criteria. Additionally, the focus on only available electronic articles, rather than grey literature, means articles may exist but were not included, thus biasing the results in this review. Furthermore, given the broad research questions and inclusion of multiple research designs (e.g., longitudinal prospective cohorts and RCTs), a quality assessment could not be performed. Each study design would require its own quality assessment meaning the results would not be comparable (*cf.* Crombie, 1996). Following this, effect sizes were not calculated for interventions



due to the heterogeneity of the outcome measures. Nevertheless, the purpose of this review was to scope the breadth of the scientific evidence and search for gaps within the literature rather than assess quality and effectiveness of RCTs and grey literature, which is associated with systematic reviews.

## **2.7 Chapter Summary**

This chapter aimed to provide a board overview of the current scientific evidence that has examined the factors that promote PA maintenance in adults with chronic health conditions. A scoping review was conducted to provide an exploratory, systematic and semi-quantitative analysis of the literature rather than a subjective narrative review (Hutchison & Breckon, 2011). The review was conducted as part of the needs assessment of intervention mapping (Bartholomew et al., 2006) and focused on four main areas pertinent to intervention development; (1) intervention characteristics; (2) theory; (3) determinants; and, (4) BCTs. Overall, the review found that multiple theories, determinants and BCTs were used in both effective and ineffective interventions making the results difficult to interpret. Face-to-face, group-based and telephone support were considered influential modes of delivery within interventions. Increased number of contacts and delivery by a trained health professional or researcher were also influential for PA maintenance. Furthermore, the scoping review found gaps within the literature allowing recommendations for future research to be made. These included: researching under-represented health conditions (e.g., respiratory), males and adults with multiple health conditions or co-morbidities; researching both successful and unsuccessful maintainers; designing specific PA maintenance interventions specifically for individuals who have already initiated PA; and mapping the link between theoretical determinants and BCTs using qualitative methods (Ritchie & Spencer, 1994). Limitations of the review were discussed, specifically in relation to the under-reporting of intervention components within articles.

# **Chapter 3**

## **Determinants and Strategies for Physical Activity Maintenance in Chronic Health Conditions: A qualitative study.**

## **Chapter 3: Study 1: Determinants and Strategies for Physical Activity Maintenance in Chronic Health Conditions: A qualitative study.**

### **3.1 Introduction**

The previous chapter (Chapter 2) provided a broad overview of the literature exploring the factors pertinent for designing a physical activity (PA) maintenance intervention for adults with chronic health conditions. The review was largely inconclusive due to the vast array of theories, determinants and strategies employed within the studies. Furthermore, research gaps within the literature were identified such as: researching under-representative groups, including those with multiple health conditions; the factors that promote successful and unsuccessful PA maintenance after an intervention; and, the need for specific PA maintenance interventions. These gaps within the literature are also consistent with previous reviews (e.g., Marcus et al., 2000). When the existing literature is inconclusive, it has been argued that qualitative methods should be called upon in the developmental phase of an intervention (Bartholomew et al., 2006). Additionally, it was suggested that qualitative research could help identify the link between determinants and strategies (Chapter 2). Therefore, the aim of the following chapter was to qualitatively explore the determinants and strategies that contribute to successful and unsuccessful PA maintenance in adults with a range of health conditions. Research is warranted to inform the development of a maintenance intervention for adults who have initiated PA and so this study recruited participants who had completed a physical activity referral scheme (PARS). The research is discussed in relation to future research and practice.

### **3.2 Background: Determinants and Strategies**

The number of adults living with chronic health conditions is expected to rise by 2035 which will increase the burden on healthcare resources and finance (BHF, 2012). The Department of Health (2012) released a mandate encouraging health care advancements towards the quality of life for adults with long-term conditions. In response to this, it has been recommended that health services need to understand the commonalities across effective intervention components (e.g., determinants and strategies) for multiple health conditions to increase cost-effectiveness and treatment value (Naylor et al., 2012; Piette, Richardson, & Valenstein, 2004). PA is a common

treatment component for a range of health conditions (DoH, 2011) but evidence suggests that adults with health conditions are less likely to maintain PA than "healthy" adults (Marcus et al., 2000). It is possible that the presence of chronic co-morbidities, (e.g., cancers or heart conditions) interfere with one's ability to engage in positive protective behaviours, such as PA (Piette & Kerr, 2006; Schoenborn & Stommel, 2011). Therefore, attention is warranted to explore the commonalities (e.g., determinants and strategies) that promote PA maintenance in a heterogeneous clinical population. An understanding of the commonalities would better inform intervention or service development promoting PA maintenance within clinical populations with co-morbidities.

To develop tailored PA maintenance interventions, behaviour change theories are used to inform the determinants and strategies (Bartholomew et al., 2006; Rothman, 2004) but have been criticised for not adequately focusing on both behavioural maintenance (Rothman et al., 2011) and PA specifically (Hutchison et al., 2012). Research suggests focusing on understanding the determinants and strategies employed by successful and unsuccessful PA maintainers after an intervention (Marcus et al., 2000; 2006). To date, studies with chronic health conditions are scant (e.g., Sweet, Tulloch, Fortier, Pipe, & Reid). In healthy adults, evidence suggests that decreased perceived cons (e.g., exercise is too time consuming), perceived behavioural control, and perceived satisfaction distinguish between successful and unsuccessful maintainers (Rhodes, Plotnikoff, & Courneya, 2008; Williams et al., 2008). Additionally, maintainers are more likely than unsuccessful maintainers to have enhanced self-efficacy for overcoming barriers, such as boredom, and inclement weather (Rhodes & Plotnikoff, 2006). Only one study focused on adults with CVD risk factors and found that increased self-efficacy, increased outcome expectations, and enhanced self-determination led to successful maintenance (Sweet et al., 2011). Nevertheless, the research was not conducted after intervention cessation and further research is needed in adults with a range of chronic health conditions to understand the commonalities of PA maintenance within this context.

Behaviour change theories have also been criticised for not adequately describing the link between determinants and strategies, thus limiting the development of interventions (Brug et al., 2005). The taxonomy of behaviour change techniques (BCTs) outlines the cognitive-behavioural strategies used to promote PA and healthy eating and attempts to link them to theory (Abraham & Michie, 2008). Specifically,

techniques associated with control theory, such as self-monitoring, feedback on performance and goal-setting have been shown to be effective (Michie et al., 2009). The taxonomy, however, was developed by exploring only 'healthy' sedentary adults and does not specify the strategies for PA maintenance. Instead, additional strategies might be more influential for PA within clinical populations, such as condition management strategies (Conn et al., 2008; Kralik, Koch, Price & Howard, 2004; Plow et al., 2012). Therefore, successful PA maintenance in adults with chronic health conditions is likely to be dependent on additional strategies not outlined within the taxonomy and warrants further exploration in relation to determinants and theory.

### ***3.2.1 Qualitative Research Exploring PA Maintenance***

Qualitative methods have been suggested to explore the mediators of PA behaviour change (Baranowski, Anderson, & Carmack, 1998). Qualitative research has the advantage of exploring the 'why' and 'how' of phenomena, which quantitative methods do not adequately enable (Green & Thorogood, 2010). Therefore, qualitative research can elucidate how the factors influence successful or unsuccessful PA maintenance and can answer questions concerning why some intervention completers embed PA into daily life whereas others do not (Hutchison et al., 2012; Veenhof, et al., 2006). Furthermore, qualitative research has been suggested as a method of exploring commonalities amongst individuals with co-occurring conditions compared to experimental designs, such as randomised controlled trials (McHugo et al., 2006). By doing so, qualitative methods can reveal a deeper understanding of PA maintenance (or relapse) in adults with a range of health conditions; thus enhancing transferability.

Despite this, the qualitative studies exploring PA maintenance in adults with chronic health conditions are scant (e.g., Dlugonski et al., 2012; Hutchison et al., 2008; Midtgaard et al., 2012; Peel, Douglas, Parry, & Lawton, 2010; Swärdh, Biguet & Opava, 2008). The available evidence has suggested that PA maintenance includes a range of determinants, such as regular support, encouragement, safety and monitoring from health professionals (Dlugonski et al., 2012; Swärdh et al., 2008). A sense of autonomy or choice over exercise behaviours and self-determination are also important for patients with rheumatoid arthritis or cancer (Midtgaard et al., 2012; Swärdh et al., 2008). Gaining benefits from PA, such as enjoyment and maintaining functional health promote a sense of "being normal" or tame the fear associated with living with multiple sclerosis (Dlugonski et al., 2012). Additionally, dog walking can encourage long-term



PA across four years in patients with diabetes with negative attitudes towards exercise (Peel et al., 2010). Nevertheless, the majority of these studies only focused on single health conditions rather than a range of health conditions. One study explored PA maintenance within a range of health conditions (*cf.* Hutchison et al., 2012) and found that congruence between core values, attitudes and beliefs was needed for long-term PA, including the ability to overcome situational conflicts or barriers to PA. While it is clear that a range of determinants are involved in PA maintenance, none of the studies above have compared the role of determinants in both maintainers and relapsers, which warrants further research.

Qualitative studies that have explored both successful and unsuccessful PA maintenance are also scant within a clinical context. Kirchoff, Elliot, Schlichting and Chin (2008) explored the benefits and barriers in African women at risk of Type 2 diabetes and discovered that both maintainers and relapsers experienced similar benefits (e.g., weight loss, improved wellbeing, and health benefits) and barriers (e.g., work commitments, time, fatigue and poor weather). Certain factors were specific to PA maintainers rather than relapsers, such as being a positive influence for family members, social support and were likely to implement goal setting or rewards. The study, however, compared individuals who had self-initiated PA during the past year rather than having completed an intervention. While it is important to understand naturally developing PA, it does not provide insight into why some individuals maintain or relapse after intervention completion (Marcus et al., 2000).

To the best of our knowledge, only one study has compared maintainers and relapsers after successful completion of a behavioural graded activity intervention for osteoarthritis patients (*cf.* Veenhof et al., 2006). Motivation, values, self-regulation, symptom acceptance (e.g., pain) and goal-setting were found to influence PA maintenance. Specifically, relapse was likely to occur when goals were achieved. Nevertheless, maintenance was defined as one to six months post-intervention, which is not consistent with the widely accepted operational definition of PA maintenance (i.e., six months post-intervention; Fjeldsoe et al., 2011). Therefore, it is uncertain whether the determinants actually relate to the maintenance phase. Qualitative research is, therefore, needed to explore the determinants of PA at least six-months after intervention completion, which can inform the development of future PA maintenance interventions.

Qualitative research has also highlighted some of the strategies that are associated with PA maintenance. Goal setting is frequently found (Kirchoff et al., 2008; Midtgaard et al., 2012; Veenhof et al., 2006) and reviewing behavioural goals is important for continual PA engagement as one integrates PA into their identity and lifestyle (Harley et al., 2009). Additionally, implementing rewards, building social networks, managing disease specific barriers and time management skills, such as prioritising or planning PA and being flexible with a routine, are also important for long-term exercise (Dlugonski et al., 2012; Kirchoff et al., 2008; Midtgaard et al., 2012). These studies, however, lack the clinical heterogeneity needed to identify the common strategies that healthcare practitioners need to implement when working with adults with multiple health conditions (Piette et al., 2004). Furthermore, it is unclear which determinants the strategies change, which is necessary information when developing interventions (Bartholomew et al., 2006). Consequently, further research is needed to explore the strategies used in adults with chronic health conditions for PA maintenance.

### **3.3 Study Aims**

Recommendations from the reviewed evidence suggest that research needs to explore the determinants and strategies employed by successful and unsuccessful PA maintainers after an intervention ends (Marcus et al., 2000; 2006). To achieve this, qualitative research methods have been encouraged to explore 'why' and 'how' some individuals maintain, and others not, after intervention cessation. Qualitative methods are also encouraged to help develop interventions, particularly when the extant literature is insufficient (Bartholomew et al., 2006) and can help identify the commonalities (e.g., determinants and strategies) that are needed to promote PA maintenance in a heterogeneous clinical population (Naylor et al., 2012; Piette et al., 2004). Therefore, the aim of this study is to qualitatively explore the determinants and strategies associated with successful and unsuccessful PA maintainers after completing PARS.

### **3.4 Methods**

#### **3.4.1 Participants**

With institutional ethics approval (Appendix A), purposive sampling was used to recruit participants from PARS in South Yorkshire, UK. A comprehensive description of PARS can be found elsewhere (BHF, 2010). Sedentary patients with

stable chronic health conditions (e.g., stable angina), are referred to PARS for 24 sessions of moderate-vigorous PA across 12 weeks. No specific behavioural or maintenance strategies are employed. Each hourly session consists of gym-based aerobic and resistance training. For study eligibility, participants were aged 18+, started the scheme 12 months prior to study commencement, increased their moderate-vigorous exercise to at least 90 minutes a week (or two sessions per week), and reported maintaining at six months post-PARS. Since PARS do not measure PA status (at baseline), attendance rates of  $\geq 75\%$  of sessions was used to ensure activity levels were increased. Incentives were offered to maximise recruitment, such as entry into a prize draw offering two participants gift certificates to a local store. The sample size was defined a priori in accordance with previous research which suggests that theme saturation (i.e., where no new themes or information emerged from new participants) occurs for 20 participants per group (Green & Thorogood, 2010). Therefore, the target sample size was 40 participants. Theme saturation actually occurred at 15 participants for successful maintainers but 20 were obtained to adhere to recommendations (Green & Thorogood, 2010). The response rate was low for unsuccessful maintainers and so purposive sampling ended when theme saturation was achieved resulting in 12 participants.

### **3.4.2 Instrumentation**

To categorise participants as successful or unsuccessful maintainers, the PA Stages of Change Questionnaire adapted from the Scottish PA Questionnaire (SPAQ) was used (Lowther, Mutrie, Loughlan, & MacFarlane, 1999). The questionnaire invites participants to choose one statement from five that best described their PA over the previous six months (e.g., "I am regularly physically active and have been so far longer than six months"). While there is consensus that maintenance is defined as sustaining a behaviour for six months or more, there is no consensus on what constitutes unsuccessful maintenance (Marcus et al., 2000). For the purpose of this study, if participants stated to have engaged in PA for six months or more, they were considered to be in the maintenance phase. If participants reported engaging in no PA, or had done so for less than six months, they were considered to be unsuccessful maintainers given that a lapse would have occurred after the referral scheme.

Current PA status was also measured to validate participant categories using the International Physical Activity Questionnaire (IPAQ) long-form (Craig et al., 2003). It

was assumed that successful maintainers would perform more activity than the unsuccessful maintainers (Conroy et al., 2007; Fletcher, Behrens, & Domina, 2008). The IPAQ measures vigorous-intensity, moderate-intensity, walking activity, and sitting time based on metabolic equivalent of task per minute (MET-minute). The scale has acceptable test-retest reliability (spearman's  $p = 0.80$ ) and has been tested in a range of populations (Craig et al., 2003).

The interview schedule (Appendix E) consisted of approximately 20 open-ended questions focusing on participants' activity participation, strategies, and related experiences before, during, and after the referral scheme (e.g., 'Tell me about your experiences of PA after PARS?'). This included an exploration of their most recent experiences and reasons for PA participation (e.g., 'What prompts you to exercise or not now?'). Two pilot interviews were conducted to ascertain the appropriateness of the interview schedule. Repetitive questions were removed and included a question on the use of technology as a strategy because this was an emerging theme from the pilot interviews (e.g., 'What do you think to using technology such as pedometers to help you stay active?').

### **3.4.3 Procedures**

PARS completers were identified from a database owned by the PARS coordinator, which contained information on attendance and PA status at six months post-PARS (e.g., 'yes, I'm still active' or 'No, I'm not as active'). Study information including participant information sheet (Appendix B), background information sheet (Appendix C) and questionnaires were distributed by the PARS coordinator to eligible participants. After obtaining informed consent (see Appendix D for consent form), each participant engaged in a one-hour semi-structured face-to-face audio-recorded interview, which was transcribed verbatim (see Appendix F for an example transcript). Pseudonyms were used to ensure confidentiality. Telephone interviews were conducted if participants could not attend a face-to-face interview. The interviews were conducted by the principal researcher who used a combination of open-ended questions, reflections, and paraphrases to elicit relevant information (Patton, 2002).

### **3.4.4 Data Analysis**

Framework analysis was used since it is a valid approach for analysing large quantities of data in health-related research with the intention of guiding intervention



development (Ritchie & Spencer, 1994). The approach has also been used within previous PA research (Staniford, Breckon, Copeland, & Hutchison, 2011). Additionally, the approach was selected for its adaptability to either inductive and deductive qualitative procedures, or a combination of the two, depending on the research question (Gale, Heath, Cameron, Rashid, & Redwood, 2013).

Framework analysis consists of five inter-connected but distinct stages. In Stage 1 (familiarisation), each transcript was read through and uploaded to QSR-Nvivo (Version 9). A discussion of how NVivo supports the qualitative process has been described elsewhere (Hutchison, Johnston, & Breckon, 2010). Briefly, reflexive notes were made for potential themes using the memo and annotation tool.

In Stage 2 (identification of a thematic framework), a thematic framework was developed based on a random selection of the transcripts and consisted of a hierarchical structure of higher-order and lower-order themes using the node structure in NVivo (Table 3.1). Themes were allowed to emerge naturally from the data using an inductive approach. Initial themes were generated by using paraphrases or codes to summarise the interpretations of segments of text concerning determinants (e.g., cognitions, behaviours, emotions, situational/environmental factors, facilitators) and strategies. Triangulation for the initial themes occurred between the principal investigator (SS) and two supervisors (JB and RC) who independently coded a transcript and discussed the emergent themes until agreement was reached.

In Stage 3 (indexing), the initial thematic framework was applied to the remaining transcripts and themes were revisited and refined as new or similar themes were identified using the constant comparative method (Gale, et al., 2013). Negative cases were identified for successful and unsuccessful maintainers during this stage. All investigators conducted theme triangulation until agreement was reached (Green & Thorogood, 2010). Inter-coder reliability was conducted with an independent researcher and achieved 86 percent, which was deemed acceptable (Miles & Huberman, 1994).

In Stage 4 (charting), charts were created to highlight associations between determinants and strategies, which were identified using the coding tool in NVivo. Frequencies of successful and unsuccessful maintainers for each theme were also obtained from NVivo to aid the analysis, which were included in the charts (Table 3.1) and are in line with Miles and Huberman (1994).

In Stage 5 (mapping and interpretation), the association charts were transformed into process maps (see Appendix G for an example) and the mechanisms were



understood by deductively applying existing literature of behaviour change theories and strategies. Meetings were held with all investigators at each stage of the analysis to reach consensus on interpretations of themes. Member checking with participants was also conducted to enhance credibility (Creswell, 2013).

Descriptive statistics were also calculated for IPAQ scores, which were computed in SPSS version 19. The total median METs-minute for all activities was used. Data was not normally distributed and a Mann-Whitney U test was performed to compare the level of activity between successful and unsuccessful maintainers.

### **3.5 Results**

#### **3.5.1 Participant Characteristics**

Thirty-two participants were interviewed including 20 successful PA maintainers (age =  $57.5 \pm 13.2$ , 45% female, 55% multiple health conditions, 95% Caucasian; 65% retired) and 12 unsuccessful PA maintainers (age =  $59.9 \pm 13.03$ , 75% female, 75% multiple health conditions, 75% Caucasian; 83% retired) with a range of health conditions: coronary heart disease (19%); musculoskeletal (6%); pulmonary (3%); mental health (6%); endocrine (3%); and, multiple health conditions (63%).

The median METs-minute for total activity performed in an average week for the sample was  $3244.5 \pm 4948.3$ . The successful maintainers performed nearly 8-fold more activity ( $Mdn = 6203.5 \pm 4940.7$ ) than the unsuccessful maintainers ( $Mdn = 777.0 \pm 2655.9$ ) and this difference was statistically significant ( $U = 22, p < .001, r = -.67$ ).

#### **3.5.2 Determinants and Strategies for Successful and Unsuccessful Maintenance**

The thematic framework outlined in Table 3.1 reports the 11 major themes and associated lower-order themes that emerged for both successful and unsuccessful maintainers. These include: (1) outcome expectations; (2) outcome experiences; (3) core values; (4) attitudes towards PA; (5) trial and error; (6) social and practical support; (7) psychological barriers; (8) physical barriers; (9) environmental barriers; (10) PA self-management strategies; and, (11) condition management strategies. Each theme will be described in relation to successful and unsuccessful maintenance.



### 3.5.2.1 PA Outcome Expectations and Experiences

All participants, including unsuccessful maintainers, reported expectations of gains from PA, such as improving health and functional independence ( $n = 32$ ). This is illustrated by a male maintainer, "I expect to get fitter and healthier" and a male unsuccessful maintainer, "I want to put five years on my life ...of being fit... It's not how long you live it's the quality of life."

By engaging in PA through the referral scheme, the majority of participants reported experiences of benefits by observing physiological or psychological improvements ( $n = 31$ ), receiving compliments from others ( $n = 9$ ), or observing improvements in others ( $n = 5$ ). One male successful maintainer stated, "I struggled with bending down to put my socks on but I'm not now". Nevertheless, PA disengagement was still reported by the unsuccessful maintainers. The lower-order theme 'no experience' confirmed that the majority of unsuccessful maintainers ( $n = 8$ ) reported experiencing little or no improvement in a prioritised outcome expectation;

*"The main thing is to lose weight and I enjoyed it [PA] when I was there....I used to think to myself, this is better than sitting down, it must be doing me some good, but I never noticed anything [weight loss] really."*  
(Fiona, female unsuccessful maintainer).

The lack of experienced benefit for a prioritised outcome appeared to result in incongruence between PA outcome expectations and experiences leading to disappointment and disengagement. Furthermore, unrealistic expectations about one's own ability, effort, and length of time needed to experience benefits appeared to contribute to this incongruence in unsuccessful maintainers ( $n = 5$ ). For example the length of time needed to lose weight appeared unrealistic as a female unsuccessful maintainer mentioned, "Well I'd probably do it [PA] for a couple of days and then go off it and think 'oh, I've done it now'."

Strategies associated with outcome expectations and experiences included goal setting ( $n = 15$ ), and self-monitoring ( $n = 9$ ) of physiological changes, such as improved blood pressure and fitness. These techniques were mainly used by successful maintainers (*cf.* Table 3.1). Technological devices, such as the internet and heart-rate monitors were used, which provided feedback on performance or health information

seeking, thus enabling self-management of a health condition. A male successful maintainer recovering from a heart-attack, triple bypass, and angina discussed the use of a heart-rate monitor to observe fitness progress and manage his heart condition;

*"I do push it and push it and push as much as I can and when your heart rate gets to, I mean I used to get my heart rate up to a hundred and thirty. Now, if I get it to a hundred, my angina starts... So each time I try to get it above. Like today, I got it to a hundred and four. I could feel it [angina] coming on and I don't want to push it so each day I try and go as long and hard as I can."* (Donald, male maintainer).

Condition management strategies also appeared to encourage positive experiences by managing unpleasant symptoms and allowing continual PA engagement. For example, pacing ( $n = 16$ ) involved engaging in enough activity and rest to avoid pain and fatigue;

*"If I get stuck into anything I've gotta watch what I'm doing and pace myself ... I mean I feel alright and I sort of push myself and think 'oh, I'll just finish this and I'll just finish that', but over the last few months I've come to realise that if I do push it I'm not very good the next day... You've got to pace yourself. If I went out of here and dug a garden, I'm going to be [tired] the next day and I think...next time, I'm only gonna do half of that."* (Dominic, male maintainer).

#### 3.5.2.2 Core Values

Core values, such as a health value, family value, or independence value, appeared to influence both successful and unsuccessful maintainers ( $n = 31$ ). A core value existed independently to PA (e.g., family or health) and was reported to be a "means to an end" that could be influenced by exercise participation. For example, since the diagnosis of a chronic health condition, one male successful maintainer stated, "I value health more than anything". If congruence existed between PA expectations, experiences and a value, then successful maintenance occurred. For example, successful maintainers discussed the impact of exercise on fitness levels and the importance (value) of family since the onset of a health condition ( $n = 10$ );



*"I like to think being active is helping me since the operation...I'd like to think I can keep helping the family...my wife likes gardening and I cut the grass. I do the digging if needs be, she does the flowers. I clean the windows, things like that so that's the important part as far as I'm concerned" (Ted, male maintainer).*

In contrast, if incongruence existed between PA expectations, experiences, and values then exercise was perceived as a barrier resulting in disengagement. For example, unsuccessful maintainers also reported a family value ( $n = 6$ ) but was seen as more important than exercise, and at times, used as an excuse out of exercise;

*"I tend to put other people first and I think that's the most important thing...If one of my kids wanted me to do something I'd do it straight away and then I think 'no I really need to go [to the gym]'... If I was at the gym and my wife text me saying will you get [something], I'll think, ' well, I'll go now then". (Paul, male unsuccessful maintainer).*

The strategies associated with core values were a range of time management strategies, such as planning ( $n = 15$ ), prioritising ( $n = 8$ ), developing a routine ( $n = 9$ ), flexibility ( $n = 8$ ), and planning "me time" ( $n = 7$ ). Only successful maintainers reported using the strategies to negotiate competing demands between exercise and core values. One female successful maintainer discussed managing her health condition, prioritising exercise, and her family value;

*"I manage it [health condition] by saying to my grandchildren I'm having a day off today...I have to know my limitations. I have to say I can do that but then I need to have a rest before I can do anything else and that's basically how I can manage it....I have to prioritise what I do, you know." (Ilene, female maintainer).*

In contrast, only unsuccessful maintainers ( $n = 5$ ) reported being unable to manage disruption of an exercise routine due to work and other factors;



*"I like a routine. I'm a routine person. I like to know exactly what I'm doing but the routine went you see. All my routine just collapsed with my job and everything because I knew I was at work Thursday and Fridays...Everything just went to POT. So it's just really trying to work on getting a routine going again." (Charleen, female unsuccessful maintainer).*

### 3.5.2.3 Trial and Error

A "trial and error" learning process appeared to be a method by which both successful ( $n = 11$ ) and unsuccessful ( $n = 6$ ) maintainers learned their physical limitations, capabilities, and strategies for PA engagement. The process appeared to involve "pushing yourself" which leads to a "knowing" of physical limitations and capabilities. The difference between successful and unsuccessful maintainers appeared to be that the maintainers accepted their limitations and worked within them but the unsuccessful maintainers were still in denial;

*"You just keep pushing and pushing...In the past I've pushed myself too much and felt it for the next week. ... I get to the point where I KNOW I can push myself to that level. I know what I can do.... and I know what I can't do" (Greg, male maintainer)*

Alternatively, the inability for unsuccessful maintainers to accept their physical limitations led to over exertion from a lack of pacing and exercise disengagement, despite knowing their capabilities;

*"I used to play a lot of sport and I find it frustrating if I can't do it (PA)... and I know I can't do things to the level that I used to do. I still think I'm nineteen and I can do what I did then, and I'd try that and suffer for it. That's the mental block I've got with it...the conscious argument isn't there. I know my body's got its limitations...and that might be a reason why I don't do it" (Doug, male unsuccessful maintainer).*

Strategies associated with trial and error were pacing ( $n = 15$ ) and graded activity ( $n = 3$ ) which appeared to be learnt through this process. Only successful maintainers reflected on the strategies. One female successful maintainer discussed learning the necessity of pacing and graded activity after an operation to remove her gall bladder;

*"I was impatient and I started walking too far and too fast and I went back to normal too quickly. I got quite ill because my body was trying to tell me to stop... I taught myself to set smaller goals and be a lot easier on myself and just do a little bit of exercise until I got back into it."*  
(Caroline, female maintainer).

In contrast, unsuccessful maintainers had not learnt to pace themselves due to frustration with not achieving their goals and lack of acceptance of the situation ( $n = 5$ );

*"I tried and tried and tried to stay below that [heart rate for weight loss] ... but I was angry with myself for not losing the weight...so I would go at it too hard...always trying to prove myself."* (Paul, male unsuccessful maintainer).

#### 3.5.2.4 Social and Practical Support

All participants reported receiving social and practical support ( $n = 32$ ). During the referral scheme, both successful ( $n = 8$ ) and unsuccessful ( $n = 4$ ) maintainers reported a cathartic effect from receiving support from group exercise and compared it to "group therapy";

*"I saw other people, some were worse off than me. I met other people who had the same problems as me and seeing how they coped gave me a boost. They were all friendly and cheerful. It was a nice atmosphere."*  
(Mavis, female unsuccessful maintainer).

Once the scheme ended, the majority of successful maintainers ( $n = 13$ ) appeared to receive social support from health professionals or family as one male

stated, "My wife keeps pushing me to come to the gym". Additionally, group exercise classes appeared to provide a substitute for the loss of routine, social aspect, and purpose during retirement that was once gained from past employment largely for successful maintainers ( $n = 8$ );

*"When you've stopped work, you miss the banter with people...you watch football on a weekend, and you've nobody to talk to on a Monday morning... The work has gone now so therefore I've got to look at something as a substitute." (Greg, male maintainer).*

In contrast, fewer unsuccessful maintainers ( $n = 5$ ) received support from family which would prevent total sedentary behaviour; "I do go to the gym sometimes when I feel guilty and get shouted at by my son or daughter". Additionally, unsuccessful maintainers ( $n = 5$ ) discussed that the loss of support and monitoring was demotivating as "once you've left the referral, you don't have to produce anything to say what you're doing. You've got to do it all yourself and that's hard". Successful maintainers also expressed a concern about exercise support ending ( $n = 7$ ), accompanied by limited confidence to independently continue with exercise;

*"I want to know what's going to happen when Derek does pack the class up because motivation's a big thing with me. I just don't motivate myself unless there's something there. If I hadn't been referred, I probably would have had another heart attack by now... and I'd go back to being a slob" (Matthew, male maintainer).*

Strategies associated with social support from health professionals and significant others included encouragement ( $n = 19$ ), health advice ( $n = 16$ ), monitoring by others ( $n = 15$ ), and a reminder to pace activity ( $n = 10$ ). A successful maintainer explained the benefits of encouragement and monitoring, "the staff encourage you and I think knowing that somebody is going to keep checking up on you helps motivate you". These strategies were experienced to a similar extent for both successful and unsuccessful maintainers (*cf.* Table 3.1).

### 3.5.2.5 Attitudes for PA Maintenance

Positive attitudes, such as commitment, and self-responsibility were held largely by successful maintainers (*cf.* Table 3.1) who stated it was "commitment more than anything" that helped maintain PA and stated, "You should take responsibility for your own health". Nevertheless, some unsuccessful maintainers also held positive attitudes that appeared to be negatively influenced by other factors, such as the referral scheme terminating, not experiencing benefits, and depression as a female suggests: "It's only me who can get myself there...but I've been feeling very low and I just can't motivate myself to do much". Also, despite knowing the benefits to exercise, only unsuccessful maintainers ( $n = 7$ ) held negative attitudes as they reported feeling "fed up", and "can't be bothered" as a reason for not engaging in PA as a male suggests; "I know I will feel better [if I go to the gym] and nine times out of ten you do, but other times I think 'Oh I can't be bothered, I'll go to sleep.'"

A strategy associated with attitudes for PA maintenance appeared to be cognitive reframing to overcome negative attitudes by successful maintainers ( $n = 10$ ). For example, similarities were drawn between commitment for maintaining PA and work as it was stated;

*"There's lots of days where I don't feel like going... It's like going to work... I've always enjoyed my job but you always get that day where... you're tired, you don't want to go...but you're going. So you go and when you've been there ten minutes you're into it anyway... and it's the same with going to the gym"* (Matt, male maintainer).

Unsuccessful maintainers had not reported any strategies specifically for overcoming negative attitudes.

### 3.5.2.6 Barriers to PA Maintenance

Both successful and unsuccessful maintainers experienced barriers ( $n = 32$ ; *cf.* Table 1). These were categorised into physical (e.g., illness), environmental (e.g., accessibility), and psychological barriers (e.g., boredom). The difference between successful and unsuccessful maintainers was their ability to overcome barriers. For



example, all unsuccessful maintainers ( $n = 12$ ) discussed barriers, such as illness, which were currently preventing exercise participation;

*"I've not been going [to the gym] since before Christmas because of how ill I've been and I've been having horrendous stomach problems and pain, so it's quite limiting at the moment".* (Deidre, female unsuccessful maintainer).

In contrast, the majority of successful maintainers ( $n = 17$ ) discussed a barrier that occurred in the past and had been overcome, such as a past caregiver duty as a male suggests; *"In the day time I was looking after my wife so I didn't have time to do anything else... but now I find the time".*

A physical barrier labeled "the plateau" also emerged and was experienced by some maintainers ( $n = 5$ ) and unsuccessful maintainers ( $n = 2$ ). It was defined as a point in an exercise regimen where physiological or psychological improvements would "taper off so you're not seeing any extra benefit". This appeared to result in dissatisfaction with any experiences of PA leading to disengagement as a male comments; *"When I first came doing things [PA], I was losing weight, looking better and feeling better but after I had plateaued, what is the reward?"*

Strategies associated with overcoming barriers were those outlined in Table 3.1. Although all participants mentioned using strategies at some point, only successful maintainers mentioned strategies specifically for overcoming barriers. Maintainers appeared to use different strategies to overcome the same barrier. For example, cognitive reframing helped some participants to manage a health condition, "I've got diabetes and I can sit there at home and feel sorry for myself or I can...say 'what can I do?'" where other participants used graded exercise: "I do the exercises to the limit it [the gout] lets me and try and push me that little bit further each time." Furthermore, the same strategy appeared to have more than one purpose. For example, finding alternatives for exercise (i.e., problem solving) helped some participants overcome exercising alone, "the chap I used to play [squash] with dropped out and we both stopped coming...then I took up scuba diving," whereas the same strategy helped others deal with pain, "I've tried the gym but I'm in too much pain...I can hardly move but swimming and water aerobics I'm fine." Only two successful maintainers had



knowledge of strategies to overcome the plateau, such as goal setting and adding variety to an exercise routine;

*“Because I knew what was happening, I wasn’t de-motivated. You get a quick gain and then it becomes harder and then it becomes maintenance. I set a new goal of sixteen stone. I’m maintaining something when I’ve set myself a target and ....you change what you do in the gym, like adding an extra set...”* (Keith, male maintainer).

### **3.6 Discussion**

Physical activity (PA) is a common treatment component for a range of chronic health conditions and services are required to target the commonalities across conditions to deliver effective health care (Naylor et al., 2012; Piette et al., 2004). This qualitative study aimed to explore the determinants and strategies that promote successful and unsuccessful PA maintenance in adults with chronic health conditions. The results demonstrated that PA maintenance is a complex trial and error process where both successful and unsuccessful maintainers have expectations, experiences, values, social support, attitudes, and barriers, similar to that of previous research (Hutchison et al., 2012; Kirchoff et al., 2008). This study adds to that, however, by highlighting the factors which also determine relapse in a heterogeneous population; the level of congruence between PA outcome expectations, experiences and values; the ability to seek social support after an intervention; the ability to accept physical limitations and capabilities through a trial and error learning process; the ability to implement strategies to overcome barriers and manage a health condition; and, the ability to cognitively reframe negative attitudes. Furthermore, multiple cognitive-behavioural (CB) strategies were used for PA maintenance.

#### **3.6.1 Determinants of PA Maintenance**

Consistent with previous research, the current study suggested outcome expectations and experiences of benefits play a key role in PA maintenance in adults with chronic health conditions (Fleig, Lippke, Pomp & Schwarzer et al., 2011; Kirchoff et al., 2008; Sweet et al., 2011; van Stralen, Lechner, Mudde, & Bolman, 2010). Moreover, the findings suggest that congruence between prioritised outcome expectations and experiences of PA benefits determines whether one maintains or

disengages with exercise. This is consistent with expectancy-value theory whereby PA disengagement is found to be the result of violations for a prioritised outcome expectation, often due to unrealistic expectations (Sears & Santon, 2001). It is likely that congruence can lead to satisfaction and provides further support that perceived satisfaction with outcomes influences PA maintenance (Rothman et al., 2011). Therefore, health professionals could promote PA maintenance by eliciting prioritised outcome expectations, identifying unrealistic expectations, and tailoring interventions to encourage congruence between expectations and experiences to prevent relapse.

Additionally, core values were held by both successful and unsuccessful PA maintainers. It was the level of congruence, however, between core values (e.g., family), outcome expectations, and experiences that influenced successful or unsuccessful maintenance. For example, if PA was seen to enhance fitness (outcome expectation) and fitness was perceived to allow the individual to spend time with the family (core value) then maintenance occurred. The values identified in this study are consistent with existing theories and definitions of value priorities (Rohan, 2000). Moreover, the finding supports existing qualitative evidence that congruence between underlying values and beliefs, attitudes, or intentions towards PA leads to maintenance (Hutchison et al., 2012). This further highlights the need for health professionals to elicit values and identify any incongruence between values, outcome expectations, and experiences to prevent relapse.

Social and practical support from significant others and health professionals could influence PA maintenance as it provided encouragement and a cathartic outlet when living with a health condition. The results contradict previous reviews that suggest that social support from family and friends is not associated with PA maintenance (van Stralen et al., 2009; see Chapter 2) but are consistent with other research (Kirchoff et al., 2008; McAuley, Jerome, Elavsky, Marquez, Ramsey, 2003; Swärdh et al., 2008). Nonetheless, the results in this study suggested that a reliance on social support (e.g., monitoring by exercise professionals) can encourage a dependency that is detrimental for long-term PA if the support is removed. Although both successful and unsuccessful maintainers received social support whilst participating in PARS, those who maintained after completion of the scheme sought further support as opposed to becoming demotivated. This finding might support previous evidence that suggests that continual support or prompts are needed after an intervention (Eakin, Reeves, Winkler, Lawler & Owen, 2010; Hardcastle & Hagger, 2011). Thus, long-term approaches are needed to

encourage autonomy and foster self-management strategies to reduce dependency on healthcare and ensure that individuals are equipped to continue exercising after support ends.

Previous research has indicated that attitudes (e.g., commitment and self-responsibility) are associated with increased adherence to exercise programs (Dishman, 1991; Hutchison et al., 2012). Within this study, successful maintainers largely held positive attitudes, while negative attitudes were only expressed by unsuccessful maintainers. Additionally, some unsuccessful maintainers also held positive attitudes but other circumstances (e.g., terminated support) meant that the attitude did not influence behaviour. Consequently, interventions need to do more to increase and challenge the factors which negatively interfere with positive attitudes towards PA. For example, previous research has indicated that health education and behavioural contracts can foster commitment (Michie et al., 2011b). Counselling approaches can also help individual's cope with depression, anxiety and other co-morbid factors associated with living with a health condition (Piepoli et al., 2010). The current research also adds that cognitive reframing can help overcome negative attitudes. Nevertheless, further research is needed to test the direct effect of strategies on enhancing long-term commitment to PA.

Trial and error emerged as a process where individuals would initially push themselves too hard with activity resulting in exacerbated symptoms and activity disengagement. Although both successful and unsuccessful maintainers reported the process, maintainers had learnt their limitations, capabilities and effective condition management strategies, whereas unsuccessful maintainers had not. Pacing appeared to be a strategy learnt through this process that helped manage any excessive PA, thereby limiting pain and fatigue, thus facilitating continual exercise engagement. These findings are consistent with previous research in chronic illness self-management (Kralik et al., 2004), which largely focuses on activity pacing in the context of pain or fatigue management (Marques, De Gucht, Maes, & Leal, 2012). Further research is needed, however, to directly test the role of activity pacing on PA maintenance.

### **3.6.2 Barriers to PA**

A range of psychological barriers (e.g., boredom), physical barriers (e.g., illness, the plateau), and environmental barriers (e.g., time, appointments) were found. The factor which distinguished between successful and unsuccessful maintenance was the



ability to overcome barriers. Maintainers largely reported implementing a range of strategies (e.g., self-management or graded activity) to overcome or cope with barriers. These findings are consistent with previous research, which suggests that barriers can prevent PA initiation and increased self-efficacy is needed to challenge barriers for continual exercise engagement (Hutchison et al., 2012; Kirchoff et al., 2008; Rhodes & Plotnikoff, 2006; Tullock et al., 2009). Consequently, continual barrier identification and strategies to overcome barriers are needed for PA maintenance.

One barrier new to PA maintenance research was the 'plateau'. This was defined as a reduction in physiological gains over time (e.g., reduced weight loss). The plateau appeared to prevent experiences of benefits leading to dissatisfaction with the outcome unless strategies were implemented. While the plateau is a new phenomenon to PA maintenance research, it is consistent with periodisation in sports training (Bompa & Carrera, 2005). Athletes are encouraged to incorporate monthly changes to a training program (e.g., implementing a new activity). Alternatively, within cancer patients, exercise variables are manipulated during progressive resistance training (e.g., training frequency, intensity or load, volume or sets, and types of exercises) to ensure continual development (*cf.* Cheema, Gaul, Lane, & Singh, 2007). Drawing from this, educating individuals in how to recognise a plateau and implement specific strategies could help patients to experience benefits and maintain activity.

### ***3.6.3 Cognitive-Behavioural Strategies***

Multiple cognitive-behavioural (CB) strategies for self-management of PA (e.g., self-monitoring, goal-setting, and feedback) and condition management or coping (e.g., pacing and acceptance of limitations) supported PA maintenance. The strategies found were consistent with the 40 item taxonomy of behaviour change techniques (Michie et al., 2011b), self-management of chronic health conditions (Kralik et al., 2004), and adaptive coping tasks (Moos & Holahan, 2007). This suggested that condition management and coping strategies, not included in the taxonomy, are applicable for PA maintenance in adults with chronic health conditions, which supports previous research (Kralik et al., 2004; Plow et al., 2012). Additionally, the multiple strategies found in this study support the results of the scoping review (Chapter 2), which also suggested that multiple strategies are needed for PA maintenance in a heterogeneous clinical population. This presents a challenge for health professionals delivering interventions because training will need to emphasise the wide range of strategies needed necessary for

PA promotion and condition management or coping. Nevertheless, it must be noted that the study was conducted within the UK healthcare system, which questions the effectiveness of these strategies across different cultural contexts and warrants further research.

Although unsuccessful maintainers generally lacked the resources or knowledge needed to overcome barriers, some individuals reported using strategies, which suggests continual attempts at being active. Furthermore, multiple strategies (e.g., pacing and cognitive reframing) were found to help overcome one specific barrier (e.g., illness) or the same strategy (e.g., self-monitoring) was used to overcome multiple barriers (e.g., illness and lack of motivation). This is consistent with previous research, which has found that one strategy (e.g., self-monitoring) can also change multiple determinants (e.g., skills and beliefs about capabilities) depending on the application and situational constraints (Michie, Francis, Hardman, & Eccles, 2008). Therefore, multiple strategies, rather than single strategies, are needed for PA maintenance and require a flexible and person-centred approach to intervention delivery to ensure that individual's select the appropriate strategies for their situation and health condition(s) (Hogden et al., 2012).

The current study also gave insight into the self-management strategies that regulated the determinants. For example, self-monitoring and goal-setting allowed prioritised PA benefits to be experienced; cognitive-reframing influenced attitudes towards PA; condition management/coping strategies (e.g., pacing and acceptance) influenced the trial and error learning process; and, multiple strategies were used to overcome barriers. Existing literature has mainly explored the strategies that regulate self-efficacy for PA, such as action planning, time-management and self-monitoring (Olander et al., 2013; Williams & French, 2011). Therefore, this study adds to that by suggesting strategies that might regulate different determinants for PA maintenance, although the findings would need to be empirically tested.

#### **3.6.4 *Implications for Practice***

Identifying the generalisable determinants and strategies across a range of long-term health conditions has enabled a number of implications for practice to be generated. It is clear that multiple determinants and strategies are needed when working with a heterogeneous population and requires a person-centred approach to healthcare. This notion supports current practice, known as a 'tool-box' approach: where multiple strategies are offered to patients, which are then selected and tailored to support



behaviour change (Hogden et al., 2012). This research also suggests that specific strategies (e.g., self-monitoring) can be implemented to change specific determinants (e.g., outcome experiences) for PA maintenance. For example: eliciting prioritised outcome expectations, values, and experiences; identifying unrealistic expectations (e.g., effort and time); and, encouraging self-monitoring can develop congruence between expectations and experiences to prevent relapse. With such knowledge, healthcare professionals can offer the appropriate strategies to change specific determinants to encourage PA maintenance, which also requires a person-centred approach to delivery.

One person-centred approach used within healthcare is motivational interviewing (MI; Miller & Rollnick, 2013). MI is a collaborative and person-centred approach to behaviour change, which focuses on eliciting client change talk (e.g., desire and need), values, client autonomy and self-efficacy, and identifies discrepancies between a client's present and ideal behaviour ( a detailed definition can be found in Chapter 4, Section 4.5.3.1). The approach has been found to develop congruence between values and behaviour (Anshel & Kang, 2007) and enhance individual motivation and autonomy for behaviour change, which is needed to reduce any dependency on healthcare services (Moore, Moore, & Murphy, 2011; Resnicow & McMaster, 2012). Thus, the principals of MI overlap with the determinants found in this study and could be a suitable approach for changing PA maintenance determinants.

Furthermore, in chronic disease self-management, evidence suggests that healthcare practitioners find MI to be an adaptive and flexible tool when integrated with other approaches, such as CB strategies (Hogden et al., 2012). An integrative motivational interviewing and cognitive behavioural (MI-CB) approach has also been proposed for health behaviour maintenance (Naar-king, Earnshaw, & Breckon, 2013). Within an integrative approach, MI is used to elicit change talk and increase motivation and autonomy for behaviour change whereas the CB strategies are suggested to encourage maintenance. Given that this study also suggested that multiple CB strategies for PA maintenance, an integrative MI-CB approach appears suitable, although efficacy and feasibility research is needed.

### ***3.6.5 Implications for Research***

Before translating the study findings into practice, further research is needed to test the role of an MI-CB intervention for PA maintenance in adults with chronic health conditions. Particularly, further research is needed to test the influence of PA

maintenance interventions on psychological determinants as proposed (e.g., outcome expectations and experiences). This is important as evidence suggests cognitive factors are rarely evaluated within PA counselling interventions and, therefore, less is known about the impact of counselling interventions on the psychological factors of PA behaviour change (Breckon et al., 2008). This research would help to identify the effective or ineffective psychological mechanisms for PA maintenance.

Given that dependency on social support can be detrimental for PA maintenance, autonomy and self-efficacy need to be promoted for long-term PA (Resnicow & McMaster, 2012). Motivational interviewing has been recommended to enhance autonomy and, if combined with tapered telephone contact after an intervention, it can support PA maintenance across 18-months (Eakin et al., 2010). Therefore, research is warranted to test the MI-CB approach as continual support for long-term PA.

The research also identified a barrier specific to PA maintenance- 'the plateau', which future research needs to explore further. The plateau is a well-known concept within the fitness industry (Bompa & Carrera, 2005) and weight management programmes (e.g., WeightWatchers). It is suggested that a plateau can typically occur after four to six months of treatment and a lack of awareness of the plateau can contribute to unrealistic weight loss expectations in relation to actual weight loss (Fabricatore et al., 2007). Given that PA behaviour also diminishes around six-months after intervention cessation (Marcus et al., 2000), an interaction between the physiological plateau and motivation to continually engage in PA could exist. For example, reduced physiological gains could have a detrimental impact on psychological factors (e.g., outcome expectations and experiences) and behaviour (e.g., PA relapse) if one is not aware of how to manage the plateau. Consequently, future research is needed to explore the impact of a physiological plateau on psychological and behavioural factors to understand its role within PA maintenance.

### **3.7 Limitations**

There were a number of possible limitations to this study. First, a bias in participant characteristics might exist because incentives were offered to boost recruitment to the study. Second, there was a low response rate from male unsuccessful maintainers and were under-represented in the study. Research has highlighted that males are more likely to complete PARS and adhere to PA than females and could account for this finding (James et al., 2008). Third, self-report measures were used to

verify participant categories but are associated with over-reporting of PA which could produce a misclassification error and could explain the large difference between successful and unsuccessful maintainers (Sarkin, Nichols, Sallis, & Calfas, 2000). Fourth, the participants were recruited from the UK National Health Service (NHS), which might differ from health services internationally and influence PA behaviour change. Further research could benefit from replicating the study in different cultural contexts and health services, specific health conditions and severities, and different socio-demographic variables (e.g., gender). Finally, although present and future experiences of PA were discussed, the retrospective nature of inviting individuals to consider past experiences could introduce memory bias (Hassan, 2006).

### **3.8 Chapter Summary**

The chapter explored the determinants and strategies that influence successful and unsuccessful PA maintenance in adults with a range of health conditions. The maintenance process was influenced by the level of congruence between PA outcome expectations, experiences and values. Additionally, how well an individual negotiates barriers, seeks social support after an intervention, and reflects on the trial and error learning process all influence whether PA maintenance is achieved or individual's relapse. Factors specific to maintenance also emerged, such as experiences of PA outcomes, and a specific physical barrier labelled 'the plateau'. Multiple cognitive-behavioural strategies emerged for both PA self-management (e.g., self-monitoring) and condition management or coping (e.g., pacing and acceptance of limitations). The research also indicated potential strategies that overlap with specific determinants. For example, self-monitoring of a prioritised outcome expectation (e.g., to lose weight) can help to encourage experiences of any changes or benefits of that expectation (e.g., I have lost weight). In line with previous research in chronic illness self-management and behavioural maintenance research, an integrated motivational interviewing and cognitive-behavioural (MI-CB) approach was recommended to target the determinants for PA maintenance (Hogden et al., 2012; Naar-king et al., 2013). Future research is needed to explore the efficacy and feasibility of an integrative approach for PA maintenance, which would further provide recommendations for policy and healthcare practice. Additionally, further research would benefit from exploring successful PA maintenance determinants and strategies within specific socio-demographic variables (e.g., gender and cultural contexts). Overall, the findings from this study provide

guidance for healthcare practice and researchers targeting the determinants and strategies for long-term PA in adults with chronic health conditions.

# **Chapter 4**

## **Development of An Integrated Motivational Interviewing and Cognitive-behavioural (MI-CB) Intervention for Physical Activity Maintenance: An Intervention Mapping Approach.**



## **Chapter 4: Development of An Integrated Motivational Interviewing and Cognitive-behavioural (MI-CB) Intervention for Physical Activity Maintenance: An Intervention Mapping Approach.**

### **4.1 Introduction**

Understanding intervention components, such as theories, determinants and strategies are pertinent to developing an intervention and are part of the intervention mapping approach (Bartholomew et al., 2006). Chapter 2 provided a broad overview of the factors which promote PA maintenance but was largely inconclusive due to the multiple theories, determinants and strategies found, including the lack of specific PA maintenance interventions. Following previous recommendations for developing PA maintenance interventions (*cf.* Marcus et al., 2000), a qualitative study (Chapter 3) was conducted to establish the determinants and strategies used by successful and unsuccessful PA maintainers. A number of determinants (e.g., congruence between outcome expectations, experiences and values), and, again, multiple strategies were found, similar to that within the scoping review (Chapter 2). It was concluded that a person-centred approach and a 'tool-box' style of intervention delivery was needed, such as integrative motivational interviewing (MI) and cognitive-behavioural (CB) techniques (MI-CB). This type of approach has been recommended for promoting health behaviour maintenance (Naar-King et al., 2013) and chronic illness management (Hogden et al., 2012). As a result, this chapter will outline the methods taken to develop an MI-CB intervention for PA maintenance employing intervention mapping principles. Intervention mapping ensures that an intervention is derived from theory and ensures a transparency of intervention reporting, which is necessary for intervention evaluation, modification and future replication (Michie & Abraham, 2004). This is particularly needed within PA maintenance interventions as Chapter 2 identified the inadequate reporting of intervention content within interventions. The advantages and limitations of the intervention mapping approach will also be discussed. Finally, this chapter represents Phase 2 of the thesis (intervention development) and forms the foundations for future chapters concerning the evaluation of intervention efficacy and feasibility (Chapter 5) and assessment of treatment fidelity (Chapter 6).

## 4.2 Background to Intervention Development

When developing behaviour change interventions, it is recommended to derive the change mechanisms, such as the determinants and strategies, from evidence supported theory, which increases intervention effectiveness and future adoption (Michie & Abraham, 2008). Theory-based interventions are suggested to highlight the hypothesised change mechanisms and causal links for behaviour change, which enhances the understanding of how an intervention works and supports intervention replication rather than "reinventing the wheel" (Michie & Abraham, 2004). Nevertheless, all too often, reporting of interventions inadequately describe the link between theory, determinants, strategies and intervention aims or outcomes, particularly within PA settings (Bird et al., 2013; Breckon et al., 2008). This prevents the identification of the effective theories and intervention components and limits future intervention replication or theory refinement (Brug et al., 2005). Therefore, a more scientific reporting of intervention components is required within PA maintenance interventions to enhance our understanding of 'what works' (Breckon et al., 2008; Michie & Abraham, 2008).

To achieve this, a more systematic approach to intervention development has been recommended, such as intervention mapping (Bartholomew et al., 2006; Brug et al., 2005). Intervention mapping is a systematic and transparent approach, which outlines specific steps for intervention development, implementation, adoption and evaluation. The method ensures intervention developers derive the intervention from theory, and link the theory to determinants and strategies. The approach consists of six steps, including: (1) needs assessment; (2) intervention objectives and change objectives; (3) theoretical methods (e.g., self-monitoring from control theory) and practical strategies (e.g., self-monitoring of PA); (4) intervention development (e.g., materials); (5) adoption and implementation; and, (6) evaluation. To date, intervention mapping has been adopted within a wide range of health behaviour change research, including HIV prevention programs (Mikolajczak, Kok, Harm, & Hospers, 2008), adolescent smoking cessation (Dalum, Schaalma, & Kok, 2012), and worksite PA interventions (McEachan, Lawton, Jackson, Conner, & Lunt, 2008). Reporting of interventions using a systematic approach can help further the understanding of intervention components within effective and ineffective interventions and can enhance the knowledge of PA maintenance; where less is known (Hutchison et al., 2012).

Intervention mapping can also enhance the development and reporting of complex interventions, such as integrated MI-CB. Given that an intervention of its nature is novel to the PA maintenance literature, there is little evidence available which explains: how such interventions are created and implemented; which determinants they attempt to change to prompt PA maintenance; how they intend to prompt PA maintenance, and; how to integrate the two therapeutic approaches within a PA setting (*cf.* Moyers & Houck, 2011). Such information is vital to aid the future evaluation, modification and replication of such complex interventions, which intervention mapping can enable.

A further advantage of intervention mapping is that it ensures an outcome and process evaluation is considered from the outset of intervention development (Bartholomew et al., 2006). An outcome evaluation tests whether the intervention impacted on the determinants (e.g., outcome experiences) and behavioural objectives (e.g., PA maintenance) outlined during the earlier steps. A process evaluation explores treatment fidelity (TF), which assesses whether the intervention was delivered as intended and can identify possible intervention components that contributed to either a successful or unsuccessful intervention. Nevertheless, intervention mapping does not outline a specific framework to ensure that a comprehensive evaluation of TF is in place.

A comprehensive TF framework has been previously developed by the Behaviour Change Consortium (BCC; Bellg et al., 2004) and consists of five areas of fidelity: (1) design (e.g., dose); (2) training (e.g., competence); (3) delivery (e.g., intervention delivered as intended); (4) receipt (e.g., participant attendance and comprehension); and, (5) enactment (e.g., the strategies used by the participants). An advantage of implementing TF measures throughout an intervention can help identify and correct any deviations from intervention protocol early on; thus enhancing the internal validity of the study and intervention effectiveness (Bellg et al., 2005). Furthermore, a TF assessment enables researchers to identify the components that might explain the effective or ineffective interventions or intervention components, which helps guide intervention refinement. For example, if an intervention is found to be ineffective, and deviations from the protocol were identified, then it can be assumed that the intervention was ineffective because of inadequate delivery. Within PA research, however, such a thorough evaluation is often absent, which means ineffective interventions, or intervention components, could be adopted whereas effective interventions could be rejected (Breckon et al., 2008). Therefore, including a TF

framework into the intervention mapping process can ensure a thorough assessment of the intervention processes.

Despite the advantages of intervention mapping, specific limitations threaten its correct implementation. While a central focus of intervention mapping is to derive an intervention from theory, there is little evidence supporting the theories or constructs for PA maintenance (Hutchison et al., 2012). Consequently, it is unclear how to develop PA maintenance interventions. Nevertheless, intervention mapping provides some guidance within such circumstance, such as conducting literature reviews, qualitative studies and using multiple theoretical constructs that are evidence-based to explain the behaviour change (Bartholomew et al., 2006). Therefore, intervention mapping can provide a transparent and systematic method for ensuring an intervention is derived from multiple theories.

A further limitation of intervention mapping is that a detailed guide is not provided for the mapping of specific techniques onto theoretical determinants during steps 2 and 3 (Michie & Abraham, 2004). This means that interventions are at risk of being theory-inspired rather than theory-based; thus limiting intervention effectiveness and future replication (Michie & Abraham, 2004). Since this limitation was first revealed, the taxonomy of behaviour change techniques (BCTs) was developed, which identifies a number of cognitive-behavioural techniques and associated theoretical constructs for promoting behaviour change (Abraham & Michie, 2008; Michie et al., 2011b). This provides a tool for the development, delivery and evaluation of theoretically-based behaviour change interventions which, if used in conjunction with intervention mapping, can also enhance the reporting of interventions.

### **4.3 Chapter Aims**

The aim of this chapter is to outline the systematic development of a counselling intervention for PA maintenance, and introduce the methods for intervention implementation and evaluation (outcome and process) of a randomised controlled trial pilot study. The intervention development is described in relation to the six steps of intervention mapping (Bartholomew et al., 2006), and will display the integration of MI-CB techniques. The transparent reporting of intervention development and implementation also enables researchers to test, refine and evaluate a theory-based intervention for PA maintenance. This chapter forms the foundations for the subsequent



chapters relating to intervention efficacy and feasibility (Chapter 5), and assessment of treatment fidelity (Chapter 6).

## **4.4 Methods**

### ***4.4.1 Step 1: Needs Assessment, Scoping Review, and Qualitative Study***

Step 1 of the intervention mapping approach consists of a needs assessment phase (Bartholomew et al., 2006). This involves collecting and interpreting data, which informs the intervention development. Three primary methods were used to conduct this step: (1) an overview of the current problem (i.e., PA maintenance and drop-out) and the impact on health and economics at the population level (*cf.* Chapter 1); (2) a scoping review of the scientific literature to understand the intervention components, theory, determinants, and strategies for PA maintenance (*cf.* Chapter 2); and, (3) a qualitative study exploring the determinants and strategies for successful and unsuccessful PA maintenance in adults with chronic health conditions (*cf.* Chapter 3). The specific methods of the scoping review and qualitative study have been reported in their respective chapters and will not be repeated again here. To decide which determinants to include, the scoping review and evidence-base was searched to find the strength of association between the determinants and PA maintenance identified from the qualitative study.

Additionally, a linkage group was created which consisted of health professionals associated with the physical activity referral schemes (PARS) across South Yorkshire. Health professionals included: PARS coordinators, exercise referral staff, health and wellbeing managers of local leisure centres, and the primary researcher's supervisory team (JB and RC). The purpose of the group was to inform the intervention development, particularly in terms of pragmatic issues associated with intervention recruitment and implementation. A detailed description of PARS was provided earlier (Chapter 1, Section 1.1.2). Briefly here, sedentary patients with chronic health conditions (e.g., diabetes) are referred to PARS for three months of free or reduced-cost gym membership and/or tailored exercise sessions. The scheme is not a traditional theory-driven behaviour change intervention targeting psychological components and does not promote PA maintenance (Harrison et al., 2004; Pavey et al., 2011).



#### ***4.4.2 Step 2: Intervention Objectives, Performance Objectives, and Change Objectives.***

Step 2 of the intervention mapping approach involves developing intervention objectives, performance objectives and matrices of change objectives for the intervention (Bartholomew et al., 2006). First, the intervention objective was created. This was to encourage PA maintenance after successful completion of PARS and completion of this intervention across a six-month period: where a reduction in PA is typically observed (Fjeldsoe et al., 2011; Marcus et al., 2000). Second, performance objectives were established which are sub-behaviours that facilitate a health behaviour (i.e., PA maintenance). They were created by answering the question: 'What do participants need to do to maintain PA in the long-term?' The objectives were informed and validated by the results of the needs assessment, (e.g., the qualitative study) and gathering feedback from the linkage group (see Step 1). Example performance objectives are: (1) identify barriers to PA participation and maintenance; and (2) seek social support for exercise. Finally, matrices of change objectives were created, which specify the action or change needed to influence the theoretical determinants and performance objectives to encourage PA maintenance.

#### ***4.4.3 Step 3: Theoretical Methods, Practical Strategies and Parameters of Use.***

Step 3 of the intervention mapping approach considers linking the change objectives to theoretical methods and practical strategies (Bartholomew et al., 2006). A theoretical method is a technique that can facilitate change in the desired determinant and is derived from theory (e.g., self-monitoring from control theory). A practical strategy is the specific component of a theoretical method that is applied to the target population (e.g., self-monitoring of PA). Parameters of use (i.e., the conditions which must be present for the strategy delivery) should also be outlined by the theory. Given the limitations of theory for explaining the BCTs (i.e., theoretical methods) for PA maintenance (Brug et al., 2005; Hutchison et al., 2012), the theoretical methods, practical strategies and parameters of use were developed from Step 1 and 2, and in consultation with the linkage group. Additionally, the theory of MI also informed the practical strategies and parameters of use (*cf.* Miller & Rollnick, 2013).

#### ***4.4.4 Step 4: Development of Intervention Components and Materials***

Step 4 of the intervention mapping approach involves the intervention development, including: intervention duration, number of sessions and content, and intervention materials (Bartholomew et al., 2006). These intervention components were developed from the findings of the scoping review (Step 1) and in conjunction with feedback from the linkage group. Although the intervention is largely a talking therapy, some materials were developed to support specific CB techniques, such as exercise diaries. An initial assessment sheet was also created to help guide the intervention provider through exploration of the main determinants for PA maintenance, including prompts to remind the provider which MI-CB techniques to use.

#### ***4.4.5 Step5: Adoption and Implementation***

Step 5 of the intervention mapping approach considers the adoption and implementation of the intervention, including dealing with recruitment across multiple leisure centres and adoption of the intervention after completion of the research. A plan of implementation (e.g., session content and structure) was developed.

#### ***4.4.6 Step 6: Intervention Evaluation***

The final step of the intervention mapping approach involves the implementation of evaluation procedures to assess effective and ineffective intervention components (Bartholomew et al., 2006). Three areas of evaluation were considered: (1) intervention efficacy; (2) feasibility; and, (3) treatment fidelity (TF) in accordance with the TF framework (Bellg et al., 2005). Aspects of feasibility were included where possible in line with previous recommendations for good practice within pilot studies (Lancaster, Dodd, & Williamson, 2004). The five aspects of TF were also implemented. Fidelity to design ensures that an intervention is delivered in accordance to its theoretical underpinning and the specified dose. Fidelity to training ensures that the intervention provider is competent to deliver the intervention techniques and can engage in on-going training to prevent "drift". Fidelity to delivery ensures that the intervention is delivered in accordance with the protocol and any deviations are identified and corrected early on. Fidelity to receipt ensures that the participants: are satisfied with intervention delivery; can understand the intervention; and, are confident to use the

strategies. Fidelity to enactment ensures that participants actually enact the strategies for behaviour change.

## **4.5 Results**

### ***4.5.1 Step1: Needs Assessment, Scoping Review, and Qualitative Study.***

The results of the scoping review and qualitative study have been provided in detail in Chapter 2 and 3 respectively. The results from the scoping review were largely inconclusive as multiple theories, determinants and BCTs were identified making the results difficult to interpret. A number of gaps within the literature were also identified, some of which were addressed within the qualitative study (Study 1, Chapter 3). The qualitative study explored the determinants and strategies used for successful and unsuccessful PA maintenance after successful completion of PARS. The studies were reviewed collectively and the key findings that were taken to inform the MI-CB intervention were as follows;

- (1) effective intervention modalities were face-to-face and telephone delivered components and are implemented within the intervention, as identified by the scoping review (discussed further in section 4.5.4.2);
- (2) multiple theories were largely employed in interventions and are suggested when no single theory adequately explains the behaviour in question (Brug et al., 2005). This informed the decision to include multiple theoretical components within the intervention;
- (3) multiple CB techniques were often employed and included self-monitoring and goal-setting for a behaviour, in line with the taxonomy of BCTs (Michie et al., 2011b). This informed the decision to include multiple CB techniques within the intervention; and,
- (4) condition management (e.g., pacing), coping strategies (e.g., acceptance through trial and error or active planning) and exercise specific strategies (e.g., exercise advice concerning the plateau) were also included; and,
- (5) the determinants identified from the qualitative study to be included in the MI-CB intervention outcome expectations, outcome experiences, values, social support, a trial

and error learning process, attitudes towards PA and overcoming barriers (physical, psychological and environmental).

To identify which determinants to implement within the intervention, existing evidence and the scoping review (Chapter 2) were searched for evidence for the associations between the determinants and PA maintenance. Multiple theories were reviewed to identify the theoretical component which best explained the link between the determinants and PA maintenance. Overlap between theories was found and so the multiple theoretical components were included. The determinants and their corresponding theoretical components identified from step 1 are presented in Table 4.1, such as outcome expectations and barrier self-efficacy for PA. Theories included were: (1) expectancy-value theory (Janis, 1984); (2) social cognitive theory (Bandura, 1986); (3) relapse-prevention (Marlatt & Donovan, 2005); (4) theory of behavioural maintenance (Rothman, 2000); and (5) disconnected values theory (Anshel & Kang, 2007).

The linkage group was consulted after each study within Step 1. PARS co-ordinators agreed that a specific PA maintenance intervention and evaluation aimed at understanding how to promote long-term maintenance would be beneficial for their service. This is particularly the case as evidence suggests that PARS demonstrate short-term but not long-term effectiveness for PA (Harrison et al., 2004; Pavey et al., 2011). Therefore, it was decided that a theoretically driven PA intervention would need to be delivered to patients after successful PARS completion to help individuals transition from PA initiation to maintenance. Successful completion was determined by successful adherence of at least 75 percent or 2 sessions per week. Step 1 also identified a research gap in that males and specific conditions (e.g., respiratory conditions) were under researched. PARS co-ordinators and leisure centre managers did not agree, however, that the research inclusion criteria should be reduced to just males or specific health conditions given the heterogeneity of their service. It was also concluded that excluding particular sub-populations would largely reduce the total sampling frame for the research. Therefore, all adults with chronic health conditions and/or co-morbidities were to be included to enhance the external validity of the study.



**Table 4.1.** Evidence of Importance and Theory of the Personal and External Physical Activity Maintenance Determinants.

Determinants	Evidence for importance	Theory
<b>Personal</b>		
PA outcome expectations	$r = .24, p < .01$ <sup>1</sup>	Expectancy-value theory/Rothman's theory of behavioural maintenance
PA outcome experiences	$r = .13, p < .05$ <sup>2</sup>	Expectancy-value theory/Rothman's theory of behavioural maintenance
Outcome expectations-experiences discrepancy	$F(1, 70) = 6.153, p < .05$ <sup>3</sup>	Expectancy-value theory/Rothman's theory of behavioural maintenance
Core values	$F(1, 163) = 105.56, p < .001$ <sup>4</sup>	Disconnected values theory
Trial and error	<i>Process involved in condition management</i> <sup>5</sup>	Social cognitive theory & Relapse prevention model
Attitudes towards PA	OddsRatio= 3.30, $p < .05$ <sup>6</sup>	Social cognitive theory
Coping skills	$r = .39, p < .01$ <sup>7</sup>	Relapse prevention model
<b>External</b>		
Social support for exercise and condition management		Social cognitive theory
Family	$F(1, 70) = 65.510, p < .05$ <sup>8</sup>	
Friends	$F(1, 68) = 4.225, p < .001$ <sup>8</sup>	
Professionals	$r = .35, p < .05$ <sup>9</sup>	
Self-efficacy/skills to overcome barriers	$F(4, 1168) = 54.67, p < .01$ <sup>10</sup>	Relapse prevention model/Social cognitive theory
Physical		
Environmental		
Psychological		

Note: <sup>1</sup>Sweet, Tulloch, Fortier, Pipe & Reid (2011); <sup>2</sup>Fleig, Lippke, Pomp, & Schwarzer (2011); <sup>3</sup>Sears & Stanton (2001); <sup>4</sup>Anshel & Kang (2007); <sup>5</sup>Kralik, Koch, Price, & Howard (2004); <sup>6</sup>Stiggelbout, Hopman-Rock, Crone, Lechner, & van Mechelen (2006); <sup>7</sup>Ziegelmann, Lippke, & Schwarzer (2006); <sup>8</sup>Stevens, Lemmink, van Heuvelen, de Jong, & Rispen, (2003); <sup>9</sup>Resnick, et. al., (2008); <sup>10</sup> Rhodes & Plotnikoff, (2006).



#### ***4.5.2 Step 2: Intervention Objectives, Performance Objectives, and Change Objectives.***

As previously mentioned, the intervention objective was to encourage PA maintenance after successful completion of PARS. The specific behaviour to be maintained was clarified with the linkage group. Due to the potential range of limitations and capabilities of the heterogeneous clinical population, it was agreed that the amount of PA to be maintained would be specific to each individual but with the view of not deteriorating below 30 minutes a day of moderate-vigorous intensity PA (DoH, 2011). This also equates to a kcal expenditure of 1,500 (Kokkinos & Myers, 2010). In terms of steps, an average of 4,600 steps/day is recommended as the absolute minimum for health benefits in populations with chronic illness due to co-morbid disability and functional limitations (Tudor-locke et al., 2011).

The performance objectives were created from the theoretical determinants that were realised during Step 1. For example, in line with expectancy value theory (Janis, 1984; Sears & Santon, 2001), it was realised that PA maintenance can occur when the most important outcome expectation (e.g., 'I expect to lose weight') is experienced (e.g., 'I have lost weight'), and the individual is satisfied with this experience (e.g., 'I am satisfied with my weight loss'). Additionally, PA disengagement was found to occur if a lack of congruence existed between prioritised expectations, experiences and values, which could be a result of unrealistic expectations. In line with relapse prevention theory (Marlatt & Donovan, 2005), it was realised that physical, psychological and environmental barriers needed to be identified and cognitive-behavioural self-management or coping strategies were needed to overcome any barriers to PA maintenance. In line with social cognitive theory (Bandura, 1986), it was also realised that PA maintenance can occur if social and practical support is received from family, friends, and health professionals, such as providing encouragement, feedback, and monitoring PA. PA disengagement can occur, however, if the individual becomes dependent on this support and the support is then withdrawn. It was also realised that PA maintenance can occur through a reflective trial and error process. This is where the individual learns from past mistakes (or relapses) and develops new strategies or approaches to continue engaging in PA. PA disengagement could occur if this process is not apparent, which is explained by relapse prevention model and social cognitive theory. The performance objectives are summarised in Table 4.2.

**Table 4.2.** Performance Objectives for Maintaining Physical Activity

- 
1. Develop congruence between prioritised PA outcome expectations, experiences, and values
  2. Identify reasons for discrepancies between prioritised PA outcome expectations, experiences and values
  3. Identify any psychological, physical, and environmental barriers to PA participation
  4. Implement cognitive-behavioural techniques and coping strategies to overcome barriers to PA participation
  5. Increase self-efficacy to overcome barriers to PA participation
  6. Seek social and practical support for exercise
  7. Seek social and practical support for condition management
  8. Adopt a reflexive trial and error approach to PA maintenance and condition management
  9. Increase positive attitudes towards PA
  10. Develop coping and condition management skills for PA
- 

Next, the matrices of change tables were created by placing performance objectives along the left table margin and each determinant across the top of the table (see Table 4.3 for examples or Appendix H for the full matrices). At the intersection of each determinant and performance objective, the desired action for change is considered. For example, if the performance objective was to develop congruence between prioritised outcome expectations and experiences, and the determinant was barrier self-efficacy, then the change objective would be to identify any psychological, physical or environmental barriers that might prevent favourable experiences of prioritised outcome expectations. The matrices of change objectives formed the main outline of the intervention to be delivered.

**Table 4.3.** Example of the Matrices of Change Objectives

<b>Performance Objectives</b>	<b>Psychological Determinants</b>		
	<b>PA outcome expectations</b>	<b>PA experiences</b>	<b>Core Values</b>
Develop congruence between PA outcome expectations, experiences and core values.	Explore the existing outcome expectations from engaging in regular PA	Discuss current experiences with PA (positive and negative) and any ambivalence	Explore how core values facilitate PA to enable continual engagement and experience PA outcome expectations
Identify any psychological barriers to PA participation	Identify any unrealistic expectations which might present as barriers	Identify any barriers that prevent positive experiences and satisfaction of prioritised outcome expectation	Discuss how core values can be a barrier if prioritised over PA.

#### **4.5.3 Step 3: Theoretical Methods, Practical Strategies and Parameters of Use**

The theoretical methods (e.g., self-monitoring from control theory) and practical strategies (e.g., self-monitoring of PA) were identified from the scoping review, qualitative study, and existing evidence-base. The qualitative study realised the need for integrative MI-CB to promote PA maintenance within a heterogeneous population. Such an approach has been previously suggested for maintenance of health behaviours (Naar-King et al., 2013). Furthermore, an integrative or 'tool-box' style approach is the preferred method among health professionals working in chronic illness management (Hogden et al., 2012). Therefore, theoretical methods, practical strategies and parameters of use are outlined in accordance with MI and the parameters for integration with CB techniques (Miller & Rollnick, 2013).

##### **4.5.3.1 Motivational Interviewing (MI)**

MI is a person-centred and collaborative approach to health care, which explores any ambivalence to change, core values, and discrepancies between expected/ideal and actual outcomes for health behaviour (Anshel & Kang, 2008; Miller & Rollnick, 2013). By tailoring MI to an individual's stage of readiness, MI can enhance autonomy and self-efficacy for behaviour change, which has been found to effectively promote PA (Hardcastle, Taylor, Bailey, Harley, & Hagger, 2013; Resnicow & McMaster, 2012).

Additionally, MI can foster a strong therapeutic relationship between practitioner and client, which has been shown to enhance intervention effectiveness and encourage maintenance of behaviour change (Wagner et al., 2005). Specific skills are used which can be categorised into technical listening skills (e.g., open questions, affirmations, reflections, summaries [OARS]) and relational skills (e.g., empathy, autonomy support, evocation and collaboration). The relational skills form the person-centred "spirit" of MI, which is suggested to be largely influential in behaviour/therapeutic change (Moyers, Miller & Hendrickson, 2005). The technical components are often used to elicit client change talk, such as client's expressions of desire, ability, reason, need, commitment, action and taking steps towards a behaviour change (Miller & Rollnick, 2013). While client's expressions of desire, ability, reason and need are seen as motivational precursors of change, expressions of action and commitment language are found to be predictors of change (Moyers et al., 2007). Particularly, enhancing the strength of commitment language has been found to be a predictor of outcomes (Amrhein, Miller, Yahne, Palmer & Fulcher, 2003). Overall, MI provides a framework of techniques that can be used to explore the determinants and performance objectives outlined above, such as exploring discrepancies between PA outcome expectations and experiences, and supporting autonomy.

#### *4.5.3.2 Cognitive-behavioural Techniques*

CB techniques are strategies that either change cognitions (e.g., changing attitudes through cognitive restructuring) or behaviours (e.g., changing PA through action planning; Willson & Branch, 2006). CB techniques often require action to enact the techniques and therefore require an individual to be in a state of readiness (Flynn, 2011). During step 1 of the intervention mapping process, it was revealed that multiple CB techniques were used for self-management of PA (e.g., self-monitoring), condition management (e.g., pacing), and coping (e.g., acceptance of limitations) for successful PA maintenance. In addition to the techniques found in Study 1, the 40-item taxonomy of BCTs was used to support the implementation of the CB techniques (Michie et al., 2011b). The primary techniques included in the intervention are outlined in Table 4.4. The linkage group suggested that additional techniques might be needed during the intervention delivery due to the range of needs associated with the heterogeneity of the sample. Therefore, the techniques listed in Table 4.4 are not exhaustive.



**Table 4.4** Cognitive-behavioural Techniques in MI-CB Intervention

Taxonomy-derived Techniques <sup>1</sup>	CB Techniques	Definition
Prompt goal setting (behavioural)		The person is encouraged to make a behavioural resolution (e.g. increase time on treadmill next week). This is directed towards encouraging people to decide to change or maintain change. Goals may also be set using SMART goals (Specific, Measurable, Achievable, Realistic and Time bound)
Prompt goal-setting (outcome)		The person is encouraged to set a general goal that can be achieved by behavioural means but is not defined in terms of behaviour (e.g. to reduce blood pressure or lose/maintain weight), as opposed to a goal based on changing behaviour as such. The goal may be an expected consequence of PA.
Prompt review of goals (behavioural/outcome)		Involves a review or analysis of the extent to which previously set behavioural goals (e.g. take more exercise next week) or outcome goals (e.g., to lose weight) were achieved.
Prompt action planning		Involves detailed planning of what the person will do including when, in which situation and/or where to act. 'When' may describe frequency such as how many times a day/week or duration (e.g. for how long). The action plans for the MI-CB intervention also included a review of barriers and progress.
Prompt self-monitoring (behavioural)		The person is asked to keep a record of specified behaviour(s) as a method for changing behaviour. This should be an explicitly stated intervention component, as opposed to occurring as part of completing measures for research purposes. This could take the form of a diary.
Prompt self-monitoring (outcome)		The person is asked to keep a record of specified measures expected to be influenced by the behaviour change, e.g. blood pressure, blood glucose, weight loss, physical fitness.
Provide feedback on performance		This involves providing the participant with data about their own recorded behaviour or commenting on a person's behavioural performance (e.g. identifying a discrepancy with between behavioural performance and a set goal)
Provide information about consequences of exercise/PA/diet/condition management (in general).		Information about the relationship between the behaviour and its possible or likely consequences in the general case, usually based on epidemiological data, and not personalised for the individual. For example, education may be provided about the physiological plateau and how to overcome it.



CB Techniques	Definition
Provide information on consequences about exercise/ PA/diet/condition management (individual).	Information about the benefits and costs of action or inaction to the individual or tailored to a relevant group based on that individual's characteristics (i.e. demographics, clinical, behavioural or psychological information). This can include and costs/benefits and not necessarily those related to health, e.g. feelings.
Provide instruction on how to perform the strategy (e.g., self-monitoring)	Involves telling the person how to perform behaviour or preparatory behaviours, either verbally or in written form. Examples of instructions include; how to use gym equipment (without getting on and showing the participant), instruction on suitable clothing, and tips on how to take action.
Prompt barrier identification	This presumes having formed an initial plan to change behaviour. The person is prompted to think about potential barriers and identify the ways of overcoming them. Barriers may include competing goals in specified situations. This may be described as 'problem solving'. Examples of barriers may include behavioural, cognitive, emotional, environmental, social and/or physical barriers.
Prompt problem solving	This presumes having formed an initial plan to change behaviour. The person is prompted to identify the ways of overcoming barriers. Barriers may include competing goals in specified situations. Examples of barriers may include behavioural, cognitive, emotional, environmental, social and/or physical barriers.
Plan social support or social change	Involves prompting the person to plan how to elicit social support from other people to help him/her achieve their target behaviour/outcome. This will include support during interventions e.g. setting up a 'buddy' system or other forms of support and following the intervention including support provided by the individuals delivering the intervention, partner, friends and family.
Provide rewards contingent on effort or progress	Involves the person using praise or rewards for attempts at achieving a behavioural goal. This might include efforts made towards achieving the behaviour or progress made in preparatory steps towards the behaviour, but not merely participation in intervention. This can include self-reward.
Provide rewards contingent on successful behaviour	Reinforcing successful performance of the specific target behaviour. This can include praise and encouragement as well as material rewards but the reward/incentive must be explicitly linked to the achievement of the specific target behaviour i.e. the person receives the reward if they perform the specified behaviour but not if they do not perform the behaviour.

CB Techniques <sup>1</sup>	Definition
Prompt time management strategies	This includes any technique designed to teach a person how to manage their time in order to make time for the behaviour. These techniques are not directed towards performance of target behaviour but rather seek to facilitate it by freeing up times when it could be performed. Also includes focusing on planning, being flexible and increasing 'me time'.
Prompt social comparison	Involves explicitly drawing attention to others' performance to elicit comparisons
Set/encourage graded tasks	Breaking down the target behaviour into smaller easier to achieve tasks and enabling the person to build on small successes to achieve target behaviour. This may include increments towards target behaviour or incremental increases from baseline behaviour.
Prompt use of visualisation/imagery	Teach the person to imagine successfully performing the behaviour or to imagine finding it easy to perform the behaviour, including component or easy versions of the behaviour
<b>Additional Techniques from Qualitative Study (Study 1)</b>	
Distraction technique	The person is encouraged to use a distraction from exercise which is found to be monotonous such as listening to music.
Prompt adding variety to exercise	In response to a physiological plateau, the person is encouraged to add variety to their exercise (e.g., by increasing the intensity, time, number of sets, or changing the actual activity) in order to overcome the plateau.
Prompt activity pacing	In response to the overwork-collapse pattern of behaviour, activity pacing involves a number of strategies including graded tasks and self-monitoring. The person is encouraged to keep an activity diary to identify the overwork collapse pattern and then is asked to reduce their activity to a level which does not trigger symptom flare ups. This is the baseline level of activity. The person is then asked to gradually increase their activity from the baseline level while taking regular rests.
Prompt cognitive restructuring	When negative or distorted thinking styles are identified (e.g., siding with the negative), the thought is challenged through questioning (e.g., what can you do? What are your capabilities?).
Prompt seeking health professional support	Similarly to planning social support, the person is encouraged to develop their support seeking skills such as seeking health/exercise support specifically in relation to their condition, health and exercise.
Encourage trial and error approach	The person is prompted to reflect on any setbacks to encourage a learning process. The trial and error approach can be used in conjunction with barrier identification, problem solving and review of goals.

<b>CB Techniques</b>		<b>Definition</b>
<b>Motivational Interviewing Related Strategies/Processes</b>		
Elicit outcome expectations		The intervention provider uses technical listening skills (OARS) to elicit outcome expectations (e.g., what do you expect to achieve by engaging in PA?).
Elicit PA outcome experience		The intervention provider uses technical listening skills (OARS) to explore the person's experiences of PA and their expectations.
Elicit priority of PA outcome expectations		The intervention provider uses technical listening skills (OARS and scaling rulers) to identify the most prioritised PA outcome expectation.
Exploration of satisfaction with PA outcomes		The intervention provider uses technical listening skills (OARS and scaling rulers) to explore the person's level or satisfaction with the outcomes.
Elicit ambivalence/discrepancy		The intervention provider uses technical listening skills (OARS) to explore any discrepancies or ambivalence between expected (ideal) and actual PA experiences. For example, is the person has lost a stone in weight but is still not satisfied with the outcome then reasons for this dissatisfaction need to be explored. Such reasons might involve unrealistic expectations.
Elicit values		The intervention provider uses technical listening skills (OARS) to explore the person's wider values (e.g., health and family) which can be used to tailor goals. Such values can be elicited by asking "What do you value the most in life?" or through the use of a value sort card exercise.
Discuss pros and cons of behaviour change		The pros and cons of changing/maintaining behaviour and staying the same are explored in line with MI principles. A decisional balance form may be used.
Encourage acceptance of situation		Reflective listening can encourage acceptance of the situation and can be used as part of cognitive reframing. The technique can also be used in conjunction with providing information about the consequences.

<sup>1</sup> Definitions are adapted from the 40-item behaviour change taxonomy (Michie et al., 2011b).

#### *4.5.3.3 The Integration of MI and CB Techniques: A Meta-Structure*

The integration of MI and CB techniques is suggested to enhance the effectiveness of interventions (Flynn, 2011; See Chapter 5 for a more detailed discussion). Within the integration of the two approaches, MI provides a meta-structure within which practitioners move from specific processes of therapy and provides the platform for CB technique delivery. The processes of therapy are: engagement, focusing, evoking, and planning (action); a detailed explanation of each process can be found in Miller & Rollnick (2013). Briefly here, during the engagement phase, the practitioner employs listening skills (i.e., OARS) to engage the client and begins to establish a therapeutic relationship, while avoiding specific traps, such as the expert and labelling trap. A collaborative exploration of the client's problem or situation will take place, including exploration of values and goals. During the focusing phase of MI, the practitioner works collaboratively with the patient to establish a focus or specific goal to explore within the session(s) (e.g., PA or diet). If any information or feedback needs to be provided by the practitioner, it is done so collaboratively using the elicit-provide-elicit method (E-P-E). This is where the practitioner asks the client for permission to provide information (E), then provides the information (P), and then asks for the client's thoughts about the information (E). The evocation phase allows the practitioner to elicit and respond to client change talk, including exploration of reasons for ambivalence and sustain talk or discrepancies between expected and experienced outcomes. Particularly, hope and confidence can be evoked using a range of strategies, such as confidence rulers, affirming strengths, cognitive reframing, and reviewing past successes. The planning phase is only entered once the patient is ready to proceed with a goal. Then, the practitioner and patient work collaboratively to develop an action plan, during the final phase. It is during the planning phase that CB techniques can be integrated (Madson, Loignon & Lane, 2009; Miller & Rollnick et al., 2013). Overall, the delivery ratio of MI to CB techniques differs during each process of therapy; with MI primarily adopted initially within the engagement and focusing phase and eventually moving towards more CB technique delivery within the planning phase. Nevertheless, the integration of the approaches also ensures that the CB techniques should be delivered using the relational principles of MI (e.g., empathy and autonomy) and with the technical components of MI (e.g., E-P-E and OARS).



#### *4.5.3.4 When to Move from MI to CB Technique Delivery*

A pertinent issue for practitioners implementing integrated MI-CB concerns knowing when to move from employing MI to action-oriented CB techniques (Burke, 2011; Resnicow, McMaster & Rollnick, 2012). As outlined above, the meta-structure provides a framework which suggests that MI is largely employed during the engagement phase whereas CB techniques are largely employed during the planning phase. Nevertheless, the processes of therapy can all occur within a single session or across a number of sessions depending on the client and their current situation or level of motivational readiness (Moyers & Houck, 2011). As a result, there are additional decision prompts (or parameters of use), which have been outlined by Miller & Rollnick (2013). For example, CB techniques can be delivered when the patient expresses increased change talk, specifically strength of commitment language, action or taking steps towards the behaviour. An example of strong commitment language is "I am going to exercise tomorrow morning" whereas weak commitment language is "I might exercise tomorrow morning" and has been shown to be a predictor of outcomes (Amrhein et al., 2003). Additionally, CB techniques could be implemented when patients begin to envision future behaviour or when sustain talk has diminished (Miller & Rollnick, 2013). It would be considered MI non-adherent if the intervention provider were to prompt CB techniques within the engagement phase unless clients expressed commitment language. Therefore, these decision prompts were employed as a guide for CB technique delivery within the MI-CB intervention.

#### *4.5.3.5 Using MI-CB techniques to Change the Determinants for PA Maintenance*

Matrices were created (*cf.* Table 4.5) to provide examples of how MI-CB techniques would be used to target the determinants for PA maintenance (e.g., congruence/discrepancy between expectations and actual PA or health experiences). For example, listening skills (e.g., OARS) would be used to explore expectations and experiences. Scaling rulers would then be used to elicit prioritised/valued PA expectations and satisfaction with current PA experiences; thus, helping to identify any ambivalence to PA behaviour change. If a lack of experience of a prioritised outcome expectation (e.g., weight loss) causes ambivalence to PA maintenance, then self-monitoring of the prioritised outcome expectation (e.g., weekly weighing) could be suggested. Additionally, E-P-E could be used when providing suggestions for CB



techniques to overcome barriers to PA, which would ensure that the delivery of CB techniques is person-centred and collaborative. Further examples can be found in Table 4.5. The table serves only as a guide as the intervention adopted a flexible and tailored approach, which is considered to enhance effectiveness compared to adhering to a manualised protocol (Lundahl, Kunz, Brownell, Tollefson, & Burke, 2010).

**Table 4.5** Parameters of Use for MI-CB Integration and Performance Objectives

Performance Objectives	MI Techniques	CB Techniques
Develop congruence between prioritised PA outcome expectations, experiences, and values	<ul style="list-style-type: none"> <li>• Use open questions, affirmations, reflections, and summaries (OARS)</li> <li>• Scaling questions: "On a scale of 0-10, what is the most important experience for you?"</li> <li>• Elicit level of change talk</li> </ul>	<ul style="list-style-type: none"> <li>• Promote self-monitoring of prioritised outcome expectation to facilitate experience (e.g., food diaries/activity diaries)</li> <li>• Provide feedback on self-monitored behaviour.</li> </ul>
Identify reasons for discrepancy between prioritised outcome expectations, experiences and values	<ul style="list-style-type: none"> <li>• Scaling questions and exploration: "On a scale of 0-10, how satisfied are you with your mobility/weight/fitness?"; "What are the reasons for a 4 and not a 3?"</li> <li>• Use OARS to explore reasons for discrepancy/ambivalence/sustain talk</li> <li>• Consider decisional balance</li> </ul>	<ul style="list-style-type: none"> <li>• Highlight the link between the situational, cognitive, behavioural, emotional, and physical levels associated with the discrepancy</li> </ul>
Identify any barriers to PA participation	<ul style="list-style-type: none"> <li>• Open-ended questions: "What do you think would get in the way of you achieving your goal?"</li> <li>• Use OARS for further exploration</li> </ul>	<ul style="list-style-type: none"> <li>• Barrier identification (e.g., the plateau, illness, access to leisure, motivation etc)</li> </ul>
Implement CB strategies and coping to overcome barriers	<ul style="list-style-type: none"> <li>• Use OARS for exploration and collaboration</li> <li>• Use E-P-E to make strategy suggestions and foster collaboration.</li> </ul>	<ul style="list-style-type: none"> <li>• Problem solving</li> <li>• Refer to the taxonomy of BCTs to tailor strategies to individual</li> <li>• Coping strategies (e.g., acceptance, planning, active seeking)</li> </ul>
Increase self-efficacy to overcome barriers	<ul style="list-style-type: none"> <li>• Use confidence rulers to elicit level of confidence and change talk: "On a scale of 0-10, how confident are you?"; "What are the reasons for a 5 and not a 3?"</li> <li>• Affirmation for any attempts at exercise/goal</li> </ul>	<ul style="list-style-type: none"> <li>• CB techniques might be applicable depending on individual situation, problem and context.</li> </ul>

Performance Objectives	MI Techniques	CB Techniques
Seek social and practical support for exercise or condition management	<ul style="list-style-type: none"> <li>• Use OARS for exploration of social support from significant other(s)</li> <li>• Use E-P-E for recommendations</li> </ul>	<ul style="list-style-type: none"> <li>• Plan social support or social change</li> </ul>
Adopt a reflexive trial and error approach	<ul style="list-style-type: none"> <li>• Use OARS to prompt reflexive learning process</li> </ul>	<ul style="list-style-type: none"> <li>• Highlight the link between the cognitive, behavioural, physical and emotional elements of problem</li> <li>• Suggest pacing technique if overwork-collapse pattern of behaviour is identified (using E-P-E).</li> <li>• Weigh up the pros and cons/decisional balance</li> </ul>
Increase positive attitudes towards PA	<ul style="list-style-type: none"> <li>• Use OARS to explore reasons for negative attitudes</li> <li>• Elicit change talk and identify reasons for negative attitudes (sustain talk)</li> <li>• Decisional balance</li> </ul>	
Develop coping and condition management skills	<ul style="list-style-type: none"> <li>• Use OARS to explore current coping strategies and foster acceptance</li> <li>• Use E-P-E for recommendations</li> </ul>	<ul style="list-style-type: none"> <li>• Refer to Table 4.4 or taxonomy to tailor to the individual.</li> </ul>

#### ***4.5.4 Step 4: Development of Intervention Components and Materials***

During the development of the intervention components, a number of factors were considered, including: (1) intervention duration; (2) intervention session number and content; and, (3) intervention materials. Each component will be discussed below;

##### ***4.5.4.1 Intervention Duration***

It was decided to deliver the intervention across three months after PARS completion with a further three months without intervention contact. This would enable an assessment of whether the MI-CB intervention could support participants into the PA maintenance phase where a decrease in PA is usually observed (*cf.* Buckworth & Dishman, 2002). Maintenance is defined, here, as having maintained PA for six months or more (Marcus et al., 2000). Furthermore, evidence suggests that a longer intervention can be more effective than a brief intervention (Fjeldsoe et al., 2011).

##### ***4.5.4.2 Intervention Session Number and Content***

The intervention consisted of seven sessions and was primarily delivered via telephone, as it is considered to be a well-established and cost-effective method (Eakin, Lawler, Vandelanotte, & Owen, 2007). This method was also chosen to reduce barriers to intervention participation and adherence, including: cost, accessibility to a research venue or leisure centre, and inclement weather (Gidlow et al., 2005). Additionally, two one hour face-to-face sessions were included at the beginning and end of the intervention, which were delivered in the leisure centres. Evidence suggests that the inclusion of face-to-face delivery increases intervention effectiveness and establishes rapport (Fjeldsoe et al., 2011).

The initial 1 hour face-to-face session consisted of the meta-structure (outlined in section 4.5.3 above) and included the four phases of MI: engagement, focusing, evoking and planning. In the engagement phase, current PA frequency and interests were elicited. Then, the prioritized expectations, values, experiences, and satisfaction with experiences were explored. The focusing phase consisted of establishing the prioritised outcome expectation and goal(s) for the current and future sessions. The evocation phase explored reasons for ambivalence, incongruence/discrepancies between outcome expectations, experiences and values for the prioritised goal. Additionally, current barriers and strategies to overcome these were established. The planning phase

was then initiated where an action plan was developed around current goal and remaining telephone sessions for the next three months.

Five telephone sessions lasting 15-30 minutes were delivered across the remaining weeks (three sessions once a week in the first month, two sessions bi-weekly in the second month, and no calls in the third month). Tapering of the intervention was implemented to counteract any potential dependency on the intervention facilitator and to encourage PA maintenance (Hughes et al., 2010). Each telephone session consisted of recapping and reviewing goals, current barriers, and strategies (e.g., self-monitoring, seeking professional help) to overcome the barriers to PA maintenance. A flexible structure was implemented to account for individual differences, problems, and goals.

The final face-to-face session occurred at the end of the third month and included feedback on participant performance and developing plans to maintain PA or overcome potential barriers. Plans for maintaining PA were made by considering potential barriers, and a discussion around further services that could assist the participants in achieving their goals.

#### *4.5.4.3 Intervention Materials*

While the intervention is largely a talking therapy, some strategies were transformed into paper based materials. An assessment sheet was created for the initial face-to-face session to guide the exploration of the determinants for PA maintenance (outlined during step 1). Additionally, action planning sheets, activity diaries and instructions to use the materials were created to help individuals to: set goals; identify barriers and techniques to overcome barriers; and, monitor their PA. These were given to participants only if participants agreed that action planning would help them achieve their goal so not to create resistance (Miller & Rollnick, 2013). All intervention materials, including the initial assessment can be found in Appendix I.

#### *4.5.5 Step 5: Adoption and Implementation*

For intervention implementation, a guide was created detailing the determinants to be targeted in each session, the session content and potential strategies to use (Table 4.6). The guide was to be used flexibly in accordance with a person-centred approach, which accounts for individual differences (Lundahl et al., 2010). The linkage group were also responsible for ensuring that pragmatic issues or barriers concerning recruitment or implementation of the intervention were taken into consideration.



Pragmatic suggestions were made concerning: (a) the population to work with; (b) the aims of the intervention; (c) the length of the intervention; (d) decisions around telephone vs. face-to face to increase accessibility to the intervention or research venue; (e) the adoption and implementation of the intervention after study completion; and (f) the strategies to use. The linkage group can enhance intervention effectiveness as potential barriers to intervention delivery are identified and ensure that the knowledge obtained from the study is translated into practice. Consideration of intervention adoption into practice after the research phase occurred after the intervention evaluation (Step 6). On-going meetings with the linkage group are currently taking place to negotiate whether the intervention (or specific components) can be adopted and implemented. This also includes the potential for training staff in intervention delivery and environmental re-structuring of leisure centres.

**Table 4.6** MI-CB Intervention Session Content, Aims, and Example Cognitive-behavioural Techniques

Session	Delivery method	Targeted determinants	Session aims and Description	BCTs Implemented
1. Week 1: Initial assessment	Face-to-face	This session is flexible but should include most of the 10 determinants (e.g., core value, outcome expectations and experiences)	<p>Through collaboration between intervention facilitator and participant, the aims of the initial assessment are to explore:</p> <ul style="list-style-type: none"> <li>• PA outcome expectations</li> <li>• discrepancy and satisfaction between experience/expectations</li> <li>• ambivalence and attitudes towards PA</li> <li>• unrealistic expectations</li> <li>• assess current coping techniques/self-management strategies</li> <li>• Promote self-efficacy using affirmations (MI)</li> <li>• Teach and tailor goals based on the above information.</li> </ul>	<p>MI strategies include OARS:</p> <ul style="list-style-type: none"> <li>• Open-ended questions</li> <li>• affirmations</li> <li>• Reflections</li> <li>• Summaries</li> <li>•</li> </ul> <p>CB techniques include:</p> <ul style="list-style-type: none"> <li>• Goal-setting</li> <li>• Action Planning</li> </ul> <p>CB techniques are tailored to the individual according to the current situation and level of change talk.</p>
2. Week 2	Telephone	<p>Barrier self-efficacy</p> <p>Trial and error</p>	<ul style="list-style-type: none"> <li>• Review of progress from previous session</li> <li>• Barrier identification and level of self-efficacy for overcoming barriers.</li> <li>• Emphasise the trial and error nature of self-management</li> <li>• Elicit CB techniques to implement to progress with action-plan or reassess goals.</li> </ul>	<p>MI strategies include OARS.</p> <p>CB techniques include:</p> <ul style="list-style-type: none"> <li>• Self-monitoring</li> <li>• Goal setting</li> <li>• Problem solving</li> <li>• Relapse prevention</li> </ul> <p>CB techniques are tailored to the individual according to the current situation and level of change talk.</p>
3. Week 3	Telephone	Outcome expectations and experiences in relation to goal	<ul style="list-style-type: none"> <li>• Review of progress from previous session</li> <li>• Identify current experiences of PA benefits and satisfaction with these</li> </ul>	<p>MI strategies include OARS.</p> <p>CB techniques are tailored to the</p>

		progress		<ul style="list-style-type: none"><li>• Discuss and teach self-monitoring strategies to implement to assess progress with goal or experiences (e.g., activity tracking, weight measurement, or medication reduction)</li></ul>	individual according to the current situation and level of change talk.
4. Week 4	Telephone	Barrier self-efficacy for long-term PA adoption  Coping strategies and condition management strategies  Social support	<ul style="list-style-type: none"><li>• Review of progress from previous session</li><li>• Affirm current progress.</li><li>• Prompt discussion of potential future barriers and strategies (coping or condition-management strategies) to overcome them.</li><li>• Prompt assessment of current social support structures and prompt environmental restructuring where possible</li><li>• Reassess action plan for the next two weeks</li></ul>	MI strategies include OARS.  CB techniques include: <ul style="list-style-type: none"><li>• Action planning</li><li>• Problem solving</li><li>• If-then plans</li><li>• Relapse prevention</li><li>• Condition management ( e.g., pacing, cognitive reframing, environmental restructuring)</li></ul>	
5. Week 6: Tapering begins	Telephone	Tailored to individual	<ul style="list-style-type: none"><li>• Review of progress from previous session</li><li>• Barrier identification and level of self-efficacy for overcoming barriers.</li><li>• Identification of strategies used to overcome barriers</li></ul>	CB techniques are tailored to the individual according to the current situation and level of change talk. MI strategies include OARS.  CB techniques include: <ul style="list-style-type: none"><li>• Relapse prevention</li><li>• Goal-setting</li></ul>	
6. Week 8	Telephone	Tailored to individual	<ul style="list-style-type: none"><li>• Review of progress from previous session</li><li>• Barrier identification and level of self-efficacy for overcoming barriers.</li><li>• Identification of strategies used to overcome barriers</li></ul>	CB techniques are tailored to the individual according to the current situation and level of change talk. MI strategies include OARS.  CB techniques include: <ul style="list-style-type: none"><li>• Relapse prevention</li><li>• Goal-setting</li></ul>	
				CB techniques are tailored to the individual according to the current situation and level of change talk.	

7. Week 12:  Exit-Interview	Face-to-face	Intervention recap and planning for the future.	<ul style="list-style-type: none"> <li>• Review of progress from previous session and intervention as a whole</li> <li>• Collaboratively identify what has or could help the individual maintain PA</li> <li>• Collaboratively identify if-then scenarios for overcoming future barriers.</li> <li>• Prompt reflection of trial and error process</li> <li>• Refer to additional services if required (e.g., counselling or GP).</li> </ul>	<p>MI strategies include OARS.</p> <p>CB techniques include:</p> <ul style="list-style-type: none"> <li>• Action planning</li> <li>• Problem solving</li> <li>• If-then plans</li> <li>• Relapse prevention</li> <li>• Condition management ( e.g., pacing, cognitive reframing, environmental restructuring)</li> </ul> <p>CB techniques are tailored to the individual according to the current situation and level of change talk.</p>
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#### 4.5.6 Step 6: Intervention Evaluation

To assess the efficacy of the intervention, a randomised controlled trial (RCT) pilot was developed entitled the *Keep Active South Yorkshire trial (KASY)*. The intervention group received three months of MI-CB and the control group received usual care (UC) post-PARS (i.e., 12-weeks of discounted gym membership at a leisure centre) to allow a comparison to be made across time. Outcome measures of the primary aim (e.g., PA maintenance) and secondary aims (e.g., psychological determinants) were implemented where possible to assess the determinants outlined during Step 2. This enabled an evaluation of the impact of the intervention on changing such psychological mechanisms. Outcome measures included: behavioural (e.g., self-report PA and pedometer data) and psychological (e.g., barrier self-efficacy). An additional secondary aim was to assess epidemiological factors (e.g., weight and BMI), which were evaluated to explore the potential impact on health indicators. All outcome measures were administered at three time points: pre-intervention (0 months), post-intervention (3 months), and six month follow-up. The six month follow-up post-PARS was included to assess whether the MI-CB intervention was any more effective at promoting PA maintenance than receiving three months of reduced cost gym membership. An evaluation of outcomes also enabled an exploration of associations between psychological determinants and PA maintenance, thus confirming or disconfirming the hypothesised theoretical links. A detailed outline and discussion of the intervention efficacy and outcomes are presented in Chapter 5. An assessment of intervention feasibility was also included in the evaluation, in accordance with recommendations for good practice for pilot studies (Lancaster et al., 2004). The feasibility assessment included: participant retention and adherence; suitability of specific procedures, such as randomisation and distribution of questionnaire battery; and, sample size calculation for a large scale trial.

Treatment fidelity (TF) measures were also implemented to monitor and assess design, delivery, receipt, enactment, and training in accordance with the behaviour change consortium framework (Bellg et al., 2004). TF implementation and monitoring can enhance an intervention's internal validity by ensuring any deviations from the protocol are corrected early on. For fidelity to design, the very nature of implementing intervention mapping ensures the intervention is theory-driven. Dose was also assessed using attendance records to intervention sessions. Fidelity to training was assessed by ensuring the intervention provider was adequately trained by a recognised body for



delivering MI. Regular supervisions were implemented throughout the duration of the intervention and independent coders assessed provider competence, which also enabled on-going training through reflexive practice. Fidelity to delivery was assessed using specific coding forms for MI and CB techniques (based on the techniques outlined in this chapter). Fidelity to receipt was assessed by assessing participant comprehension of CB techniques and confidence to use the CB techniques. Specific measures were created to assess this. Satisfaction with receipt was also measured using a validated client evaluation of motivational interviewing form. For fidelity to enactment, a questionnaire was created to assess the techniques that participants used based on the strategies that emerged from the qualitative study. A detailed description of the TF methods will be discussed in chapter 6, along with a critical discussion of whether the MI-CB intervention was delivered with fidelity or not.

#### **4.6 Discussion**

This chapter outlined the development of an integrative MI-CB intervention to promote PA maintenance in adults with chronic health conditions using intervention mapping principles. Intervention mapping ensures the systematic development of a theory-driven intervention, implementation and evaluation (Bartholomew et al., 2006). The approach enables transparent reporting of intervention content, which encourages future intervention replication and refinement, thus meeting the call for a more scientific reporting (Michie & Abraham, 2008). This is important as the transparency of intervention components is often lacking within PA research, which limits our understanding of 'what works' within interventions (Bird et al., 2013; Breckon et al., 2008). Therefore, this chapter contributes to the PA maintenance literature by enhancing our understanding of the development of integrative therapies for health behaviour change.

Throughout the six steps of intervention mapping, the intervention process, content and evaluation became apparent. In step 1, determinants (e.g., outcome expectations and experiences) and multiple theoretical components (e.g., expectancy-value theory and social cognitive theory) for PA maintenance were identified. In step 2, the performance objectives (e.g., to maintain PA after PARS) were combined with the determinants to create matrices of change objectives, which outlined the main content of the intervention. In step 3, techniques to change the determinants were identified resulting in an integrative MI-CB intervention for PA maintenance. A method for integrating the two approaches was also outlined in a matrix which can enhance

intervention training and implementation. Step 4 outlined the intervention materials (e.g., activity diaries) and duration (e.g., three months with tapered telephone and face-to-face sessions). Step 5 outlined the intervention plans for session content and overall intervention structure. Additionally, plans for implementation within leisure centres post-research were reported as on-going. In Step 6, an outline was provided for the outcome evaluation procedure for the Keep Active South Yorkshire Trial. This was a three month randomised controlled trial pilot with usual care (i.e., three months of discounted gym membership). Outcomes were focused on behavioural (e.g., PA), psychological (e.g., outcome expectations), and epidemiological outcomes (e.g., weight). Additionally, methods of treatment fidelity (TF) were outlined for the process evaluation, enabling an assessment of whether the intervention was delivered and received as intended (Breckon et al., 2008). Further research is now needed to test the feasibility and efficacy of the MI-CB intervention.

It was also identified that multiple theoretical components and techniques were necessary to understand the mechanisms of PA maintenance. This is in line with the scoping review (Chapter 2), qualitative study (Chapter 3) and previous evidence for PA maintenance (Amireault et al., 2012). Additionally, previous research has argued that when there is no guide to selecting an appropriate theory for a specific behaviour, then multiple theoretical components should be chosen (Michie, Johnston, Francis, Hardman & Eccles, 2008). Consequently, PA maintenance is a complex process consisting of a number of theoretical determinants and processes, which supports previous research (Amireault et al., 2012; Crain, Martinson, Sherwood, & O'Connor, 2010) and the notion of employing a single theory for behavioural maintenance should be questioned (Brug et al., 2005).

Additionally, intervention mapping made transparent the exact method for integrating and implementing the MI-CB intervention. This is important for practitioners wanting to adopt the MI-CB approach given that a central issue concerning its implementation is to know when to move from MI techniques to CB techniques (Moyers & Houck, 2011; Resnicow & McMaster, 2012). Miller & Rollnick (2013) outline a meta-structure and decision prompts (e.g., strength of client commitment talk) to enable the flow between the engagement phase to the action planning phase, which was incorporated into the intervention. Additionally, defining the parameters of use for techniques enables intervention providers to understand how to use both MI and CB techniques in relation to the theoretical determinants identified during Step 1. This detailed intervention description can enable researchers to assess the fidelity to MI-CB

delivery through process evaluations, which is necessary to determine whether the intervention was delivered as intended (Bellg et al., 2004). For example, if the intervention is delivered with fidelity (process) and also encourages PA maintenance (outcome) then it can be argued that integrative MI-CB is effective and would warrant further attention (Bellg et al., 2004). Thus, a transparent reporting of intervention components can enable such process evaluation and further identify 'what worked' within an intervention.

#### ***4.6.1 Implications for Practice***

Integrative approaches to chronic disease management programs have been suggested to increase cost-effectiveness within healthcare services (Naylor, et al., 2012). While integrative MI-CB interventions are developed in mental health care (Burke, 2011), they are slowly emerging in health behaviour change settings (Hogden et al., 2012) and specifically for health behaviour maintenance (Naar-king et al., 2013). Consequently, little is understood with regards to how to integrate and practice the approach or whether they even work to change behaviour. Therefore, intervention mapping provided a transparent outline of proposed methods to integrate MI-CB for health behaviour change, which can enhance replication (or refinement). By evaluating intervention efficacy and feasibility, practitioners will be in a better position to understand whether adopting integrated MI-CB is worthwhile for PA maintenance. Additionally, monitoring and assessing the TF framework will enable the development of specific training packages that incorporates a better understanding of the processes that contribute to intervention effectiveness or ineffectiveness (Breckon et al., 2008).

#### ***4.6.2 Implications for Research***

Before an MI-CB approach can be adopted into healthcare, intervention efficacy and feasibility need to be assessed. An evaluation of the behavioural, psychological and epidemiological outcomes will enable preliminary evidence to be gathered of whether an MI-CB intervention is beneficial for PA maintenance. Further research is needed, therefore, to evaluate the MI-CB intervention outcome protocol outlined in steps 2 to 4. An RCT pilot study can assess whether the MI-CB intervention is more effective for promoting PA maintenance than usual care, particularly after an intervention has ended (Eakin et al., 2010; Marcus et al., 2000). Additionally, implementing measures to assess associations between both psychological and behavioural outcomes based on the proposed theoretical determinants can assess whether such factors actually promote PA



maintenance, as proposed (Naar-King et al., 2013). Furthermore, TF monitoring and assessment can encourage a deeper understanding of the process factors that influence and enhance internal validity within interventions (Bellg et al., 2004). Furthermore, implementing a TF framework within a PA maintenance intervention can prevent a type III error from occurring; where interventions are rejected for ineffectiveness when in fact incorrect delivery is the cause (Dobson & Cook, 1980). Therefore, further research is needed which implements such a comprehensive TF framework, particularly within PA research (Breckon et al., 2008). The efficacy and feasibility study will be outlined within Chapter 5 and the method for TF implementation and evaluation will be presented in Chapter 6 of this thesis.

#### **4.7 Limitations**

Limitations of the intervention mapping approach emerged during the MI-CB intervention development. First, a common experience amongst researchers is that intervention mapping is a time and resource intensive approach (McEachan et al., 2008), which needs to be taken into account during future PA intervention planning. Second, the linkage group was approached to inform the development of strategies during step 3, who were all trained in MI and, to some extent, CB techniques. Consequently, using such an expert linkage group could bias the intervention development towards implementing MI and CB techniques as opposed to other therapeutic approaches. Nevertheless, in practice, healthcare practitioners often see the need for integrative approaches as they can complement each other, thus creating a holistic approach, which is supported by evidence (Flynn, 2011; Hodgen et al., 2012). Third, intervention mapping is used to develop theory-based interventions and encourages theory testing by implementing a comparison group (Michie & Prestwich, 2010), which was not included in the proposed RCT during step 6. Reasons for this were concerned with a lack of available resources to conduct a multi-arm trial. Therefore, the study will not be able to assess whether the multiple theory-based MI-CB intervention is any more effective than single theories. Additionally, the study will not be able to assess whether the MI-CB intervention is any more effective than single-therapy interventions (e.g., MI only). Nevertheless, given that the intervention is a pilot study, the aim is not to test theory per se, but to assess preliminary efficacy and whether the MI-CB approach is worth investing into further research (Lancaster et al., 2004). Fourth, the selection of multiple theoretical constructs to explain the determinants and strategies was a complex process given that multiple theories exist, often with overlapping constructs (Michie et al., 2005).

Consequently, important theories might have been missed, such a self-determination theory, which has been suggested to explain the processes of MI (Vansteenkiste et al., 2012). Finally, when assessing feasibility, a qualitative assessment of intervention acceptability is traditionally undertaken (Lancaster et al., 2004); however, the primary researcher was also the intervention provider (SS), which might encourage researcher bias due to the lack of blinding (Littlewood, 2011). Furthermore, the close therapeutic relationship between intervention provider and participant might facilitate socially desirable responses to questions concerning intervention advantages or disadvantages (Taber et al., 2009). Instead, participant satisfaction of intervention provider skills will be assessed through a validated questionnaire when evaluating fidelity to receipt within the framework. Enabling participants to complete such questionnaires anonymously is one method to limit researcher bias (Littlewood, 2011).

#### **4.8 Chapter Summary**

Chapter 4 outlined the six steps of the intervention mapping approach (Bartholomew et al., 2006) for the development of an integrated motivational interviewing (MI) and cognitive-behavioural (CB) intervention (MI-CB) for PA maintenance in adults with chronic health conditions. Intervention mapping was selected for a number of reasons: (1) as a method to aid intervention development; (2) to ensure the intervention was theory-based; and (3) to enable a transparent reporting of intervention components which can enhance future replication and evaluation (Michie & Abraham, 2008). The approach details how the determinants, strategies and theoretical components from Step 1 (scoping review and qualitative study; Chapters 2 and 3 respectively) are transformed into performance and change objectives for PA maintenance (Step 2). It was evident that multiple theoretical components, determinants and techniques were needed rather than a single theory which supports the notion that PA maintenance is a complex behavioural process (See Chapter 2 and 3; Amireault et al., 2012; Crain et al., 2010). An integrative MI-CB intervention was outlined in relation to changing the theoretical determinants (Step 3). Additionally, a detailed outline of how the MI-CB intervention could be implemented was also proposed, including decision points for when to move from using MI to CB techniques. Intervention content and materials were suggested (Step 4). A plan for intervention implementation and structure was proposed in Step 5, although strategies for intervention adoption into practice are on-going. Finally, proposals for a RCT pilot are made where behavioural (e.g., PA maintenance), psychological (e.g., barrier self-efficacy) and epidemiological



outcomes (e.g., weight) are proposed. Additionally, a comprehensive treatment fidelity (TF) framework (Bellg et al., 2004) was suggested for implementation to enhance intervention internal validity and assess process outcomes, which is often lacking within PA interventions (Breckon et al., 2008). Further research was proposed which provides the foundation to test intervention efficacy and feasibility (Chapter 5) and the TF framework (Chapter 6).

## **Chapter 5**

**Study 2 (a): Efficacy and Feasibility of an Integrated Motivational Interviewing and Cognitive-behavioural Intervention for Physical Activity Maintenance: A pilot randomised controlled trial.**

**Chapter 5: Study 2 (a): Efficacy and Feasibility of an Integrated Motivational Interviewing and Cognitive-Behavioural Intervention for Physical Activity Maintenance: A pilot randomised controlled trial.**

**5.1 Introduction**

It has been suggested that, to better understand PA maintenance, an intervention focusing specifically on PA maintenance is needed (Marcus et al., 2000; Chapter 1). Such interventions have not yet been developed for adults with chronic health conditions and so little is known about the factors that influence PA maintenance within a heterogeneous clinical population (Chapter 2). In the previous chapter (Chapter 4), an outline was provided for the development, delivery and evaluation plan of a specific PA maintenance intervention for adults with chronic health conditions. The intervention employed integrative motivational interviewing (MI: Miller & Rollnick, 2013) and cognitive-behavioural (CB) techniques (MI-CB). An integrative intervention can provide a person-centred approach to intervention delivery, which is needed to meet the varying needs of a diverse clinical population (Hogden et al., 2012). The MI-CB intervention was developed following the six steps of intervention mapping (Bartholomew et al., 2006) and the theoretical determinants (e.g., outcome expectations) and techniques (e.g., self-monitoring) were outlined for PA maintenance. During the final step of intervention mapping (Step 6), a plan for the MI-CB intervention evaluation was outlined. It was proposed that a randomised controlled trial (RCT) would establish whether an MI-CB intervention is more effective than a usual care (UC) control group. The evaluation also consisted of three areas: (1) feasibility (e.g., participant retention); (2) preliminary efficacy of the MI-CB intervention for PA maintenance; and, (3) treatment fidelity (e.g., delivery protocol adherence).

The following chapter will outline the implementation of the RCT and present the results of the feasibility and preliminary efficacy outcomes (Study 2a). Given the novelty of the MI-CB intervention specifically for PA maintenance, the information here could inform the development of a large scale trial and indicate whether integrative MI-CB intervention actually influences PA maintenance and the associated theoretical determinants. Future implications for research and practice will also be discussed. This chapter will begin by providing an overview of the need for PA maintenance interventions. Then, the chapter will explore the evidence base concerning the role of

MI within PA settings and, finally, expand on the rationale for integrating MI-CB techniques as evidence by the literature from the mental health field.

## **5.2 Background**

### ***5.2.1 The Need for a PA Maintenance Intervention***

The number of adults living with comorbid health conditions is expected to rise by 2035 placing increased pressure on the resources of the NHS (BHF, 2012). Following this, it has been proposed that interventions need to target the commonalities of treatment for multiple health conditions, rather than single-disease interventions, to increase cost-effectiveness (Piette, Richardson, & Valenstein, 2004). Physical activity (PA) is one such common treatment component, which is beneficial for a range of chronic health conditions (DoH, 2011). Adults are encouraged to undertake the equivalent of 150 minutes of moderate-vigorous intensity PA (MVPA), although it is rarely maintained in the long-term (DoH, 2011; Marcus et al., 2006). In the UK, one support option for people with chronic health conditions is a Physical Activity Referral Scheme (PARS). PARS exist whereby sedentary individuals living with stable chronic health conditions, such as cardiovascular disease (CVD), are referred for 12-weeks (usually) of free or reduced-cost MVPA, although schemes are largely heterogeneous across the UK (DoH, 2001). Evidence suggests that PARS are effective for initiating PA but effects are rarely maintained in the long-term (Harrison et al., 2004; Pavey et al., 2011). A criticism of PARS is the lack of focus on promoting long-term 'lifestyle' behaviour change, which is needed to continually experience health benefits (Pavey et al., 2011). Consequently, interventions are needed that specifically focus on PA maintenance (Marcus et al., 2000; 2006; NICE, 2006).

A specific PA maintenance intervention is also important for disentangling the determinants and strategies associated with the PA initiation from the maintenance phase (Marcus et al., 2000; Rothman et al., 2011). To date, only one study has specifically focused on PA maintenance in older adults (Martinson et al., 2008). The participants had already initiated and adopted PA for one year prior to the study. The intervention delivered a seven session course over the telephone covering a range of topics, such as benefits of physical activity and goal setting. The intervention was effective at supporting PA maintenance across 24 months compared to usual care (Martinson et al., 2010).

The study also explored the theoretical mediators that influenced PA maintenance and found that self-efficacy, enjoyment, and PA integrated into the self-concept influenced PA maintenance (Crain et al., 2010). Specifically, self-efficacy mediated the relationship between perceived barriers and self-concept integration, although it was self-concept and enjoyment that were the largest predictors of PA maintenance. The authors suggest that enjoyment of PA might encourage the behaviour to be integrated into the self-concept and, therefore, individuals are intrinsically motivated within the PA maintenance phase compared to the initiation phase. It was argued, however, that PA maintenance is a complex process consisting of not one single mechanism but multiple mechanisms. Nevertheless, the intervention was conducted in 'healthy' adults rather than chronically ill adults. Given that evidence suggests that interventions targeting chronically ill adults have smaller effect sizes (Conn et al., 2008), it is likely that different mechanisms are involved in PA maintenance, which warrants further attention. Furthermore, counselling and psychological approaches are recommended for PA promotion in adults with chronic conditions in order to target the complexity of the behaviour change or maintenance (NICE, 2009).

### ***5.2.2. The Influence of Motivational Interviewing on PA Maintenance***

One counselling approach is motivational interviewing (MI; Miller & Rollnick, 2013), which has demonstrated effectiveness in changing a wide range of behaviours, such as substance misuse, physical activity, diet, safe sex and gambling (Lundahl et al., 2010). MI is a person-centred, goal-orientated approach that enhances motivation for health behaviour change by eliciting client change talk (i.e., desire, ability, reasons, and need) and fostering commitment and action to change (Miller & Rollnick, 2013). A more detailed outline of MI can be found in Chapter 4, section 4.5.3. Overall, evidence suggests MI is effective for increasing initial PA and produces small to medium effect sizes (Greaves et al., 2011; Lundahl et al., 2010), particularly in a CVD population (Artinian et al., 2010).

For PA maintenance, however, the available evidence for the effectiveness of MI appears equivocal. One study explored PA maintenance in older adults with lower extremity osteoarthritis after an initial eight-week intervention (Hughes et al., 2010). The study reported that boosters delivered across 18-months employing MI via telephone produced maintenance of a 21 percent increase in caloric expenditure. While this suggests MI can be used to support PA maintenance, it is unclear whether MI had a



long-term effect after the boosters ended because the study did not include a follow-up period. Understanding the impact of an intervention after its cessation is important for assessing long-term effectiveness (Eakin, Reeves, Winkler, Lawler, & Owen, 2010; Marcus et al., 2006). Generally, when a follow-up period is included after an MI intervention ends, initial PA gains are observed to decrease towards original baseline values (Buckworth & Dishman, 2002; Van Keulen et al., 2011). Suggested reasons for this have been the lack of study power and low MI dosage (e.g., two MI telephone calls; Van Keulen et al., 2011). When the dose of MI delivered within an intervention is increased (e.g., 18 MI telephone calls tapered across 12 months), PA maintenance has been found up to six-months after an intervention ends (Eakin et al., 2010). Nevertheless, the maintenance effect was no different between the MI intervention and a usual care group who received quarterly newsletters and health tips, suggesting additional factors can influence the effectiveness of MI for PA maintenance (Eakin et al., 2010).

One such factor that could influence PA maintenance is the mode of MI delivery (e.g., face-to-face versus telephone). Evidence suggests that interventions employing face-to-face components are more effective than interventions delivered only by telephone (Fjeldsoe et al., 2011). To support this, a less intensive MI intervention (i.e., five face-to-face MI sessions across six months) successfully promoted maintenance of walking across 12 months after an intervention ended in adults with CVD risk factors (Hardcastle, Taylor, Bailey, Harley, & Hagger, 2013). While this suggests that less intensive interventions can demonstrate long-term effectiveness if face-to-face components are included, the clinical importance of the results must be questioned. The significant effect was found for walking but the level of intensity was not reported. Both treatment groups engaged in less than the government PA guidelines of moderate intensity exercise (i.e.,  $\geq 600$  MET-minutes/wk) at six-month post-intervention (*cf.* Hardcastle et al., 2013). Additionally, the control group engaged in more MVPA than the intervention group at 12 months. Therefore, it could be that more intensive face-to-face interventions are needed to encourage long-term PA after intervention cessation.

A further criticism of employing MI to maintain PA is that MI was originally designed to increase motivation for initial behaviour change rather than encourage action; thus, less is known about the MI strategies that promote behavioural maintenance (Naar-king et al., 2013). Instead, other approaches, such as cognitive-behavioural (CB) techniques (e.g., self-monitoring, action planning and goal setting) are

more action-oriented and have been suggested to be implemented once initial motivation for behaviour change has been established by using MI (Burke, 2011). As a result, it has been suggested that MI can be used as an integrative framework where additional action-oriented approaches (e.g., CB techniques) can be delivered in order to promote behavioural maintenance (Naar-King et al., 2013). Nevertheless, MI-CB specifically for PA maintenance is yet to be tested within adults with chronic health conditions.

In summary, MI is found to be more effective than information giving (Greaves et al., 2011) and might promote long-term PA maintenance after an intervention ends (Eakin et al., 2010; Hardcastle et al., 2013). It is likely, however, that additional factors influence the effectiveness of MI, such as the intensity of delivery (van Keulen et al., 2011) or the mode of delivery (e.g., face-to-face; Fjeldsoe et al., 2011), and integration with other techniques, specifically for behavioural maintenance (Naar-king et al., 2013). Nevertheless, such factors are yet to be tested for PA maintenance within adults with chronic health conditions.

### ***5.2.3 A Rationale for an Integrated MI-CB Intervention for PA Maintenance***

Integrated MI-CB techniques are largely implemented within the mental health field and substance misuse (Westra & Arkowitz, 2011). It is argued that integrating MI and CB techniques can complement each other, thus generating a more effective therapy (Flynn, 2011). By using integrated MI-CB, it is suggested that MI can increase motivation or explore ambivalence about an existing behaviour change, while the CB techniques can encourage action for change or maintenance (Burke, 2011). Alternatively, CB interventions are criticised for producing low response rates to therapy because they adopt a directive approach lacking expressions of empathy and failing to acknowledge the client's autonomy for change, which is central to behaviour change or maintenance (Flynn, 2011; Ryan, Lynch, Vansteenkiste, & Deci, 2011). Instead, MI fosters client autonomy and self-efficacy by supporting client choices and perspectives (Miller & Rollnick, 2013). In doing so, MI minimises any pressure, control and resistance to change, which has been shown to enhance the therapeutic relationship and increase intervention adherence (Flynn, 2011). Therefore, it is suggested that MI can remove the overt directive nature of CB interventions, thus enhancing client adherence to interventions and CB technique enactment (Driessen & Holon, 2011).

The criticisms of CB interventions stem from the mental health field employing cognitive behavioural therapy (CBT), which uses similar techniques as those within health behaviour change interventions (e.g., self-monitoring and relapse prevention; Hobbis & Sutton, 2005). Instead of using MI-CBT, it has been suggested that integrating MI with the specific CB techniques (i.e., MI-CB), can be beneficial for health behaviour change, particularly behavioural maintenance (Naar-king et al., 2013). Furthermore, integrated MI-CB techniques are a flexible approach, which takes individual differences and contexts into consideration (Flynn, 2011). Flexible approaches within PA are encouraged because they can challenge the limitations of the 'one-size-fits-all' approach; thus, encouraging real-world dissemination (Ballew, Brownson, Haire-Joshu, Heath, & Kreuter, 2010). For this reason, integrative approaches are also employed in healthcare for adults with chronic health conditions, particularly as the approach can account for the range of patients' psychosocial needs (Hogden et al., 2012).

Evidence supporting an integrative MI-CB approach is scarce within PA and chronic health settings. One study included MI-CB integration in an intervention for adolescent obesity whereby an initial MI assessment was delivered followed by allocation to a standard interview assessment or MI assessment and a 12 session intervention employing CB techniques (e.g., goal setting, problem solving, and relapse prevention) across six months (Brennan, Walkley, Fraser, Greenway, & Wilks, 2008). Conclusions could not be drawn with regards to PA maintenance due to equipment malfunction, non-compliance of measures, and a short follow-up period post intervention (Brennan et al., 2013).

Another study focused on PA as a treatment component for alleviating the symptoms of depression and was delivered using MI and CB techniques (Baxter et al., 2010; Chalder et al., 2012). The study found that the intervention group engaged in more PA than the control group at four months post-randomisation and there was no change between the groups across 12 months. Additionally, PA did not affect symptoms of depression. The authors suggested that a bias in self-reported PA might have occurred due to knowledge of the allocated condition; thus, the PA data needed to be interpreted with caution. Additionally, the study's primary outcome was reducing symptoms of depression and not PA maintenance; thus the techniques delivered might not have been tailored to long-term PA. Therefore, it is unclear whether MI-CB

promotes PA maintenance in adults with chronic health conditions and warrants further research.

### **5.3 Study Aims**

The primary aim of Chapter 5 was to detail the results of a pilot study of an intensive (although tapered) three month integrated MI-CB intervention employing face-to-face and telephone components for PA maintenance in adults with chronic health conditions. By adopting a randomised controlled trial (RCT) pilot design, the aim of the study was to assess whether the MI-CB intervention was any more effective than a usual care (UC) control group for promoting PA maintenance (primary outcome) across six-months post-PARS. The secondary aims of this chapter were to explore the effects of the MI-CB intervention on psychological outcomes (e.g., barrier self-efficacy), and epidemiological outcomes (e.g., body mass index [BMI]) associated with PA maintenance. The final aim of the pilot study was to assess the feasibility of the Keep Active South Yorkshire trial (KASY), including the recruitment, retention and attrition, suitability of measures, and to calculate a sample size for future trials. By exploring these aims, the study will reveal the preliminary effectiveness and feasibility of an MI-CB intervention for promoting PA maintenance in chronic health, which will guide future intervention development and inform healthcare practice.

### **5.4 Hypotheses**

Given the exploratory nature of the pilot study, non-directional hypotheses (2-tailed) were assumed. Therefore, it was hypothesised that:

- 1) PA would differ between the MI-CB and UC group across the three time points: baseline, 3 months (post-intervention), and 6 months post-PARS (follow-up);
- 2) PA maintenance would differ between the MI-CB and UC group across the three time points;
- 3) Psychological determinants would differ between the MI-CB and UC group across the three time points;
- 4) Epidemiological measures (e.g., BMI) would differ between the MI-CB and UC group across the three time points;
- 5) There would be a relationship between the psychological determinants and PA outcomes in the MI-CB intervention across the three time points; and,



6) The null hypothesis was assumed for feasibility of the KASY trial and MI-CB intervention.

## **5.5 Method**

### **5.5.1 Research Design**

The pilot study was a three month pragmatic, multi-centre randomised controlled trial assessing feasibility and preliminary efficacy of integrated MI-CB. The study also included a six month post-PARS follow-up assessment point to capture efficacy of the intervention in promoting PA maintenance. The name of the trial was the Keep Active South Yorkshire trial (KASY).

### **5.5.2 Participants and Recruitment**

In this study, 35 participants aged 33 to 75 years ( $M = 59.34$ ,  $SD = 10.86$ ) were recruited through a rolling recruitment procedure from a 12-week PARS. Initially, only PARS delivered in Sheffield were approached but to increase the sampling frame, leisure centres in Barnsley and Rotherham were invited to participate in the research. In total, six leisure centres across South Yorkshire delivering a similar PARS programme were involved in the recruitment process between July and December, 2012 (*cf.* Section 1.1.3 for further description of PARS in South Yorkshire). Additionally, to increase recruitment reach, successful PARS completers were invited to the study either by an exercise referral officer, telephone or postal invitation.

#### **5.5.2.1 Inclusion and Exclusion Criteria**

To be eligible for the pilot study, individuals must have met two key inclusion criteria: (1) individuals that had completed at least 75% of PARS (i.e. 18 sessions out of 24) to ensure PA levels had been increased from the start of PARS (i.e. sedentary); (2) individuals that had a stable health condition, which is the primary inclusion criteria to attend PARS (BHF, 2010).

Two key exclusion criteria were also adopted: (1) individuals that were profoundly deaf, given that the intervention would be mainly delivered over the telephone; (2) individuals that had scheduled a major operation to take place during the course of the intervention that would prevent PA engagement.



#### *5.5.2.2 Randomisation Procedure*

To ensure the primary researcher was blinded to participant group allocation, a randomisation sequence was generated by an independent researcher and inputted into a random computer generator (NQUERY Version 7.0, Statistical Solutions) before study commencement. After participants completed baseline assessments, the primary researcher was informed on a case-by-case 1:1 basis whether participants were assigned to either the MI-CB intervention or the UC control group.

#### *5.5.3 Ethics Approval*

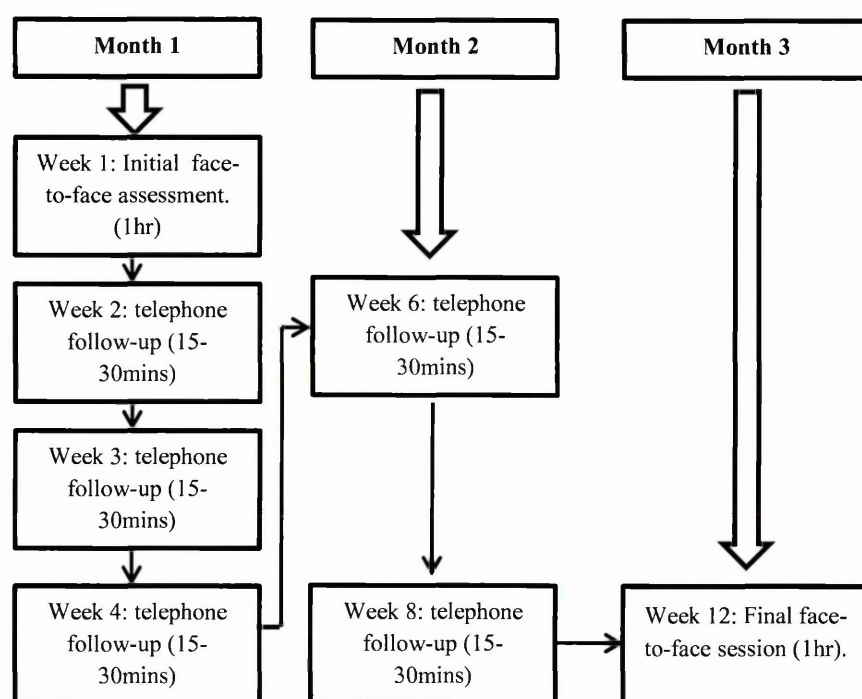
Ethics approval was obtained from Sheffield Hallam University Ethics Committee (July 2012; Appendix J). All participants were given a participant information sheet (Appendix K) and signed a consent form (Appendix D) indicating: (1) agreement to participate in the research; (2) for their data to be used within the research; and, (3) they understood that participation was voluntary and they could withdraw their consent at any time.

#### *5.5.4 Intervention Description*

##### *5.5.4.1 MI-CB Intervention Description*

The pilot study was developed using intervention mapping (Bartholomew et al., 2006). For a detailed outline, readers are referred to Chapter 4. Briefly, participants were offered three months of MI-CB. Two 1-hour face-to-face sessions were delivered: (1) at initial assessment (week 1); and, (2) at exit interview (week 12). Five telephone sessions lasting 15-30 minutes were tapered throughout the intervention at weeks 1, 2, 3, 4, 6 and 8. Figure 5.1 shows a flow chart of intervention delivery. Multiple theoretical components found to influence PA maintenance informed the intervention: (1) expectancy-value theory (Janis, 1984); (2) social cognitive theory (Bandura, 1986); (3) relapse-prevention (Marlatt & Donovan, 2005); (4) theory of behavioural maintenance (Rothman, 2000); and, (5) disconnected values theory (Anshel & Kang, 2007). Nine theory-derived determinants (e.g., barrier self-efficacy and coping skills) found to promote PA maintenance were targeted for change. Table 5.1 lists the determinants and associated theories used within the MI-CB intervention. MI was the main communication method used to elicit information and change/talk, to develop empathy and rapport, and explore the discrepancy between expectations and experiences. CB

techniques were delivered according to individual issues and barriers, such as cognitive-reframing, action-planning, self-monitoring (e.g., activity diaries, and activity tracking using smart phones or websites), goal setting, and activity pacing. The intervention was delivered by the primary researcher undertaking a PhD. in health and exercise psychology and had completed the beginner, intermediate and advanced MI workshops (6 days) delivered by a qualified trainer as part of the Motivational Interviewing Network of Trainers (MINT). The researcher's competence was assessed during the training using the Motivational Interviewing Treatment Integrity (MITI) form (Moyers et al., 2010).



*Figure 5.1.* Flow diagram of the intervention delivery

**Table 5.1.** Theory-derived determinants used in the MI-CB Intervention.

<b>Determinants</b>	<b>Theory</b>
<b>Personal</b>	
PA outcome expectations	Expectancy-value theory/Rothman's theory of behavioural maintenance
PA outcome experiences	Expectancy-value theory/Rothman's theory of behavioural maintenance
Outcome expectations-experiences discrepancy	Expectancy-value theory/Rothman's theory of behavioural maintenance
Core values	Disconnected values theory
Trial and Error	Social cognitive theory & Relapse prevention model
Attitudes towards PA	Social cognitive theory
Coping skills	Relapse prevention model
<b>External</b>	
Social support for exercise and condition management	Social cognitive theory
Family	
Friends	
Professionals	Relapse prevention model/Social cognitive theory
Self-efficacy/skills to overcome barriers	
Physical	
Environmental	
Psychological	

#### *5.5.4.2 Usual Care Description*

After a 12-week PARS, each individual received the offer of a discount on a three month membership scheme at their local leisure centre, which represents the usual care (UC) of PARS completers. Participants randomised into the UC group received no other support. At the last data collection point of the trial (6 months), participants were offered feedback on their completed questionnaires so not to bias the results. For ethical

reasons, the feedback session was delivered based on the components of the MI-CB intervention (e.g., exploring discrepancies between expectations and experiences).

### **5.5.5 Measures**

All measures for primary (physical activity) and secondary (psychological and epidemiological) outcomes were collected at three time points: (1) baseline (0 months); (2) post-intervention (3 months); and, (3) follow-up (6 months). Questionnaires were completed in the presence of the primary researcher and took a maximum of 30 minutes to complete.

#### *5.5.5.1 Demographic Characteristics*

At baseline, participants provided information on age, gender, ethnicity, employment status, and health condition(s).

#### *5.5.5.2 Primary Outcome Measures: Physical Activity (PA)*

Physical activity maintenance was the main intervention objective, as stated during the intervention mapping process (*cf.* Chapter 4) and was, therefore, the primary outcome.

##### *5.5.5.2.1 Average Steps per Day*

The Silva ex<sup>3</sup> Plus Pedometer is a triaxial device used to objectively measure average daily steps. An objective measure of PA was chosen to limit reporting bias, associated with self-report measures in PA studies (Reilly et al., 2008). Pedometers were worn around the neck for seven waking days and participants were instructed to keep a 7-day step log in case the pedometer's 7-day memory function failed. The mean steps/day was calculated and used to represent the outcome variable. The pedometer has good convergent validity with a range of accelerometers for monitoring moderate-vigorous free living PA ( $r = 0.86$ ; Tudor-Locke, Williams, Reis, & Pluto, 2002). Usability was taken into consideration to select appropriate technology to measure PA within an older adult population. Previous studies report negative side effects (e.g., skin irritations) with other devices such as the ActiHeart when worn for seven days, leading to a loss of information (Scott et al., 2011). Instead, the pedometer has been found to be user-friendly and reliable in an older adult clinical population (Talbot, Gaines, Huynh, & Metter, 2003).

#### 5.5.5.2.2 Kcal Expenditure from All-intensity PA and Moderate-Vigorous PA (MVPA).

The Community Healthy Activities Model Programme for Seniors Scale (CHAMPS; Stewart et al., 2001) scale was used to measure total weekly kilocalories (kcal) expenditure from all PA intensities (kcal-All/week), and weekly kcal expenditure from moderate-vigorous PA (MVPA; kcal-MVPA/week). The 41-item measure asks participants to rate the total hours spent performing a specific activity (e.g., walking uphill) in a typical week. The CHAMPS scale has been used in previous PA maintenance research (*cf.* Martinson et al., 2008). Within this study, the CHAMPS scale for kcal-All/week demonstrated good internal consistency at 0 months ( $\alpha = 0.75$ ), 3 months ( $\alpha = 0.77$ ), and 6 months ( $\alpha = 0.75$ ). The CHAMPS scale for kcal-MVPA/week also demonstrated acceptable to good internal consistency at baseline ( $\alpha = 0.68$ ), 3 months ( $\alpha = 0.73$ ), and 6 months ( $\alpha = 0.68$ ). Similarly, the scale has demonstrated good reliability for kcal-MVPA/week ( $r = 0.76$ ), acceptable reliability for all kcal-All/week ( $r = 0.62$ ), and is sensitive to change in an older adult population (Harada, Chiu, King, & Stewart, 2001). The scale also correlates well with other measures of MVPA, such as the doubly labeled water test ( $r = 0.28$ ); the gold standard in PA measurement (Colbert, Matthews, Havighurst, Kim, & Schoeller, 2011).

#### 5.5.5.3 Psychological Outcomes (Secondary Outcomes)

Psychological measures were implemented, where possible, to measure the determinants that the intervention aimed to influence for PA maintenance, as outlined during the intervention mapping process (*cf.* Chapter 4). A battery of self-reported questionnaires measuring the psychological determinants included:

##### 5.5.5.3.1 Barrier Self-Efficacy

The barrier self-efficacy for exercise scale (BARSE) is a 13-item scale and was used to assess participant's self-efficacy to exercise three times a week across the following three months (McAuley, 1992). Participants were asked to circle their level of confidence to exercise 3 times per week for the next 3 month while overcoming barriers, such as 'if the weather was very bad' and 'I was bored by the program or activity'. Items were scored on a 100-point percentage scale with 10-point increments, ranging from 0 (not at all confident) to 100 percent (highly confident). The mean was calculated to obtain a total percentage self-efficacy score. Higher percentages indicated increased



self-efficacy. The BARSE scale demonstrated excellent internal consistency at baseline ( $\alpha = 0.92$ ), 3 months ( $\alpha = 0.96$ ), and 6 months ( $\alpha = 0.96$ ) and is consistent with previous PA research in an older adult population (McAuley, Jerome, Marquez, Elavsky, & Blissmer, 2003).

#### 5.5.5.3.2 *Physical and Psychological Outcome Expectations and Experiences*

The outcome expectations and realisations for physical activity scale (OERS) is a 14-item scale used to measure the discrepancy between PA outcome expectations at baseline and PA outcome realisations/experiences at 3 and 6 months (Wilcox, Castro & King, 2006). At baseline, the questionnaire asked participants: "we would like to know to what extent you expect the following factors to change, if at all, across the next six months due to physical activity". To assess experiences at 3 and 6 months, the same measure was used but participants were asked: 'We would like to know how you feel the following factors have changed, if at all, over the past three months'. At 6 months, the last phrase was replaced with 'the *past six months*'. In both versions of the questionnaire, participants were asked to tick the number that closely corresponded to their level of expectation for each factor. All factors were on a 10-point likert scale ranging from 0 to 10, where '0' represents *to get worse*, '1-2' represents *no change*, '4-6' represents *moderate improvement*, and '7-10' represents *extreme improvement*. Factors were categorised according to physical expectations (e.g., quality of sleep and depression). Total scores for physical expectations ranged from 0 to 40, and psychological expectations scores ranged from 0 to 100. Higher scores represent higher expectations. The OERS scale demonstrated good to excellent internal consistency for physical expectations at baseline ( $\alpha = 0.87$ ), 3 months ( $\alpha = 0.90$ ), and 6 months ( $\alpha = 0.83$ ). For psychological expectations, excellent internal consistency was demonstrated at baseline ( $\alpha = 0.93$ ), 3 months ( $\alpha = 0.96$ ), and 6 months ( $\alpha = 0.94$ ). This is consistent with previous research (Wilcox et al., 2006). The test-retest reliability for each factor has been reported elsewhere (King, Taylor, Haskell, DeBusk, 1989).

#### 5.5.5.3.3 *Coping Skills*

The COPE Scale is a 60-item multi-dimensional measure, which was used to assessing adaptive and maladaptive coping (Carver, Scheier, & Weintraub, 1989) and is largely used in adults with chronic health conditions (Curtis, Groarke, Coughlan, & Gsel, 2004). The scale consists of problem focused (e.g., planning), emotion focused

(e.g., religion) strategies and maladaptive strategies (e.g., behavioural de-activation). For the purpose of this study, seven adaptive coping strategies were selected according to the recommendations of Carver et al., (1989): active coping, planning, seeking instrumental social support, seeking emotional social support, positive reinterpretation and growth, suppression of competing activities, and restraint coping. Three maladaptive coping skills were also selected: venting of emotions, denial, and behavioural disengagement. Participants were asked to indicate the extent to which they used each coping strategy in relation to their health condition. Each strategy consisted of four items and were presented on a 4-point likert scale ranging from '1 = I usually don't do this at all', to '4 = I usually do this a lot'. Scores on each scale range from 4 – 16. Total scores were calculated for adaptive (range: 28 to 112) and maladaptive coping strategies (range: 12 to 48) separately. Adaptive coping strategies demonstrated excellent internal consistency at baseline ( $\alpha = 0.87$ ), 3 months (0.92), and 6 months ( $\alpha = 0.92$ ). Also, the scale for maladaptive coping strategies demonstrated excellent to good internal consistency at baseline ( $\alpha = 0.81$ ), 3 months ( $\alpha = 0.75$ ), and 6 months ( $\alpha = 0.74$ ). This is consistent with previous research (Carver et al., 1989).

#### *5.5.5.3.4 Social Support*

The COPE scale was also used to measure two forms of social support found to be influential in promoting PA in adults with chronic health conditions: seeking instrumental social support and seeking emotional social support (Aggarwal, Liao, & Mosca, 2008). Each sub-scale consisted of four items and was measured on a 4-point likert scale from '1 = I usually don't do this at all', to '4 = I usually do this a lot'. The total was calculated for each sub-scale, ranging from 4 to 16. An example item for seeking instrumental social support was, 'I try to get advice from someone about what to do', and an example item for seeking emotional social support was, 'I discuss my feelings with someone.' The scale for seeking instrumental social support represented acceptable, good and excellent internal consistency at baseline ( $\alpha = 0.69$ ), 3 months ( $\alpha = 0.75$ ), and 6 months ( $\alpha = 0.84$ ) respectively. Also, the scale for seeking emotional social support represented good to excellent internal consistency at baseline ( $\alpha = 0.76$ ), 3 months ( $\alpha = 0.91$ ), and 6 months ( $\alpha = 0.84$ ). This is consistent with previous testing of the scale (Carver et al., 1989).

#### *5.5.5.4 Epidemiological Measures (Secondary Outcomes)*

Epidemiological outcomes were also considered as secondary outcomes given the impact of PA on factors such as weight and the link to morbidity (Donnelly et al., 2009).

##### *5.5.5.4.1 Weight (Kg)*

An objective measurement of weight was taken as longitudinal studies across 10 years have demonstrated the relationship between PA maintenance and weight management in both males and females (Hamer et al., 2013). Measures were taken at baseline, 3 months, and 6 months by using scales available in the leisure centres.

##### *5.5.5.4.2 Body Mass Index (kg/m<sup>2</sup>)*

Body mass index (BMI) was calculated as longitudinal studies have consistently demonstrated the relationship between increased PA and lower BMI (Hamer et al., 2013). BMI was categorised according to the World Health Organization (WHO) Classification of Obesity (James, Leach, Kalamara, & Shayeghi, 2001). BMI ranges were: underweight (< 18.5), normal weight (18.5-24.9), pre-obesity (25.0-29.9), obesity class I (30.0-34.9), obesity class II (35.0- 39.9), and obesity class III ( $\geq 40$ ).

#### *5.5.5.5 Feasibility of the KASY Trial*

A number of feasibility criteria were explored according to the recommendations for pilot studies (Lancaster et al., 2004). These factors were: (1) study recruitment response rates; (2) participant retention and attrition rates; (3) missing data; (4) acceptability of measures; and, (5) sample size calculation for a large scale trial.

#### **5.5.6 Plan of Analysis**

Exploration of the data and data analyses were conducted in a series of steps, including: (1) baseline differences between treatment and UC groups; (2) intervention outcomes by primary and secondary variables between treatment and UC groups at baseline, 3 and 6 months; (3) clinical significance of intervention outcome between treatment and UC groups for kcal-MVPA/wk and average steps/day; and (4) relationship between psychological outcomes and PA between treatment and UC groups.

Analysis for feasibility included: recruitment response rate; adherence to intervention, attrition rates, and missing data; and sample size estimation for a large scale RCT.

All variables were checked for outliers using *z*-scores and normality was checked using Kolmogorov-Smirnov tests. Square root log transformations were performed on data when two or more test assumptions were violated (i.e., normality, homogeneity of variances; and, homogeneity of regression slopes). Statistical significance was set at  $p \leq .05$ . Intention-to-treat analysis was used to deal with any missing data using the last-observation-carried forward approach (Shao & Zhong, 2003). Data were analysed using SPSS 19 for windows.

Baseline differences between MI-CB intervention and UC groups for all participants' characteristics and variables were performed using chi-square tests on categorical variables and *t*-tests were performed on continuous variables.

Descriptive statistics were calculated to compare the means (*M*) and standard deviations (*SD*) between treatment and UC groups at baseline, 3 and 6 months. To assess the preliminary effect of the intervention on the primary and secondary outcomes, repeated-measures ANCOVA ( $_{m}$ ANCOVA) was used for Time x Group comparisons consisting of 3 (time: baseline, 3 and 6 months) x 2 (group: intervention and control). Baseline data was used as the covariate for each variable to correct for regression to the mean and any differences (Vickers & Altman, 2001). Effect sizes and 95% confidence intervals were calculated using Hedges' (adjusted) *g* to correct for bias associated with small samples. Cohen's rule of thumb was used to interpret the magnitude of effect (i.e., large [0.8], medium [0.5], and small [0.2]; Cohen, 1988).

To assess whether any relationships existed between psychological variables and PA outcomes in the MI-CB group, Pearson's (*r*) product-moment correlation coefficient was used. To assess PA maintenance, the percentage of participants meeting the recommended guidelines for kcal-MVPA/week, and average steps/day were reported for all time points between treatment and UC groups. Odds ratios were calculated using logistic regression between treatment and UC groups controlling for baseline values (to correct for differences and regression to the mean). The threshold values of 1500 kcal/week (Kokkinos & Myers, 2010), and 4600 steps/day (Tudor-locke et al., 2011) were used. These thresholds are the recommended guidelines for health benefits specifically in older adults and clinical populations.

Feasibility of intervention recruitment strategy was assessed using descriptive statistics to explore the response rate (%), adherence to the intervention, attrition rates,



and missing data. Spearman's correlations co-efficient was conducted, to explore any relationships between adherence and demographics, as data were not normally distributed. Additionally, sample size calculations for large scale trials were calculated from the pilot data to perform two statistical procedures on kcal-MVPA/week: (1) repeated-measures ANOVA ( $_{mm}$ ANOVA); and, (2) ANCOVA. For sample size estimation for  $_{mm}$ ANOVA, the programme NQUERY Advisor 7.0 (Statistical Solutions) was used to calculate a difference of  $d = 0.25$  in kcal-MVPA/week between groups at follow-up, at 80% power, two-tailed,  $\alpha = 0.05$ , and using the means and standard deviations from this pilot data. For sample size estimation for ANCOVA, a simple formula was used to convert the sample size estimate from the  $_{mm}$ ANOVA stated above based on the recommendations of Borm, Francen, & Lemmens (2007):  $(1 - p^2)n + 1$ . In this instance,  $p$  is the correlation between the baseline and follow-up values for the outcome measure kcal-MVPA/week; and,  $n$  is the sample size estimate per group for a t-test.

## 5.6 Results

### 5.6.1 Sample Characteristics at Baseline

Table 5.2 shows the descriptive statistics of the overall sample, intervention and UC group. Overall, the majority of study participants were likely to be male (57%), have multiple health conditions (71%), have an average of 3.57 comorbidities ( $SD = 2.12$ ), were retired (46%), where white British ( $n = 34$ ), and were classed as either pre-obesity (34%) or obesity class I (34%) according to their BMI scores ( $_{BMI}M = 31.70$ ,  $SD = 5.21$ ). The mean age of participants was 59.34 years ( $SD = 10.86$ ), and expended an average of 4022.08 kcal-MVPA/wk ( $SD = 3449.45$ ) and an average of 5458.45kcal-All/wk ( $SD = 4214.23$ ). Participants achieved an average of 5582.80 steps per day ( $SD = 3058.61$ ).

Randomisation successfully resulted in similar characteristics on all demographic and primary outcome variables. Independent samples  $t$ -tests revealed differences ( $p < .05$ ) between treatment and UC groups for four secondary outcome variables: physical outcome expectations for PA ( $t[33] = 2.39$ ,  $p = .023$ ), adaptive coping ( $t[33] = 3.04$ ,  $p = .005$ ), barrier self-efficacy for PA ( $t[33] = 2.10$ ,  $p = .043$ ), and instrumental social support ( $t[33] = 2.86$ ,  $p = .007$ ). Participants in the intervention group were more likely to have higher expectations for physical outcomes, use more



adaptive coping strategies, have higher self-efficacy to overcome barriers for PA, and use more instrumental social support than participants in the UC group.

**Table 5.2** Means, Standard Deviations, and % of Baseline Characteristics for Total Sample and Treatment Groups for the KASY Trial<sup>a</sup>

	Intervention (n=17)	UC (n=18)	Sample (N=35)
<i>Demographics</i>			
Age (years)	60.70 ± 10.04	58.05 ± 11.72	59.34 ± 10.86
Female (%)	41.0	44.0	43.0
Condition (%)			
Multiple	71.0	72.0	71.0
Musculoskeletal	12.0	11.0	11.0
Coronary Heart Disease	12.0	-	6.0
Cerebrovascular	-	6.0	3.0
Mental health	-	6.0	3.0
Endocrine and Metabolic diseases	6.0	6.0	6.0
Comorbidities	3.05 ± 1.63	4.05 ± 2.43	3.57 ± 2.12
Employment (%)			
Full-time	6.0	6.0	6.0
Part-time	6.0	28.0	17.0
Full-time Carer	6.0	6.0	6.0
Unemployed	18.0	6.0	11.0
Incapacity Benefit	12.0	17.0	14.0
Retired	53.0	39.0	46.0
Ethnicity (n)			
White British	16.0	18.0	34.0
Black Caribbean	1.0	-	1.0
Weight (Kg)	89.59 ± 12.13	89.21 ± 17.20	89.40 ± 14.74
Body Mass Index (kg/m <sup>2</sup> ; %)			
Normal weight	6.0	6.0	6.0
Pre-obesity	24.0	44.0	34.0
Obesity Class I	47.0	22.0	34.0
Obesity Class II	23.0	17.0	20.0
Obesity Class III	-	11.0	6.0
<i>Primary Outcomes</i>			
Average Steps/day	5638.29 ± 3063.19	5530.40 ± 3142.14	5582.80 ± 3058.61

	Intervention (n=17)	UC (n=18)	Sample (N=35)
Kcal-All/wk	6495.13 ± 4302.78	4479.36 ± 4000.61	5458.45 ± 4214.23
Kcal-MVPA/wk	4799.73 ± 3450.16	3287.62 ± 3379.06	4022.08 ± 3449.45
<i>Secondary Outcomes</i>			
Barrier Self-Efficacy*	69.81 ± 21.54	54.78 ± 20.80	62.0 ± 22.0
Adaptive Coping **	74.58 ± 12.17	61.22 ± 13.77	68.0 ± 15.0
Maladaptive Coping	22.41 ± 7.00	22.00 ± 7.51	22.02 ± 7.16
Emotional Social Support	7.58 ± 3.00	8.00 ± 3.98	7.8 ± 3.49
Instrumental Social Support **	10.70 ± 3.11	7.77 ± 2.94	9.20 ± 3.33
Outcome Expectations (Physical)*	29.52 ± 8.28	21.72 ± 10.78	25.51 ± 10.29
Outcome Expectations (Psychological)	65.94 ± 19.16	54.22 ± 25.59	61.0 ± 22.0

\*  $p < .05$  difference between treatment groups at baseline

\*\*  $p < .01$  difference between treatment groups at baseline

<sup>a</sup> Values presented are the untransformed raw means and standard deviations

### 5.6.2 Intervention Effects for Primary Outcomes by MI-CB and UC Groups between 0, 3, and 6 Months: Hypothesis 1

Table 5.3 displays the adjusted for baseline mean scores, significance levels of the  $\text{mANCOVAs}$ , and hedges adjusted  $g$  standardised mean differences with 95% CIs for primary outcomes between MI-CB and UC groups. The  $\text{mANCOVA}$  models examined whether there was a significant difference between MI-CB and UC groups at 3 and 6 months while controlling for baseline scores on each primary outcome variable. For kcal-MVPA/wk, the MI-CB group expended more kcals than the UC group at 3 months ( $F(1, 32) = 7.83, p = .009, g = 0.90$ ) and this difference was maintained at 6 months ( $F(1, 32) = 5.34, p = .027, g = 1.05$ ). Figure 5.2a displays a 'fork like' pattern where the MI-CB group continue to increase by an average expenditure of 770 kcals-MVPA/wk between baseline and 3 months (end-point), which is maintained between 3 and 6 months post-intervention demonstrated by a slight increase of 94 kcals-MVPA/wk. Conversely, the UC group have a total decrease in kcal expenditure across 6 months of 2049.23. The mean difference between MI-CB and UC groups was 2561.29 and 2913.06 kcal-MVPA/wk expenditure at 3 and 6 months respectively.

For kcal-All/wk, the MI-CB group expended more kcals from all PA intensities than the UC group at 3 months ( $F(1, 32) = 7.71, p = .009, g = 0.92$ ) and this difference

was maintained at 6 months ( $F(1, 32) = 4.95, p = .033, g = 0.78$ ). Figure 5.2b also displays a 'fork like' pattern where the MI-CB group increased their kcal expenditure from all PA intensities by 1126 kcals, which is maintained between 3 and 6 months post-intervention. Only a slight loss of 34 kcals-All/wk was found. Conversely, the UC group lost an average of 2374.91 kcals-All/wk across 6 months. The mean difference between MI-CB and UC groups was 3270.26 and 3467.35 kcal-All/wk expenditure at 3 and 6 months respectively.

There were no main effects between MI-CB and UC groups for average steps/day at 3 months ( $F(1, 32) = 0.29, p = .592, g = 0.13$ ), and 6 months ( $F(1, 32) = 0.79, p = .382, g = 0.21$ ). Despite this, Figure 5.2c demonstrates that the MI-CB group experienced a slight decrease on average of 15 steps/day between baseline and 3 months whereas the UC group decrease on average of 346 steps/day. Between 3 and 6 months post intervention, the MI-CB group generally maintain the average number of steps/day with an increase of 66 steps/day, whereas the UC group lose a further 141 steps/day. The mean difference between MI-CB and UC groups was 331.04 and 537.44 average steps/day at 3 and 6 months respectively.

**Table 5.3** Descriptive Statistics (mean, SD), Raw Change Scores (within treatment group), Significance Levels<sup>a</sup> (between treatment groups), and Standardised Mean Differences (Hedges adjusted *g*) with 95% Confidence Intervals for the Primary Outcomes at 3 and 6 Months between Treatment Groups.

		Average Steps/day	Kcal-MVPA/wk <sup>b</sup>	Kcal-All/wk <sup>b</sup>
3 Months (End-point)	MI-CB Mean (SD)	5567.71 (2594.68)	4792.25 (4335.93)	6584.48 (5170.88)
	UC Mean (SD)	5236.67 (2521.56)	2230.96 (4210.72)	3314.22 (5020.81)
	MI-CB Change Score (0-3 months) <sup>c</sup>	-15.1	770.17	1126.03
	UC Change Score (0- 3 months) <sup>c</sup>	-346.14	-1791.12	-2144.23
	Hedges Adjusted <i>g</i> (95%CI) <sup>d</sup>	0.13 (-0.54, 0.79)	0.90 (0.20, 1.59)	0.92 (0.22, 1.62)
	<i>P</i>	0.592	0.009**	0.009**
6 Months (Follow-up)	MI-CB Mean (SD)	5633.25 (2574.25)	4885.91 (4571.31)	6550.89 (5110.03)
	UC Mean (SD)	5095.81 (2501.73)	1972.85 (4439.29)	3083.54 (4961.7)
	MI-CB Change Score (3-6 months) <sup>c</sup>	65.54	93.65	-33.59
	UC Change Score (3- 6 months) <sup>c</sup>	-140.86	-258.11	-230.68
	Hedges Adjusted <i>g</i> (95%CI) <sup>d</sup>	0.21 (-0.46, 0.86)	1.05 (0.35, 1.76)	0.78 (0.09, 1.46)
	<i>P</i>	0.382	0.027*	0.033*

\*  $p < .05$  difference between treatment groups at baseline

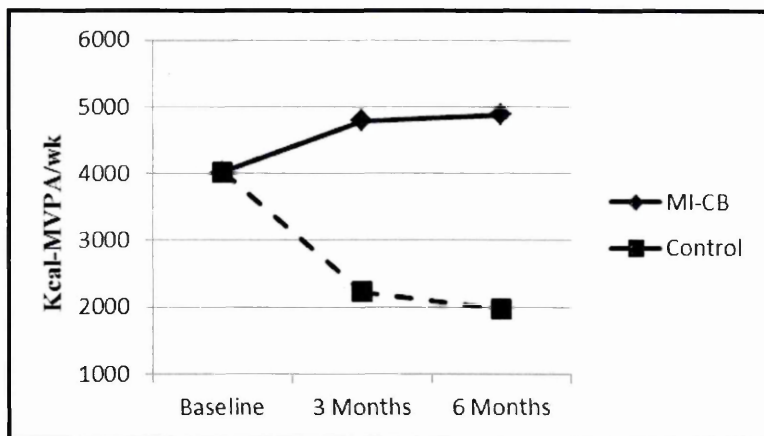
\*\*  $p < .01$  difference between treatment groups at baseline

<sup>a</sup> Significance values (*P*) are presented for the square-root log transformed adjusted for baseline values

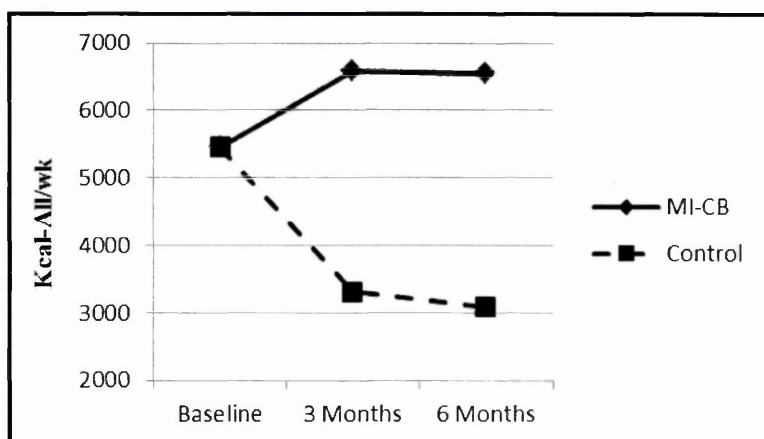
<sup>b</sup> Means and SD are the untransformed adjusted for baseline values

<sup>c</sup> Change scores are calculated from the untransformed adjusted baseline values: Kcal-MVPA/wk = 4022.08; kcal-All/wk = 5458.45; and, average steps/day = 5582.81. A positive value represents an increase and a negative value represents a decrease over time.

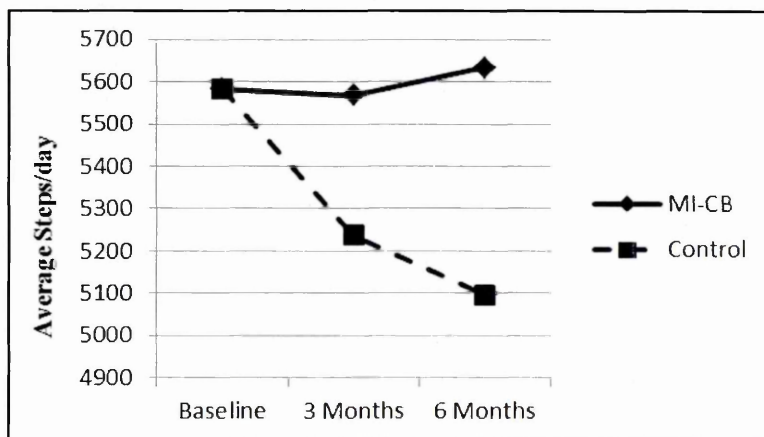
<sup>d</sup> Hedges *g* and 95% CIs are presented for the square-root log transformed adjusted for baseline values



**Figure 5.2a** Adjusted for baseline means for Kcal-MVPA/wk means at baseline, 3 and 6 months by treatment group. Adjusted baseline mean is evaluated at 4022.08



**Figure 5.2b** Adjusted for baseline means for Kcal-All/wk means at baseline, 3 and 6 months by treatment group. Adjusted baseline mean is evaluated at 5458.45



**Figure 5.2c** Adjusted for baseline means for average steps/day at baseline, 3, and 6 months by treatment group. Adjusted baseline mean is evaluated at 5582



### 5.6.3 PA Maintenance within MI-CB and UC Groups: Hypothesis 2

Table 5.4 shows the descriptive statistics and odds ratios for the number of individuals who met the PA guidelines for average steps/day and kcal-MVPA expenditure between MI-CB and UC groups.

#### 5.6.3.1 Steps/day

Descriptive statistics revealed that approximately 53% of the MI-CB and 55% of the UC groups met the guidelines at baseline, and 3 and 6 months. Adjusted for baseline odds ratios revealed that there were only small odds of the MI-CB group meeting the guidelines compared to the UC group at 3 months ( $OR = 0.83, p = .87$ ) and at 6 months ( $OR = 0.44, p = .52$ ). Within the MI-CB group, there was no change in the percentage of participants meeting the guidelines between baseline and 3 months but small decrease of 5.8% between 3 and 6 months was found when no intervention was delivered. Within the UC group, there was no change in the percentage of participants meeting the guidelines at any of the three time points.

#### 5.6.3.2 Kcal-MVPA/wk

Descriptive statistics revealed that approximately 88% of the MI-CB group were likely to meet the guidelines compared to approximately 55% of the UC group at baseline, and 3 and 6 months. In the MI-CB group, a small decrease of 5.8% of participants meeting the guidelines occurred between 3 and 6 months. Within the UC group, a small but continual decrease in the percentage of participants meeting the guidelines across all time points was observed. Adjusted for baseline odds ratios revealed that the MI-CB group was 4.5 times more likely than the UC group to meet the guidelines at 3 months ( $p = .11$ ) and almost 4 times more likely to meet the guidelines at 6 months ( $p = .09$ ).

**Table 5.4.** Descriptive Statistics and Adjusted Odds Ratios for Maintaining Average Steps/day and KcalMVPA Expenditure by Treatment Groups between 0, 3, and 6 Months.

	Baseline	3 months	6 months
Steps/day <sup>a</sup>			
Intervention, %	52.9	52.9	47.1
<i>n</i>	9	9	8
UC, %	55.6	55.6	55.6
<i>n</i>	10	10	10
Odds ratio	0.90	0.83	0.44
95% CI, lower limit	0.23	0.89	0.03
95% CI, upper limit	3.40	7.92	5.28
p, Intervention vs. UC	0.87	0.87	0.52
Kcal, MVPA <sup>b</sup>			
Intervention, %	88.20	88.20	82.40
<i>n</i>	15	15	14
UC, %	61.1	55.6	50.0
<i>n</i>	11	10	9
Odds ratio	4.77	4.53	3.97
95% CI, lower limit	0.82	0.70	0.80
95% CI, upper limit	27.56	29.13	19.53
p, Intervention vs. UC	0.08	0.11	0.09

<sup>a</sup>The value of 4500 steps/day was used as a threshold to assess PA maintenance

<sup>b</sup>The value of 1500 kcal/week was used as a threshold to assess PA maintenance.

#### **5.6.4 Intervention Effects for Psychological Outcomes by MI-CB and UC Groups between Baseline, 3 and 6 Months: Hypothesis 3**

Table 5.5 displays the adjusted for baseline mean scores, significance levels of the  $\eta^2$  ANCOVAs, and hedges adjusted *g* standardised mean differences for psychological outcomes between MI-CB and UC groups. The  $\eta^2$  ANCOVA models examined whether there was a significant difference between MI-CB and UC groups at 3 and 6 months while controlling for baseline scores on each secondary (psychological) outcome variable. At 3 months, the MI-CB group had higher self-efficacy for

overcoming barriers to exercise ( $F(1, 32) = 5.50, p = .025, g = 0.56$ ), experienced more physical outcomes ( $F(1, 32) = 6.11, p = .019, g = 1.23$ ), and experienced more psychological outcomes ( $F(1, 32) = 7.09, p = .012, g = 0.63$ ) than the UC group. No main effects between treatment and UC groups were found for adaptive coping strategies ( $F(1, 32) = 1.21, p = .279, g = 0.27$ ), maladaptive coping strategies ( $F(1, 32) = 0.50, p = .485, g = -0.17$ ), instrumental social support ( $F(1, 32) = 0.18, p = .673, g = 0.14$ ) and emotional social support ( $F(1, 32) = 0.54, p = .470, g = 0.23$ ) at 3 months. At 6 months, no main effects between treatment and UC groups were found for any psychological outcomes although a small effect was found for barrier self-efficacy ( $F(1, 32) = 3.44, p = .073, g = 0.45$ ), instrumental social support ( $F(1, 32) = 1.55, p = .222, g = -0.43$ ), physical outcome experiences ( $F(1, 32) = 1.25, p = .273, g = 0.55$ ), and psychological outcome experiences ( $F(1, 32) = 0.86, p = .360, g = 0.22$ ).

**Table 5.5** Descriptive Statistics (mean, SD), Significance Levels (between treatment groups)<sup>a</sup>, and Standardised Mean Differences (Hedges adjusted *g*) With 95% Confidence Intervals for Secondary Outcomes at 3 and 6 Months between Treatment Groups.

	Psychological Outcomes				
	Barrier Self-Efficacy	Adaptive Coping	Maladaptive Coping	Emotional Support <sup>b</sup>	Instrumental Support <sup>b</sup>
3 Months (End-point)	MI-CB Mean (SD)	72.49 (18.71)	20.53 (8.17)	8.69 (4.14)	9.58 (4.97)
	UC Mean (SD)	67.37 (18.12)	21.89 (7.93)	8.02 (4.03)	8.95 (4.91)
	Hedges Adjusted <i>g</i> (95%CI) <sup>c</sup>	0.56 (-0.11, 1.24)	0.27 (-0.39, 0.94)	-0.17 (-0.83, 0.50)	0.23 (-0.44, 0.89)
	P	0.025*	0.279	0.485	0.673
6 Months (Follow-up)	MI-CB Mean (SD)	61.38 (31.85)	68.67 (19.48)	19.37 (5.45)	8.31 (4.91)
	UC Mean (SD)	47.03 (30.90)	70.37 (18.83)	20.10 (4.74)	8.44 (4.56)
	Hedges Adjusted <i>g</i> (95%CI) <sup>c</sup>	0.45 (-0.22, 1.12)	-0.09 (-0.75, 0.58)	-0.14 (-0.80, 0.52)	0.14 (-0.52, 0.81)
	P	0.073	0.728	0.573	0.222

\*  $p < .05$  difference between treatment groups.

<sup>a</sup> Significance values (*P*) are presented for the square-root log transformed adjusted for baseline values for emotional and instrumental social support.

<sup>b</sup> Means and SD are the untransformed adjusted for baseline values.

<sup>c</sup> Hedges *g* and 95% CIs are presented for the square-root log transformed adjusted for baseline values for emotional and instrumental social support.

**Table 5.5.** Descriptive Statistics (mean, SD), Significance Levels (between treatment groups)<sup>a</sup>, and Standardised Mean Differences (Hedges adjusted *g*) With 95% Confidence Intervals for Secondary Outcomes at 3 and 6 Months between Treatment Groups.

	Psychological Outcomes		Epidemiological Outcomes	
	OERS Physical	OERS Psychological	Weight (kg)	BMI
3 Months (End-point)	MI-CB Mean (SD)	23.35 (6.41)	59.70 (31.49)	87.69 (5.05)
	UC Mean (SD)	15.40 (6.22)	39.62 (30.61)	89.32 (4.91)
	Hedges Adjusted <i>g</i> (95%CI) <sup>c</sup>	1.23 (0.51, 1.95)	0.63 (-0.05, 1.31)	-0.32 (-0.99, 0.35)
	P	0.019 *	0.012 *	0.119
6 Months (Follow-up)	MI-CB Mean (SD)	19.71 (6.25)	51.87 (29.84)	89.59 (8.82)
	UC Mean (SD)	16.22 (6.06)	45.24 (29.01)	89.39 (8.58)
	Hedges Adjusted <i>g</i> (95%CI) <sup>c</sup>	0.55 (-0.12, 1.23)	0.22 (-0.44, 0.89)	0.02 (-0.64, 0.69)
	P	0.273	0.360	0.961

\*  $p < .05$  difference between treatment groups.

<sup>a</sup> Significance values (*P*) are presented for the square-root log transformed adjusted for baseline values for emotional and instrumental social support.

<sup>b</sup> Means and SD are the untransformed adjusted for baseline values.

<sup>c</sup> Hedges *g* and 95% CIs are presented for the square-root log transformed adjusted for baseline values for emotional and instrumental social support.



### ***5.6.5 Intervention Effects for Epidemiological Outcomes by MI-CB and UC Groups between Baseline, 3 and 6 Months: Hypothesis 4.***

Table 5.5 displays the adjusted for baseline mean scores, significance levels of the  $\text{mANCOVAs}$ , and hedges adjusted  $g$  standardised mean differences for epidemiological outcomes between MI-CB and UC groups. The  $\text{mANCOVA}$  models examined whether there was a significant difference between MI-CB and UC groups at 3 and 6 months while controlling for baseline scores on each epidemiological variable. At 3 months, there was no main effect between treatment and UC groups for weight ( $F(1, 32) = 1.87, p = .181, g = -0.32$ ) and BMI ( $F(1, 32) = 2.56, p = .119, g = -0.37$ ), although the effect size indicates a small reduction in weight and BMI was found. At 6 months, there was no main effect between treatment and UC groups for weight ( $F(1, 32) = 0.01, p = .925, g = 0.02$ ) or BMI ( $F(1, 32) = 0.01, p = .961, g = 0.02$ ) and both groups returned to similar baseline values.

### ***5.6.6 The Relationship between Psychological and Physical Activity Outcomes for the MI-CB Intervention: Hypothesis 5***

Pearson's correlation coefficients were calculated to assess relationships between the psychological variables (i.e., secondary outcomes) and PA (i.e., primary outcomes) for the MI-CB intervention group. Results are presented in Table 5.6.

#### ***5.6.6.1 Kcal-MVPA/wk***

For the MI-CB group, participants with higher barrier self-efficacy ( $r = .553, p = .021$ ) or more experiences of physical outcomes at 3 months ( $r = .555, p = .021$ ) expended more kcal-MVPA/wk at 3 months compared to those who had lower self-efficacy or experienced less outcomes. Also, participants who experienced more physical outcomes at 3 months also expended more kcal-MVPA/wk at 6 months compared to those who experienced less physical outcomes ( $r = .488, p = .047$ ). Higher barrier self-efficacy at baseline was related to kcal-MVPA/wk ( $r = .515, p = .035$ ) at 6 months. No other psychological variables were related to kcal-MVPA/wk expenditure at any of the time points.

#### 5.6.6.2 Kcal- All/wk

Inverse relationships were found between kcals-All/wk at baseline used fewer adaptive coping strategies ( $r = -.519, p = .033$ ) and less instrumental support ( $r = -.540, p = .025$ ) at 3 months. A positive relationship was found between participants who experienced more physical outcomes at 3 months and kcal-All/wk expenditure at 3 months ( $r = .562, p = .019$ ). Higher barrier self-efficacy at baseline was also related to kcal-All/wk at 6 months ( $r = .505, p = .039$ ). No other psychological variables were related to kcal-All/wk expenditure at any of the time points.

#### 5.6.6.3 Average Steps/day

For the MI-CB group, there were no statistically significant relationships between any of the psychological variables and average steps/day at any of the time points

**Table 5.6** Pearson's *r* Correlation Coefficients between Psychological and Physical Activity Outcomes for MI-CB Intervention.

Primary Outcomes	Secondary Outcomes											
	Barrier Self-Efficacy			Adaptive Coping Skills			Maladaptive Coping Skills			Instrumental Support		
	Baseline	3 months	6 months	Baseline	3 months	6 months	Baseline	3 months	6 months	Baseline	3 months	6 months
Steps/day												
Baseline	.279	.013	-.344	.068	-.245	.013	-.275	-.316	-.019	-.004	-.295	-.045
3 months	.322	.008	-.011	.095	-.106	-.129	-.320	-.210	-.070	-.050	-.236	-.149
6 months	.352	.003	.007	-.013	-.286	-.182	-.259	-.296	.018	-.061	-.364	-.170
Kcal, MVPA												
Baseline	.309	.376	.070	-.232	-.432	-.284	-.380	-.300	-.444	-.078	-.478	-.230
3 months	.401	.553*	-.076	.158	-.006	.131	-.276	-.244	-.168	-.195	.044	.157
6 months	.515*	.216	-.045	.000	-.071	.153	-.020	-.174	.010	-.241	-.103	.118
Kcal, ALL												
Baseline	.206	.252	-.001	-.221	-.519*	-.237	-.254	-.228	-.336	-.030	-.540*	-.220
3 months	.402	.468	-.101	.191	-.023	.241	-.113	-.195	-.104	-.143	.025	.210
6 months	.505*	.172	-.023	.066	-.014	.252	.130	-.091	.098	-.186	-.057	.173

\* Correlation is significant at the 0.05 level (2-tailed)

	Emotional Support			Physical OERS			Psychological OERS		
	Baseline	3 months	6 months	Baseline	3 months	6 months	Baseline	3 months	6 months
Steps/day									
Baseline	-.449	-.317	-.163	.009	.248	-.080	-.182	-.093	-.194
3 months	-.194	-.152	-.308	.079	.195	.183	-.126	-.172	-.153
6 months	-.276	-.326	-.257	.108	.218	.133	-.110	-.082	-.224
Kcal, MVPA									
Baseline	-.149	-.158	-.114	.361	.422	.300	.239	.166	-.116
3 months	-.310	-.046	-.002	.283	.555*	-.082	.248	.229	-.021
6 months	-.236	-.138	-.001	.300	.488*	.135	.163	.199	.025
Kcal, ALL									
Baseline	-.158	-.228	-.037	.345	.380	.303	.224	.218	-.059
3 months	-.259	-.082	.052	.333	.562*	-.012	.267	.307	.083
6 months	.130	-.103	.053	.348	.457	.183	.201	.268	.125

\* Correlation is significant at the 0.05 level (2-tailed)

### **5.6.6 MI-CB Intervention Feasibility: Hypothesis 6**

#### **5.6.6.1 Study Recruitment, Retention, and Missing Data.**

Initially, the desired sample size for the study was 30 participants per group ( $N = 60$ ; Hertzog, 2008). Figure 5.3 shows the response rate and retention of participants throughout the trial. Within the recruitment phase, only 175 individuals had successfully completed PARS. From this sampling frame, a 24.43% response rate ( $n = 41$ ) was achieved. Out of the 41 interested participants, four were excluded. Reasons were for medical reasons ( $n = 2$ ) or withdrew their interest due to not perceiving the need for PA maintenance support ( $n = 1$ ), or did not meet study criteria ( $n = 1$ ). Thirty seven participants were randomised into the study. Thirty-five participants successfully completed the trial generating high retention rates (96%). Only two participants dropped out of the MI-CB intervention, which occurred before the intervention began and were excluded from any analyses. Reasons for drop-out were scheduling of a major operation to take place during the intervention, and bereavement. Missing data occurred for the COPE scale at 3 months ( $n = 2$ ) and 6 months follow-up ( $n = 5$ ). The reasons for non-completion of the COPE scale were that it was too lengthy and complicated. Pedometer data were also missing at 6 month follow-up ( $n = 3$ ). Reasons for declining the pedometer were associated with illness or symptom flare-ups at the time.



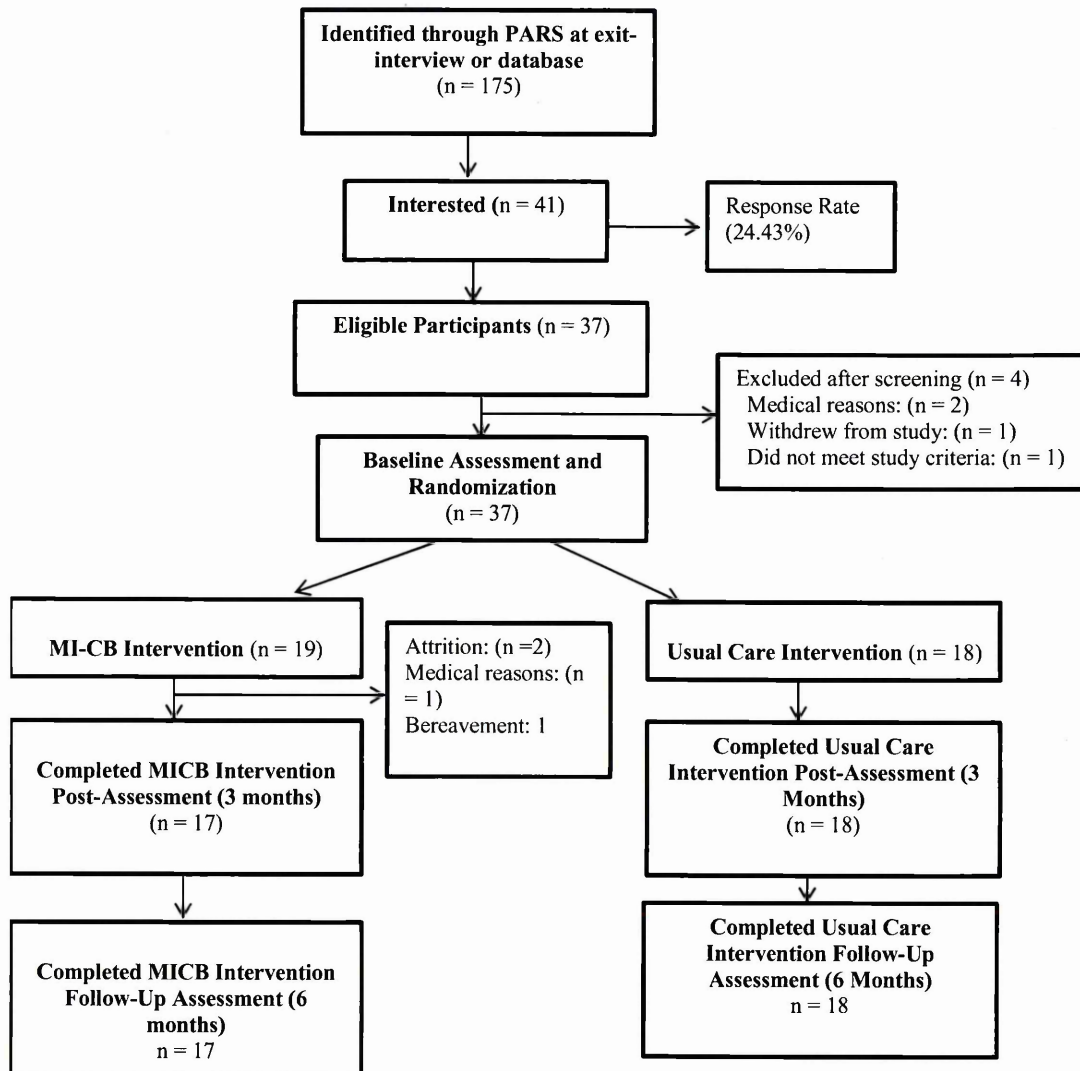


Figure 5.3 Pilot study recruitment and retention flow diagram.

#### 5.6.6.2 Adherence to the MI-CB Intervention

Overall, 59% ( $n = 10$ ) of participants in the MI-CB group attended all seven sessions ( $M = 6.29$ ,  $SD = 1.10$ ). Six percent ( $n = 1$ ) missed three sessions, and 35% ( $n = 6$ ) missed one or two sessions. The primary reasons for missing a session were illness, bereavement, medical appointments, and caregiver duties. Spearman's correlation coefficient was conducted to explore relationships between the demographic variables and all outcome measures at Time 2 and Time 3. Only one positive relationship was found between age and attendance suggesting the older participants were more likely to adhere to the intervention ( $r_s = .68$ ,  $p = .003$ ).

#### 5.6.6.3 Sample Size Calculation for Future RCTs

To perform an  $m$ ANOVA or ANCOVA, sample sizes are displayed in Table 5.7 based on the effect size ( $d$ ) needed to detect a difference in kcal-MVPA/wk between treatment groups at follow-up, at 80% power, two-tailed,  $\alpha = 0.05$ , mean kcal-MVPA/wk = 4799.73 ( $SD = 3450.17$ ). An ANOVA required a smaller sample than an  $m$ ANOVA to be sufficiently powered to detect a clinical difference in kcal-MVPA/wk.

**Table 5.7** Sample Size Estimates for  $m$ ANOVA and ANCOVA.

Effect size ( $d$ )	Sample size per group ( $m$ ANOVA)	Sample size per group (ANCOVA)
0.20	394	298
0.50	64	49
0.80	26	21

## 5.7 Discussion

The overall aim of the RCT pilot study was to assess the preliminary efficacy and feasibility of an integrated motivational interviewing (MI) and cognitive-behavioural (MI-CB) intervention promoting PA maintenance in adults with chronic health conditions. The MI-CB intervention employed seven counselling sessions tapered across three months delivered using both face-to-face and telephone support, which is congruent with best available evidence for promoting PA maintenance (van Keulen et al., 2011; Fjeldsoe et al., 2011; also, see Chapter 2). In terms of intervention efficacy, the primary aim was to assess the effects of the MI-CB intervention compared to UC six months after completing PARS for PA maintenance (primary outcome), theory-derived psychological determinants (secondary outcome), and epidemiological factors (secondary outcome). The study also assessed PA maintenance in accordance with guidelines for health promoting benefits of MVPA kcal expenditure and average steps/day between treatment and UC groups. Furthermore, the relationships were assessed between psychological determinants and PA maintenance between treatment and UC groups to identify whether the MI-CB intervention targeted the theoretical mechanisms for change previously outlined in Chapter 4. In terms of feasibility, the aim was to assess; the recruitment, retention and attrition rates, suitability of measures, and to calculate a sample size for future trials.

### 5.7.1 *Effects of the MI-CB Intervention on Physical Activity (Primary Outcomes):*

#### *Hypothesis 1*

The pilot RCT addressed a number of limitations of previous research: (1) an integrative MI-CB intervention had not been employed for PA maintenance within adults with chronic health conditions, despite a theoretical rationale for enhancing intervention effectiveness (*cf.* Flynn, 2011; Naar-king et al., 2013); (2) specific PA maintenance interventions focusing solely on the maintenance phase are sparse (Martinson et al., 2008); and, (3) studies are recommended to assess PA maintenance after an intervention ends to establish true intervention efficacy in the long-term (Eakin et al., 2010; Marcus et al., 2006). It was hypothesised that PA behaviour would differ between the MI-CB and usual care treatment groups across six months post-PARS for average steps per day, kcal expenditure from MVPA, and from all other PA intensities. This study found that an integrated MI-CB intervention was effective for promoting PA

maintenance across six months compared to usual care. Those who received usual care declined in PA participation, which is consistent with previous research in this area (Buckworth & Dishman, 2002; Foster et al., 2012; Marcus et al., 2000; Pavey et al., 2011) and suggests an integrated MI-CB can, in fact, prevent a decline in PA from occurring.

For kcals expended from MVPA, a large effect was found between treatment and UC groups where the MI-CB group expended an average of 2913 kcals more than the UC group at six months per week. Given that 1500 kcal expenditure per week is the equivalent of 30 minutes of MVPA per day for five days a week (Kokkinos & Myers, 2010), the MI-CB group engaged in almost an extra 60 minutes per day of MVPA than the UC group at six months. This MVPA increase is more than any other intervention promoting PA maintenance at follow-up (*cf.* Eakin et al., 2010; Hardcastle et al., 2013; Hughes et al., 2010; Martinson et al., 2010). Although the results here are encouraging, it is important to acknowledge that previous studies of a similar nature have included a longer follow-up period post-intervention than reported here. Given that longer follow-ups are often associated with reduced PA over time (Marcus et al., 2000), this could account for the smaller kcal expenditure between treatment groups in previous studies (Müller-Riemenschneider et al., 2008). Therefore, to truly assess the effects of an integrated MI-CB intervention, a longer follow-up period post-intervention is needed. Nevertheless, the impact of the integrated MI-CB intervention is promising in maintaining MVPA, which is associated with health benefits and successful aging (Archer, et al., 2013; DoH, 2011), and supports previous research (Naar-king et al., 2013).

For kcals expended from all intensities of PA per week, including low intensity PA, a large effect was found between treatment and UC groups where the MI-CB group expended almost double the kcals at three months and over double the kcals at six months post-PARS. Previous PA maintenance research has demonstrated similar findings (Martinson et al., 2010), although the authors found a decrease in kcal expenditure at six months. The fact that a decrease was not observed here suggests that an integrated MI-CB intervention could promote maintenance of all intensities of PA, including lower intensities. Lower intensity PA (e.g., walking and gentle swimming) increases basal levels of PA, which could produce similar health-enhancing benefits to MVPA, especially in clinical populations where disability can prevent engagement in higher intensity activities (e.g., running; Tudor-Locke et al., 2011). It is likely that the

MI-CB intervention encouraged participants to engage in activities that were suited to their physical abilities and limitations, thus promoting long-term PA engagement. Therefore, employing integrated MI-CB can encourage PA maintenance in adults with a range of chronic health conditions and provides further support that a flexible person-centred approach is needed in chronic illness management (Hogden et al., 2012).

For average steps per day, however, there was no difference between MI-CB and UC groups at three and six months follow-up. This is inconsistent with previous research utilising a single therapeutic approach, such as MI or CB techniques, which have found evidence for increasing or maintaining average steps per day at one year follow-up (DeGreef et al., 2010; DeGreef et al., 2011). Although non-significant, the effect size reported was modest at three months and six months follow-up between MI-CB and UC groups where the MI-CB group maintained the number of daily steps compared to the UC group. This suggests the pilot study was not powered to detect such a small effect but a larger sample size might provide the power to do so (Maxwell, 2004).

#### ***5.7.2 The Effect of the MI-CB Intervention on Maintaining PA Guidelines:***

##### ***Hypothesis 2.***

The recommended guidelines for MVPA kcal expenditure for adults is 1500 kcals per week which equates to about 30 minutes per day on at least five days a week (Kokkinos & Myers, 2010). Although non-significant, the MI-CB group were approximately four times more likely to meet the guidelines than the UC group at three months and this difference was still observed at six months. These odds are higher than that found in previous PA maintenance studies, although as mentioned, previous research reported longer follow-up periods of a year or more post intervention (Eakin et al., 2010; Martinson et al., 2010). Data here further supports the call for a post-intervention follow-up of at least 1 year to verify the effects of integrated MI-CB for PA maintenance, especially as evidence suggests PA decreases over time (Marcus et al., 2000; Buckworth & Dishman, 2002).

In terms of meeting the recommended average steps per day for adults with chronic health conditions (i.e.,  $\geq 4600$  steps/day), the MI-CB intervention was no more successful than the UC group. Fifty percent of the MI-CB intervention did not increase their average steps per day. One reason for this could be that the aim of the intervention was to increase MVPA through activities which were suitable for the individual with



regards to their health condition(s). Hence, non-weight bearing activities (e.g., swimming and cycling) or resistance training (e.g., circuits and gym work) would not have been measured by a pedometer. This supports the need for validated objective measures, such as an accelerometer and/or global positioning systems (GPS) to accurately measure all modes of PA (Maddison & Ni Mhurchu, 2009). The use of alternative objective measures for PA behaviour is further discussed as a research recommendation in section 5.7.6.

### ***5.7.3 Effects of the MI-CB Intervention on Psychological Outcomes and their Relationship to PA Maintenance: Hypothesis 3 and 5***

A number of evidence-based and theory-derived psychological variables were measured which have been found to influence PA maintenance in previous research (See Chapter 3 and 4). These included: (1) barrier self-efficacy; (2) coping skills; (3) social support; and, (4) outcome expectations and experiences. Each psychological variable is discussed in turn below:

#### ***5.7.3.1 Effect of the MI-CB Intervention on Barrier Self-Efficacy***

The MI-CB group increased their self-efficacy to overcome barriers to PA participation (e.g., inclement weather or boredom) at three months follow-up and this was significantly different to the UC group, supported by the correlational data for MVPA. This difference between groups was not maintained, however, at six months post-PARS as the MI-CB intervention observed a decrease in PA. This finding supports previous research which suggests that MI-CB can facilitate short-term increases in self-efficacy for behaviour change (Flynn, 2011; Resnicow & McMaster 2012). That said, the difference observed at six months between treatment groups closely represented a medium effect ( $g = 0.45$ ), suggesting that larger samples could generate sufficient power to detect a difference between treatment groups. In addition to insufficient power, a number of alternative reasons could explain the decline in self-efficacy observed in the MI-CB intervention at six months. First, evidence suggests that different types of self-efficacy, such as recovery self-efficacy, might be more influential within the PA maintenance process to recover from lapses in PA behaviour (Luszczynska & Sutton, 2006; See Chapter 2). Second, determinants other than self-efficacy might be important for PA maintenance (e.g., perceived satisfaction of PA outcomes; Rothman et al., 2011), but were not measured here to reduce participant fatigue. Therefore, researchers might

wish to include variables such as perceived satisfaction and recovery self-efficacy in future PA maintenance research testing the role of integrative MI-CB intervention.

Previous evidence also suggests that barrier self-efficacy is predictive of long-term PA (McAuley et al., 2003), which might be further supported by the correlational data here. A positive relationship was found between self-efficacy at baseline and PA outcomes at six months, suggesting that the higher the self-efficacy at baseline the more PA one engaged in at six months. One explanation is that the MI-CB intervention could have helped maintain initial increases in self-efficacy leading to increased PA participation in the long-term and is consistent with previous research that suggests that on-going support is needed to maintain PA (Eakin et al., 2010). Nevertheless, mediational analysis is needed, with larger samples, to more accurately assess the influence of integrated MI-CB on the relationship between barrier self-efficacy.

#### *5.7.3.2 Effect of the MI-CB Intervention on Coping Skills*

The MI-CB intervention was no more effective than the UC group in promoting adaptive coping skills or reducing the use of maladaptive coping skills (as underpinned by the relapse prevention model) at three and six months follow-up. Previous research employing the relapse prevention model has demonstrated that more adaptive and fewer maladaptive coping skills for overcoming PA barriers is related to PA engagement and reduction in PA relapse (Simkin & Gross, 1994; Ziegelmann et al., 2006). Additionally, coping planning has been found to be predictive of long-term PA, specifically in older adults with orthopaedic health conditions (Ziegelmann et al., 2006). The results of the current study do not support this. Given that the MI-CB intervention intended on promoting coping skills measured by the COPE scale, such as problem solving and planning (See Chapter 4 for an outline), the lack of support might be concerned with a lack of treatment fidelity (TF), such as poor adherence to the MI-CB intervention or intervention provider competence, as previous research has found (Breckon et al., 2008). Therefore, TF research is needed to draw firmer conclusions with regard to the role of an MI-CB intervention for promoting coping strategies for PA maintenance.

Data suggested that fewer adaptive coping strategies were used at three months if an increase in kcal expenditure from all PA intensities was reported at baseline. This is inconsistent with previous research, which suggests that increased coping strategies are related to increases in PA (Ziegelmann et al., 2006). One possible explanation is that increased PA could result in less need for adaptive coping strategies because PA itself is

considered a coping or illness management strategy (Darling, Coccia, & Senatore, 2011). Overall, the role of coping skills is unclear within PA maintenance and it is uncertain whether the MI-CB intervention could have an impact on coping skills and warrants further research.

#### *5.7.3.3 Effect of the MI-CB Intervention on Social Support*

The findings in this study suggest that the MI-CB intervention might have been more effective than usual care for promoting social support as small effects, although non-significant, were found at three months. A small positive (non-significant) effect was found for emotional support at three months, suggesting the MI-CB intervention used more emotional support but this was not sustained at six months. Additionally, a small negative correlation was found for instrumental social support, suggesting that the MI-CB group engaged in more PA at baseline but used less instrumental social support (e.g., seeking practical help) at three months. This contradicts a body of research evidencing the role of increased social support for PA maintenance (Kouvonen et al., 2011; Resnick et al., 2008; Stevens et al., 2003; van Stralen et al., 2010). In contrast, evaluations of PARS suggest that individuals develop a sense of mastery over exercise with the help of an exercise professional, which enables them to integrate PA into their identity (Moore, Moore, & Murphy, 2011). It could be the case that those individuals who had increased their PA significantly at the end of PARS had also developed a greater sense of mastery over exercise reducing the need for further instrumental support. Additionally, one benefit of the MI-CB intervention was to promote PA autonomy, thus reducing dependency on health and exercise professionals (See Chapter 3 and 4; Scott et al., *in press*). Therefore, the MI-CB intervention could have helped individuals maintain a sense of mastery, in line with social cognitive theory (Bandura, 1986). Further research is needed to test this assumption, which would include measures associated with autonomy and mastery for PA maintenance.

The limitations of the social support scales also need to be considered because they were sub-scales taken from the COPE (Carver et al., 1989) in attempt to reduce participant fatigue bias. Despite this, it is plausible that participant fatigue already occurred given that the COPE scale was administered last, had the most missing data, and participants reported that the questionnaire was too long and complicated. Future research needs to take into consideration the order of questionnaires and/or introduce breaks to reduce participant fatigue, particularly in older adults or special populations



(Hardy, Allore, & Studentski, 2009). Another explanation could be that the social support sub-scales were not specifically developed for PA. Specific scales, such as the social support for exercise habit scale (*cf.* Stevens et al., 2003) should be considered in future research.

#### *5.7.3.4 Effect of the MI-CB Intervention on Outcome Expectations and Experiences*

The MI-CB intervention group experienced more positive physical experiences (e.g., weight loss) and psychological experiences (e.g., stress reduction) at three months compared to the UC group. Although the MI-CB intervention was no more effective than the UC group in increasing PA experiences after the intervention ended, correlational data revealed that increased physical outcome experiences at three months was related to increases in MVPA at six months. Experiences of physical outcomes might provide motivation for PA engagement, particularly if congruence is achieved between prioritised outcome expectations and experiences, as previous research suggests (Fuchs et al., 2012; Sears & Santon, 2001; Wilcox et al., 2006). This is particularly the case if the experienced outcomes are congruent with an individual's values (Hutchison et al., 2012), which the MI-CB intervention aimed to achieve (See chapter 4). This finding provides some support for the role of integrated MI-CB in promoting congruence between expectations, experiences and values, particularly for physical outcomes. Future research is needed, however, to accurately measure congruence between values and outcome expectations/experiences and the impact on PA maintenance. The OERS questionnaire used within this study is one measure that can assess congruence between valued expectations and experiences (Wilcox et al., 2006). Due to the categorical nature of the analysis needed to assess congruence, this measure could not be used for this purpose in this study because of the small sample size. Overall, the findings in this study suggest that integrated MI-CB can increase the number of physical outcomes experienced and might be more influential than psychological outcomes for long-term engagement in MVPA.

#### ***5.7.4 Effects of the MI-CB Intervention on Epidemiological Outcomes (Weight and BMI): Hypothesis 4***

The MI-CB intervention was no more effective than the UC group in reducing weight (kg) or BMI at three and six months follow-up and contradicts previous research. Nonetheless, at 3 months, a small effect was found suggesting a reduction in BMI of

0.61 and a reduction in weight of 1.71kg was practically significant in the MI-CB intervention. The MI-CB intervention was conducted over the Christmas period suggesting that the intervention encouraged weight loss during a time which is traditionally associated with weight re-gain (Cook, Subar, Trioano, & Schoeller, 2012). Nevertheless, when intervention components ended, weight and BMI returned to baseline levels suggesting further support is needed to help individuals maintain weight loss.

Previous research suggests that both aerobic and resistance training can reduce BMI or other measures of adiposity (Willis et al., 2011). This was not supported by the current intervention. The fact that the MI-CB group reported engaging in over the recommended guidelines for PA suggests that weight loss should have been apparent. A possible explanation lies with a limitation of using BMI to measure changes in weight status in PA research as BMI does not account for increases in lean body mass associated with increased aerobic and resistance training (Berrington de Gonzalez et al., 2010). It is possible, therefore, that individuals in the MI-CB group experienced increases in lean body mass and reduction in fat-mass from increased PA, which would not be detected by measuring BMI. Researchers are therefore encouraged to measure changes to lean body mass via more appropriate methods than BMI. Additionally, the MI-CB intervention specifically targeted PA maintenance as opposed to diet change and so it is unclear whether employing integrative MI-CB to promote a healthy diet would have had a greater impact on weight status. Therefore, integrative MI-CB could do more to promote diet and measure changes in lean body mass as a more accurate physiological measure in interventions.

### ***5.7.5 Feasibility of the MI-CB Intervention: Hypothesis 6***

#### ***5.7.5.1 Study Recruitment, Randomisation, Adherence and Retention***

The recruitment phase lasted approximately six months and used six leisure centres, which delivered PARS across South Yorkshire and yet only achieved a small sampling frame (i.e., 175 PARS completers). Consequently, this study did not achieve the desired sample size for a small pilot (i.e.,  $N=60$ ; Hertzog, 2008). Recruitment issues are often reported in adults with chronic health conditions and hard-to-reach populations (Scott et al., 2011). This limits randomisation procedures as participant characteristics might not be evenly distributed across treatment groups, which would otherwise occur



in larger samples (Treasure & MacRae, 1998). Likewise, randomisation was not successful for a number of psychological variables at baseline in this study. Instead, minimisation has been suggested as an alternative to randomisation for small clinical trials (Altman & Bland, 2005). Minimisation is considered the platinum standard for RCTs where participants are allocated to a treatment group depending on their characteristics. For example if Group A have more females than males, then a male participant will be allocated to that group, thus, ensuring excellent distribution of participant characteristics across treatment groups. Therefore, future research, or replication of the current study, could employ minimisation procedures rather than randomisation.

Despite this, the MI-CB intervention had excellent retention rates (i.e., 96%), supporting the role of integrated MI-CB for promoting intervention adherence (Flynn, 2011). Additionally, on-going intervention contact, such as telephone support, appears important for PA maintenance and retention of participants and this finding is supported by previous trials (Burke, Mansour, Beilin, & Mori, 2008; Eakin et al., 2010). In terms of adherence, it was found that older participants were more likely to complete intervention sessions than younger participants. This is consistent with previous research suggesting that older adults, that might be retired, are more likely to have spare time to engage in interventions compared to those in full or part-time employment (Chung et al., 2009; Gidlow et al., 2005). Barriers to intervention session adherence were identified, such as medical appointments, illness, caregiver duties and bereavement; which are consistent with previous research in older adults with health conditions (Hefferon, Murphy, Mcleod, Mutrie, & Campbell, 2013). Therefore, future interventions could benefit from reducing these barriers, particularly by employing a flexible person-centred approach to meet a range of patient's needs.

#### *5.7.5.2 Missing Data in Outcome Measures*

As discussed in section 5.7.3.3, the COPE scale was reported to be too complicated and long which resulted in missing data through non-completion. Participant bias could have occurred resulting in unreliable data being reported, thus affecting the results for coping strategies and social support (See section 5.7.3.2 and 5.7.3.3). Although the scale is often used in adults with chronic health conditions (Curtis et al., 2010) it was not acceptable within the current population in PA maintenance research. It is suggested that future research should develop a specific

coping scale for PA or behaviour change in general. Furthermore, some participants struggled to read, write, or concentrate within the sample, thus the primary researcher (SS) supported the participants to complete the questionnaires. Therefore, the participant's ability to complete such measures need to be considered in future research.

Missing data also occurred with the pedometer data as participants reported symptom flare-ups resulting in limited walking. Limitations have also been documented concerning the accuracy of pedometer data in clinical populations with disabilities, such as musculoskeletal conditions in previous research (Farmer, Croteau, Richeson, & Jones, 2006; See section 5.6.8.1). The Acti-heart was originally considered for use within this study; however, previous research has reported limited usability within a clinical population due to the invasive procedure involving skin preparation and potential skin irritations (Scott et al., 2011). It was for this reason that pedometers were originally selected for this study due to their low cost and usability, particularly in an older adult and chronically ill population (Talbot et al., 2003). Due to the potential limitations with the pedometers, however, other devices such as accelerometers and GPS monitors could be more accurate measures for accurately assessing intensity, exercise duration, and mode of exercise in a heterogeneous clinical population.

#### *5.7.5.3 Sample Size Estimation for Future Large Scale RCTs*

Sample size estimation for a large scale RCT was calculated given that no previous research for MI-CB interventions for PA maintenance in adults with chronic health conditions has been conducted. An ANCOVA for data analysis requires fewer participants (e.g., 21 participants per group for a large effect) and provides one solution to the potential recruitment issues already discussed in section 5.7.5.1. This finding is consistent with previous statistical research (Borm et al., 2007). Thus, future replication of the current study, using the CHAMPS scale, might benefit from selecting an ANCOVA as the main statistical analysis. It must be noted that the sample size calculation would need to be adjusted for potential attrition in future trials as this was not accounted for in the calculation made here (*cf.* Borm et al., 2007). Furthermore, the sample size estimate must be interpreted with caution as small samples often have inflated error variances; thus, effect sizes can deviate from the true effect (Kraemer, Mintz, Noda, Tinklenberg, & Yesavage, 2006). Therefore, future trials with larger samples will need to re-assess the standard deviation in a chronic health population and

revise the sample size estimations accordingly. In the meantime, the current estimations provide direction for future research.

#### ***5.7.6 Implications for Research***

One future research implication concerns the objective measurement of PA behaviour. Objective measures of PA (e.g., pedometers and accelerometers) are considered to be more valid than self-reported PA (Tudor-Locke et al., 2002); however, the inclusion of individuals with musculoskeletal disabilities within this pilot study could affect pedometer reliability. Disabilities can affect gait or walking speed, which, in turn, can affect the accurate measurement of pedometers (Farmer et al., 2006). Individuals with disabilities may also choose alternative activities, such as resistance based circuits or swimming, which is not detected by pedometers. In such cases, it has been suggested to use piezoelectric (accelerometer) pedometers, which have demonstrated reliable accuracy in measuring steps at slower walking speeds and intensity of alternative activities (Melanson et al., 2004). In conjunction with accelerometers, technological advances have led PA research to employ devices using global positioning systems (GPS) and geographical information systems (GIS) to map the location, speed, distance and time spent within specific intensities of activity (Maddison & Ni Mhurchu, 2009). Nevertheless, GPS devices are not without limitations, including: device failure; limited battery life; reduced memory function; expensive (particularly if used with multiple devices); poses a threat to privacy through reverse identification; and, limited function indoors or dense urban areas (Maddison & Ni Mhurchu, 2009; McCluskey, Ada, Dean, & Vargas, 2012). It was for these reasons that GPS devices were not employed within this pilot study. As technology continues to advance and correct the limitations, however, future research should look to employ GPS and accelerometer devices to more accurately measure PA.

Other psychosocial measures have also been suggested to better measure psychological factors in relation to PA maintenance. For example, measures for social support for exercise have been suggested, such as the social support for exercise habit scale (Stevens et al., 2003) rather than the support sub-scales from the COPE measure (Carver et al., 1989). Additional determinants for PA maintenance might also be important such as perceived disability (Plotnikoff, Trinh, Courneya, Karunamuni, & Sigal, 2011), perceived satisfaction (Rothman et al., 2011), autonomy and mastery (Moore et al., 2011), and recovery self-efficacy (Ziegelmann et al., 2006) and these



should be considered in future PA maintenance research with adults with chronic health conditions. Furthermore, researchers should also be mindful of the number and order of measures within questionnaire batteries to minimise potential participant fatigue bias (Hardy et al., 2009). Additionally, this pilot study revealed that recruiting adults with chronic health conditions and co-morbidities appears problematic (Scott et al., 2011). To overcome this, future research with larger scale trials needs to consider longer recruitment phases and multiple sites to reach the desired sample size. The use of ANCOVA to analyse trial results might also require a smaller sample. Specifically, it has been recommended to use minimisation, rather than randomisation if researchers feel large samples cannot be achieved from the outset in larger trials (Altman & Bland, 2005).

In addition to these recommendations, the preliminary results of the MI-CB intervention appear promising as it was shown to promote PA maintenance. To increase confidence in the intervention, however, a large scale RCT is warranted, which should include a longer post-intervention follow-up period of  $\geq 1$  year. While it appears that an MI-CB intervention is more effective than usual care (i.e., three months of reduced rate membership), it is unclear whether integrated MI-CB is any more effective than single therapies, such as MI or CBT. Consequently, a large scale RCT would benefit from including a comparison group with only CBT or MI. Additionally, a large scale RCT should be powered sufficiently to perform sub-analyses and mediated regression to assess whether the MI-CB intervention mediates the theoretical determinants (e.g., barrier self-efficacy) and PA.

Before conducting a large scale trial, however, further research is needed to assess TF, such as fidelity to protocol delivery and intervention provider competence, particularly as the MI-CB intervention did not enhance coping skills and, to some extent, social support as intended. Additionally, assessing TF would allow firm conclusions to be drawn with regards to the processes that underpin the effective and ineffective MI-CB intervention components (Breckon et al., 2008). This will enable further refinements to the MI-CB intervention, which can enhance cost-effectiveness and prevent ineffective intervention components from being implemented (Resnick et al., 2005).

### **5.7.7 *Implications for Practice***

Before the MI-CB intervention could be implemented into practice, a large scale trial is warranted to test whether the intervention can promote PA maintenance over a longer follow-up period (i.e. >1 year) and actually change the theoretical determinants proposed. Nevertheless, this study demonstrated MI-CB can enhance adherence rates to an intervention and encourage PA maintenance after an intervention and supports previous research (Flynn, 2011; Naar-king et al., 2013). Services such as PARS do not focus on long-term PA and demonstrate poor adherence rates during the scheme (Gidlow et al., 2005; James et al., 2008) and decreased PA after the scheme (Pavey et al., 2011). Consequently, integrating MI-CB techniques into PARS could enhance adherence rates and long-term PA outcomes in these schemes potentially making them viable and cost-effective which currently they are not (NICE, 2006; Pavey et al., 2011).

Employing integrated MI-CB targeting the theoretical determinants for PA maintenance (e.g., self-efficacy and experiences of valued physical outcome expectations) could also promote PA maintenance, as this study suggests. Knowledge of theoretical determinants, and the techniques to change them, would need to be delivered through training either in addition to or as an adaptation of existing training for job roles in PARS. Integration of MI-CB into existing services could enhance cost-effectiveness as mentioned but research would need to clarify the exact cost of integrative therapies compared to single therapies, such as MI.

### **5.8 *Limitations***

Results of the MI-CB pilot need to be interpreted in light of a number of limitations. First of all, the study was underpowered due to the small sample size. Consequently, sub-group analyses could not be performed on socio-demographic variables (e.g., gender), and health risk or health condition. Therefore, the participant's that might get the most benefit from an MI-CB intervention remain unknown. Additionally, the small sample size meant that mediated regression could not be performed to assess whether the relationships between theoretical psychological outcomes and PA were actually influenced by the MI-CB intervention. Such analyses, however, were not the aim of the study and should be left to large scale RCTs as opposed to small pilot or feasibility studies (Lancaster et al., 2004).



For the PA outcomes, large variances were also observed, which can be a result of small sample sizes (Field, 2005). A large variance can inflate effect sizes but confidence intervals of effect sizes were reported in this study to interpret the true magnitude of effect (Maxwell, 2004). When considering confidence intervals for the PA outcomes, they span a large range. Nevertheless, for kcal expenditure from MVPA and all intensities we can be 95% confident that the MI-CB intervention would produce at least a small positive effect if the intervention were to be repeated. For average steps/day, psychological outcomes experiences and instrumental social support, the confidence intervals span both a negative and positive range of values which introduces uncertainty of the intervention effect if the study were to be repeated. Nevertheless, with larger sample sizes, the variance and confidence intervals would be reduced, thus increasing confidence in the results, which warrants a large scale RCT (*cf.* Maxwell, 2004).

Large variances could also be the result of differing levels of physical ability associated with specific health conditions. For example, participants with diabetes might be able to perform more MVPA than a participant with osteoarthritis of the knee. Specifically within chronic health and older adult population, decreased perceived disability has been found to increase levels of PA (Plotnikoff et al., 2011). Therefore, perceived disability could be a confounding variable, which was not measured within this study.

Self-reported measures within PA research should also be interpreted with caution due to over-reporting (Sarkin et al., 2000). Objective measures are considered to be more reliable, however, the heterogeneity associated with multiple health conditions may impact on the reliability of measures such as pedometers, as discussed above (Farmer et al., 2006). Consequently, more reliable objective measures of PA should be selected that accurately detect all modes and intensities of PA within a chronic health population (e.g., an accelerometer pedometer). An accelerometer pedometer, for example, is also user-friendly unlike the Acti-Heart as reported in previous studies (Scott et al., 2011). PA diaries can also be used to observe the mode or type of PA engaged (e.g., swimming; McCluskey et al., 2012).

The issue of heterogeneity also affected the use of objective epidemiological measures. For example, weight and BMI were selected over measures such as cholesterol and heart rate, as these measures consistently predict mortality risk factors in a range of chronic health conditions (Lichtash et al., 2013). Measures of cholesterol and

heart-rate were not selected because they could be influenced by medication. Large sample sizes would be needed to perform sub-analyses to determine the intervention effect across medicated and non-medicated participants, which was not feasible in this small pilot study. A large scale trial could consider the use of additional measures such as cholesterol and heart rate.

Finally, one area of feasibility that was not assessed within the study was acceptability (Lancaster et al., 2004). Reasons for this were concerned with the social desirability bias that might occur because of the close therapeutic relationship between the primary researcher (SS) and participants. That said, the excellent participant retention rates could be seen as a sign of acceptability. In addition, participant satisfaction with the intervention provider's skills and enactment of CB techniques will be assessed in Chapter 6 and will contribute to the understanding of acceptability.

## **5.9 Chapter Summary**

The aims of this chapter were to explore the preliminary effectiveness and feasibility of an integrated MI-CB intervention promoting PA maintenance in adults with chronic health conditions. A RCT pilot study was conducted across three months, with a three month follow-up (six months). The MI-CB intervention was found to promote PA maintenance across six months compared the usual care group after successfully completing PARS. Additionally, the MI-CB intervention was four times more likely than usual care to meet the guidelines of expending 1,500 kcals per week from moderate-vigorous MVPA (Kokkinos & Myers, 2010) at six months. Individuals in the MI-CB intervention were found to have increased barrier self-efficacy and experienced more physical and psychological outcome experiences at three months compared to the usual care group but these differences were not significant at six months. A lack of effect of the MI-CB intervention on coping skills and, to some extent, social support was found. The MI-CB intervention group experienced a small reduction in weight as indicated by a small (non-significant) effect size at three months, but this returned to baseline values at six months. The MI-CB intervention also appeared feasible because it generated excellent retention rates, particularly among older adults. In summary, the MI-CB intervention produced favourable effects for PA maintenance which were sustained across six months, although the psychological determinants that influence PA maintenance after an intervention ends are unclear.

Limitations were presented, which should be considered when interpreting the results. For example, the small sample size and exploratory nature of the pilot study. This also prevented specific analyses from being conducted, such as sub-group analysis (e.g., gender, health condition) and mediated regression to more accurately understand the effects of the intervention of specific individuals. Additionally, confounding variables, such as perceived disability, were suggested to play a role in PA maintenance, which were not measured here. The reliability of the pedometer was also questioned concerning its ability to correctly measure steps in a sample with a range of musculoskeletal disabilities. As a result, it was suggested that more reliable measures, such as GPS and accelerometers, should be used. Following the limitations, recommendations for future research and practice were also made. Overall, A large scale RCT is warranted to test the effectiveness of integrated MI-CB compared to single therapies (e.g., MI only) for PA maintenance, which can then be used to inform practice (e.g., health trainer roles). Before such a study can be implemented, however, an assessment of treatment fidelity is needed to assess the effective and ineffective processes underpinning the MI-CB intervention (Breckon et al., 2008). This can enable refinements to the MI-CB intervention to be made and prevent ineffective components from being implemented, thus increasing cost-effectiveness (Resnick et al., 2005).

## **Chapter 6**

### **Study 2(b): Treatment Fidelity of an Integrated Motivational Interviewing and Cognitive Behavioural Intervention for Physical Activity Maintenance.**

## **Chapter 6: Treatment Fidelity of an Integrated Motivational Interviewing and Cognitive Behavioural Intervention for Physical Activity Maintenance.**

### **6.1 Introduction**

In the earlier chapters (Chapter 1-3), the theories, determinants and strategies that influence PA maintenance in adults with chronic health condition were investigated. It was evident that a person-centred and integrative approach was needed which was underpinned by multiple theoretical components (e.g., relapse prevention and expectancy-values theory) to promote PA maintenance. By employing intervention mapping principles, an intervention was developed that used integrated motivational interviewing (MI; Miller & Rollnick, 2013) and cognitive-behavioural techniques (MI-CB; see Chapter 4, section 4.5.3 for definition). The intervention also aimed to influence the psychological determinants (e.g., outcome expectations and barrier self-efficacy) to promote PA maintenance. In the previous chapter (Chapter 5), the preliminary effectiveness and feasibility of the integrated MI-CB intervention was explored and found that the intervention had a greater effect on PA maintenance than usual care. The results also indicated that the MI-CB intervention influenced some psychological mechanisms, such as barrier self-efficacy, in the short-term but not necessarily in the long-term. Additionally, psychological mechanisms such as coping skills and social support were not influenced by the MI-CB intervention. It was argued that an assessment of treatment fidelity (TF) was needed to identify whether the intervention was delivered, received and enacted as intended. An exploration of TF mechanisms can help identify any deviations from the intervention protocol that influence intervention efficacy (Bellg et al., 2004). TF exploration can also enable modifications to the intervention to be made; thus, enhancing its effectiveness (Breckon et al., 2008). To ensure a comprehensive TF evaluation is conducted, the application of a TF framework has been previously suggested (Bellg et al., 2004). The following chapter will outline the methods employed to implement each area of the TF framework and will critically discuss the results in relation to the MI-CB intervention. The chapter will begin by providing an overview of the advantages and limitations of TF within a PA setting or within MI-based research. The chapter will also provide further recommendations for research, practice, and training.



## 6.2 Background: Treatment Fidelity

Treatment fidelity (TF) is defined as the methodological strategies used to assess, monitor, and enhance the internal and external validity of an intervention (Bellg et al., 2004; Borrelli, 2011; Breckon et al., 2008; Resnick et al., 2005). The importance of TF in psychological and behavioural interventions has been stressed since the 1970s but originally focused only on treatment integrity (i.e., the extent to which an intervention was implemented as intended; Bellg et al., 2004). Since then, the definition has been expanded by the Behaviour Change Consortium (BCC) to reflect a multidimensional TF framework and includes five main components: (1) design; (2) training; (3) delivery; (4) receipt; and, (5) enactment (Bellg et al., 2004). A range of methods can be used for the assessment and monitoring of each fidelity component and have been extensively described (*cf.* Bellg et al., 2004; Borrelli et al., 2011; Breckon et al., 2008; Carpenter et al., 2013; Hardeman et al., 2008; Resnick et al., 2005; Robb, Burns, Docherty, & Hasse, 2011). An adapted framework has also been developed for PA counselling interventions although is less comprehensive than the BCC TF framework (Breckon et al., 2008). Table 6.1 provides a definition of each of the five fidelity components and example methods.

**Table 6.1.** Definitions of Treatment Fidelity Framework Components

<b>Component of treatment fidelity</b>	<b>Definition<sup>1</sup></b>	<b>Treatment fidelity methods</b>
Design	Treatment fidelity practices related to study design are intended to ensure that a study can adequately test its hypotheses in relation to the underlying theory and clinical processes	A standardised intervention protocol and specified theoretical underpinning. Assessment of intervention dose.
Training	Assessment and on-going evaluation of training of interventionists to ensure that they have been satisfactorily trained to deliver the intervention to study participants.	A combination of supervised role-playing, clinical supervision and reviews of audiotapes applied as an adjunct to a training manual, including on-going training and supervision.
Delivery	Treatment fidelity processes that monitor that the intervention is delivered as intended.	Assessment of delivered techniques from audio-recorded sessions in accordance with technique checklists. Corrections of any intervention deviations.
Receipt	Receipt of treatment focuses on the participant and assures that the treatment has been received and understood by the individual (e.g., he or she is able to perform treatment-related behavioural skills and cognitive strategies as intended).	Assessing participant comprehension of intervention CB techniques using active listening skills or post-intervention questionnaires.
Enactment	Enactment of treatment skills monitors that the individual performs treatment-related behavioural skills and cognitive strategies in relevant real-life settings as intended.	Post-intervention questionnaires, monitoring and providing feedback on completed intervention tasks to ensure participant enactment of intervention techniques.

<sup>1</sup> Definitions are adapted from Resnick et al., (2005) and Breckon et al., (2008).

### **6.2.1 *Advantages of TF Implementation***

There are a number of advantages of implementing a TF framework within intervention evaluation (Bellg et al., 2004). First, adopting a TF framework can increase the internal validity of interventions and assess the factors that contribute to Type I and II errors (Bellg et al., 2004). For example, if significant results are found, TF measures can reveal which factors are relevant to effectiveness or whether extraneous variables influenced the results. Second, a TF framework avoids a 'black box' approach to intervention evaluation, thus preventing a Type III error; where the intervention is assumed to be ineffective when, in fact, inadequate delivery was the cause (Dobson & Cook, 1980; Saunders, Ward, Felton, Dowda, & Pate, 2006). Third, implementing a TF framework can support theoretical testing (Perepletchikova, 2011; Wilson et al., 2010) and encourages adequate reporting of intervention components (Michie & Abraham, 2008). Finally, assessing TF enables a better understanding of the effective and ineffective intervention components, which reduces the likelihood of commissioners or researchers investing in empirically ineffective interventions that cannot be translated to real-world settings. Therefore, adopting a TF framework can help identify issues regarding intervention delivery that can be rectified early on; thus increasing intervention retention, effectiveness, internal validity, and cost-effectiveness (Borrelli, 2011).

### **6.2.2 *Limitations of TF Implementation***

Despite the importance of TF, it is rarely addressed adequately within psychotherapy research or, more specifically, behaviour change interventions; thus limiting the understanding of 'what works' in interventions (Breckon et al., 2008; Perepletchikova, Treat & Kazdin, 2007). Reasons for this have been identified, such as a lack of general knowledge around TF, cost constraints, labour or resource demands and the lack of editorial requirement for TF reporting (Perepletchikova, Hilt, Chereji, & Kazdin, 2009). Therefore, the extent to which TF can be implemented is likely to be determined by funding availability and study design. In response to these barriers, it has been recommended to consider the level of TF implementation as a continuum (Perepletchikova, 2011). The continuum ranges from essential TF procedures (level 1) to optimum TF adequacy (Level 5). At minimum (level 1), a description of the intervention, procedures and on-going supervision is provided. At the optimum level

(level 5), high-quality TF measures are used, raters are trained, inter-rater reliability is assessed, rater bias is reduced and data are reported in terms of protocol adherence and intervention provider competence. At present, however, it is argued that even the minimum of TF implementation is necessary due to its scarcity within interventions (Pereplechikova, 2011). Therefore, TF implementation is recommended to understand the effective or ineffective mechanisms of intervention components, even at a minimum level, which can enhance intervention modification and replication in future trials (Bellg et al., 2004; Pereplechikova et al., 2009).

A further limitation of TF implementation lies with the assessment of provider training and delivery, which can create a rigid and manualised method of working; thereby preventing intervention adaptations to account for individual differences (e.g., health condition, culture, and socio-demographic factors; Breckon et al., 2008; Leventhal & Friedman, 2004). In turn, this can limit therapeutic/behaviour change and prevent intervention replication in a real-world setting (Leventhal & Friedman, 2004). Consequently, it was suggested to consider whether intervention recipients achieve the desired outcome, such as PA maintenance in addition to intervention provider adherence to delivery protocols (Leventhal & Friedman, 2004). Furthermore, the reliability and validity of TF measures are open to criticism as they are often created solely for a specific intervention without rigorous testing (Mowbray, Holter, Teague, & Bybee, 2003). Validating questionnaires using confirmatory factor analysis, for example, might not be appropriate in small novel trials. Coding of intervention components amongst intervention providers could introduce error. Where this is the case, researchers are encouraged to test the internal consistency of measures and ensure reliability of coding with independent assessors and inter-rater reliability; thus enhancing the quality of TF implementation (Mowbray et al., 2003).

### **6.2.3 *Treatment Fidelity in PA Research***

Similarly within PA research, TF is rarely acknowledged and studies that do incorporate a TF component are criticised for inadequate reporting (Breckon et al., 2008; Hardeman et al., 2008; Saunders et al., 2006). Again, the lack of focus on TF implementation might be due to specific barriers, such as lack of TF knowledge or cost implications (Pereplechikova et al., 2009). For example, studies might provide a brief description of the fidelity measures used within trial protocols or outcome research; although TF results are not always reported (e.g., Albright, Maddock, & Nigg, 2009;



Ang et al., 2011; Broekhuizen, van Poppel, Koppes, Brug, & van Mechelen, 2010; Burton, Parkenham, & Brown, 2010; Elliot et al., 2010). The few studies that present TF results predominantly measure only two components of the TF framework: (1) proficiency in intervention delivery and protocol adherence (e.g., Bombardier et al., 2013; Bull & Milton, 2010; Griffin et al., 2010; Hardcastle, Taylor, Bailey, & Castle, 2008; Steele, Mummery, & Dwyer, 2007; Wilcox, Parra-medina, Felton, Poston, McClain, 2010); and, (2) participant adherence/retention (e.g., Chang, Brown, & Nitzke, 2009; Kolt et al., 2006; Leslie, Marshall, Owen, & Bauman, 2005). This suggests that an inconsistent operational definition of TF is adopted (Saunders et al., 2006). For example, Bombardier and colleagues (2013) demonstrated that intervention providers were consistently proficient in delivering motivational interviewing (MI) using the telephone. In contrast, Griffin and colleagues (2010) demonstrated that older adults decreased their attendance to a PA intervention over time but the majority of participants completed homework assignments and self-monitoring of daily steps. While such results are informative, neither study focused on all components of the TF framework, providing an incomplete picture of the mediating components within PA interventions (Saelens et al., 2000). Therefore, a comprehensive TF evaluation is needed within PA interventions (Breckon et al., 2008).

#### ***6.2.4 Treatment Fidelity in Integrated Motivational Interviewing and Cognitive Behavioural Research.***

Assessing TF in newly developed therapies, such as integrated MI-CB, is important to ensure adherence to the treatment and to understand the effective components (Haddock et al., 2012). By assessing TF, the effective mechanisms of the therapy are identified and enable the translation of knowledge to practice (Madson & Campbell, 2006). A number of measures have been developed, within MI research, to assess different aspects of the TF framework, including delivery, training and receipt (Madson & Campbell, 2006). Examples of these measures include the motivational interviewing treatment integrity code (MISC), the motivational interviewing skills code (MISC), the motivational interviewing supervision and training code (MISTS), and the client evaluation of motivational interviewing (CEMI; *cf.* Madson et al., 2013 for a comprehensive review). These measures enable research to deconstruct the active mechanisms of MI by relating TF to treatment outcomes, such as the effects of adherence to delivery on smoking cessation (Amrhein, Miller, Yahne, Palmer, &



Fulcher, 2003; Broekhuizen et al., 2012; Catley et al., 2006; Guydish et al., 2013; McCambridge, Day, Thomas, & Strang, 2011; Moyers et al., 2005; Perry & Butterworth, 2011; Pirlott, Kisby-Sakarya, Defrancesco, Elliot, & Mackinnon, 2012; Thyrian et al., 2007). Nevertheless, such studies have mainly been conducted in addictive behaviours (e.g., alcohol or smoking cessation) with relatively little focus on health behaviour change (*cf.* Broekhuizen et al., 2012; Pirlott et al., 2012), specifically PA (*cf.* Perry & Butterworth, 2011). Therefore, a range of studies conducted with different clinical populations and problems will be reviewed to gain an understanding of TF implementation in MI research.

Regardless of the clinical population or problem, studies largely consider the effects of adherence to MI delivery and practitioner competence on treatment outcomes (e.g., Guydish et al., 2013; McCambridge et al 2011; Thyrian et al., 2007). These factors are found to be predictive of improved treatment outcomes, such as reduced self-reported drug use (Guydish et al., 2013). When MI components are disaggregated, findings reveal that the MI 'spirit', complex reflections, increased therapist MI competence and adherence to MI delivery and empathy predict cannabis and smoking cessation (Guydish et al., 2013; McCambridge et al 2011; Thyrian et al., 2007; See Chapter 4 for a description of MI). Overall, the studies demonstrate that high adherence to the delivery of specific MI components is important for effective treatment outcomes and provides support for the hypothesised mechanisms of MI (Miller & Rollnick, 2013).

The exact effective MI principles, however, appear to vary across studies making it difficult to identify 'what works', thereby limiting the development of practitioner training and interventions. This may be explained by the varying measures used, which differ in terms of reliability, thus limiting a comparison across studies (Madson & Campbell, 2006). Additionally, MI studies explore different clinical populations and problems (e.g., cannabis cessation in adolescents and smoking cessation in postpartum women), which suggests that MI might work differently depending on the context and mental or physical health condition under study (Resnicow et al., 2002). Nevertheless, the emergent evidence is beginning to indicate that effective MI mechanisms (e.g., MI-consistent behaviours) found to promote cessation of negative health behaviours, such as smoking, are similar to the promotion of positive health behaviours, such as fruit and vegetable consumption (Pirlott et al., 2012). While this might suggest that the findings from MI studies in addiction can be

applied to health behaviour change, further research is needed, particularly in a PA context.

One factor which is found to consistently predict client outcomes, however, is client change talk and MI consistent behaviours (Apodaca & Longabaugh, 2009). The theory of MI postulates that increased change talk (e.g., desire, need and commitment to change) mediates the effect between therapist skills and behaviour change as the client begins to talk themselves into change (Miller & Rollnick, 2013). In contrast, increased sustain talk (e.g., unwilling to change behaviour) relates to unsuccessful behaviour change. Specifically, it has been demonstrated that MI consistent therapist skills can elicit participants' change talk and reduce sustain talk 17 % of the time (Moyers et al., 2007). Although different categories of change talk are proposed within MI (e.g., need, desire, commitment, action), evidence suggests that the total client change talk predicts outcomes (Barnett et al., 2014; Pirlott et al., 2012). Therefore, there is an increased emphasis on training MI practitioners to demonstrate MI consistent behaviours while eliciting and responding to client change talk.

In addition to total change talk, commitment language has consistently been shown to be predictive of behavioural outcomes for addictive behaviours (Apodaca & Longabaugh, 2009). In particular, patients' strength of commitment to remain abstinent from substances (e.g., 'I will not smoke today') is more predictive of treatment outcomes than weak statements of commitment (e.g., 'I'll think about stopping smoking tomorrow'; Amrhein et al., 2003). Nevertheless, the role of commitment language in positive health behaviours, such as PA, is equivocal. Parry and Butterworth (2010) discovered that strength of commitment was related to the stages of change model but not directly to PA initiation in rural women in a 12-week intervention. This finding could be explained by only assessing commitment to change from the initial assessment at the start of the intervention. One would expect MI to change participants' commitment throughout the duration of the intervention and so it would have been more beneficial to measure commitment strength towards the end of the intervention. Nevertheless, understanding the role of change talk/sustain talk, including commitment language, is important for MI-CB integration.

To date, much of our understanding about the effective components of MI emerges from research that explores MI separately rather than as an integrative therapy (Haddock et al., 2012). Without an understanding of how the two therapies are integrated, further modification and development of training within the approach can be

hindered (Nutall, 2008). Miller and Rollnick (2013) propose a meta-structure for therapeutic sessions, which aids integration and consists of four phases: engaging, focusing, evoking and planning. During the engagement phase, the practitioner uses technical skills (e.g., open questions and reflections) to gain rapport and empathy with the client while exploring the problem(s). The practitioner then works collaboratively with the client to identify a focus for the therapy session(s) during the focusing phase. During the evoking phase, the clients' ambivalence for change is explored and the practitioner elicits or responds to client change talk, thus preparing the client for change. It is during this phase where the practitioner makes a judgement call as to whether to deliver more action-orientated CB techniques, such as action planning. There is no clear point at which to move into the planning phase and is likely to be met with client resistance if the practitioner incorrectly times the transition (Moyers & Houck, 2011). Consequently, a number of methods for integration have been outlined, including identifying signs of readiness, such as increased change talk, taking steps, decreased sustain talk, resolving of ambivalence, envisioning a new future, and client questions about change (Miller & Rollnick, 2013). Therefore, understanding change talk as a sign of client readiness is important for the effectiveness of MI-CB integration and behaviour change. The integration of MI and CB techniques, however, is yet to be evaluated using a comprehensive TF framework within a PA setting.

In summary, assessing TF within an MI-CB intervention can help develop an understanding of whether the components of MI (e.g., responses to client change talk, commitment language, empathy and MI-adherent behaviours) have been adhered to during intervention delivery. Additionally, TF can help understand the extent to which integrated MI-CB was actually integrated and the specific CB techniques employed. Furthermore, by adopting a comprehensive TF framework, intervention processes other than adherence to MI or CB techniques can be explored, such as participant's comprehension and enactment of intervention techniques. By exploring these factors, a better understanding of the processes that underpin potential effective or ineffective intervention components can be identified, thus enabling further intervention refinements to be made.

### **6.3 Study Aims**

The primary aim of this chapter is to present the results of the TF framework components: design, training, delivery, receipt, and enactment as implemented within the MI-CB intervention for PA maintenance (Bellg et al., 2004). Due to the limited funding, limited measurement resources and level of training available, TF will be implemented and reported in accordance with level 2 on the TF continuum (Pereplechikova, 2011). This means that the intervention provider engages in standardised training and receives on-going supervision, including independent coding of MI-CB delivery. Such a level of TF can still enable identification of any protocol deviations early on; thus ensuring internal validity and reduces the risk of a Type III error (Dobson & Cook, 1980). Given that the MI-CB intervention demonstrated efficacy (Chapter 5), the implementation of a TF framework at this level will elucidate the effective and ineffective mechanisms at the descriptive level. Further conclusions will be drawn in relation to the intervention and findings will inform future research and practice.

### **6.4 Research Questions**

As the study is exploratory, a series of research questions were generated and described in accordance with each component of the TF framework below;

#### **6.4.1 Design (dose)**

(a) To what extent was the MI-CB intervention underpinned by theory and delivered according to the specified dose in the protocol?

#### **6.4.2 Training**

(b) To what extent did the initial and on-going training lead to competence in delivering all components of MI, including relational (e.g., empathy) and technical skills (e.g., reflections)?

#### **6.4.3 Delivery**

(c) To what extent were the MI and CB techniques delivered?

(d) To what extent was the MI-CB intervention integrated?



#### **6.4.5 Receipt**

- (e) To what extent were the CB techniques understood by participants
- (f) To what extent were the participants confident to use the CB techniques?
- (g) To what extent were the participants satisfied with the receipt of the MI-CB intervention?

#### **6.4.6 Enactment**

- (h) To what extent did the participants enact the CB techniques?

### **6.5 Method**

#### **6.5.1 Participants**

Seventeen participants completed the MI-CB intervention and were included in the TF study. A detailed outline of the MI-CB intervention is provided elsewhere (*cf.* Chapter 4). The participant characteristics are also described in-depth elsewhere (*cf.* Chapter 5). Briefly, baseline characteristics were: average age 60.71 ( $SD = 10.04$ ), 41% female, 71% multiple health conditions, 53% retired, and 16 participants were white British. At trial recruitment, consent to participate was obtained from participants (Appendix D) and further verbal permission was gained at the beginning of each session to audio-record the session.

#### **6.5.2 Measures**

##### **6.5.2.1 Attendance**

Evidence of intervention dose was collected using attendance figures (i.e., the number of sessions attended and session duration). Attendance is often used as a measure of the dose, delivery, and receipt of treatment fidelity components (Bellg et al., 2004). A log of completed sessions was kept for measuring attendance. Duration of session was determined by the duration of each audio-tape. The frequencies and mean were calculated for session number and length.

##### **6.5.2.2 Motivational Interviewing Treatment Integrity Form (MITI v.3.1.1)**

The MITI (v 3.1.1; Moyers, Martin, Manuel, Miller & Ernst, 2010) was used to assess intervention provider competence and adherence to MI skills by an independent



coder. The MITI was also used for the intervention provider's on-going training and supervision as used in previous research (Pierson et al., 2007). The form consists of global spirit and global empathy rating scales to assess the "spirit" of MI. Total scores were out of 5. MI technical skills were also assessed using frequency scores for open and closed questions, simple and complex reflections and MI adherent and MI non-adherent behaviours. Formulas for calculations can be found in the MITI manual (*cf.* Moyers et al., 2010). Competence thresholds are provided in Table 6.2 for a benchmark. The MITI has previously demonstrated good discriminant and construct validity (Forsberg, Berman, Kallmen, Hermansson & Helgason, 2008). The primary researcher (SS) could not code the data independently as it emerged that 40-hours of weekly supervision and coding was needed to achieve coding competence and inter-rater reliability (Moyers et al., 2010). Instead, three audio-tapes were selected at random and were coded by a highly trained independent rater in MI.

**Table 6.2.** Ratio and Percentage Thresholds for Level of Competency in MI Skills for the MITI.<sup>1</sup>

Clinician behaviours	Beginner proficiency	Competency
Global clinician ratings	Average of 3.5	Average of 4
Reflection to question ratio	1	2
Percent open questions	50%	70%
Percent complex reflections	40%	50%
Percent MI-Adherent	90%	100%

<sup>1</sup> Table is adapted from Moyers et al., (2010).

#### 6.5.2.3 Integrated MI-CB Coding Tool

A coding tool was developed to assist training and the assessment of MI-CB integration including the use of client change talk; adapted from the Motivational Interviewing Skills Code (MISC; Miller, Moyers, Ernst, & Amrhein, 2008). Figure 6.1 demonstrates an example completed form, which consists of rows of blank spaces to code the implemented MI or CB techniques and client change talk. A list of codes is displayed in the margins to prompt the coder, such as 'CT' for change talk and 'BI' for barrier identification (See Figure 6.1). Codes written in bold represent the client speech or utterance.

#### 6.5.2.4 CB Technique Delivery Checklist

A CB technique delivery checklist was added to the MITI to assess fidelity to technique delivery and enactment (Appendix M) and was informed by the intervention content (*cf.* Chapter 4). Frequencies of CB techniques delivered during the intervention by the provider were totalled at the end of each session. The whole audio-tape was played back to ensure no techniques were missed. This approach has been found to be valid and reliable and has been used in previous studies (Haddock et al., 2012; Saelens et al., 2000).

#### 6.5.2.5 Client Evaluation of Motivational Interviewing (CEMI)

The CEMI scale assesses client's perceptions of the intervention provider's use of MI skills (Madson et al., 2013) and was used to assess fidelity to receipt after completion of the trial. The scale has 16-items which asks participants to rate how much the provider demonstrated specific behaviours and were adapted to include PA maintenance (e.g., 'help you to feel hopeful about changing or maintaining physical activity'). A 4-point likert scale was used consisting of '1' never, to '4' a great deal. All scores were summed with a maximum total of 64 for total satisfaction. Relational subscales (e.g., empathy) and technical subscales (e.g., evoking and eliciting change talk) were summed with a maximum total of 32 each. Higher scores represent MI consistency. The scale has been tested with confirmatory factor analysis, although the test-retest reliability is yet to be established (Madson et al., 2013). This study demonstrated poor internal consistency for CEMI total ( $\alpha = 0.51$ ), good internal

consistency for the relational subscale ( $\alpha = 0.83$ ), and almost acceptable internal consistency for the technical subscale ( $\alpha = 0.57$ ).

#### 6.5.2.6 CB Technique Enactment

A CB technique enactment questionnaire was adapted from Saelens et al., (2000), which assessed how often participants used CB techniques (Appendix N). The techniques chosen to be assessed were informed by the intervention content and a previous qualitative study (*cf.* Scott et al., *in press*; Chapters 3 and 4). Techniques were phrased in a way which participants could understand (e.g., 'graded tasks' was re-phrased as 'I gradually increase my activity as I see myself progressing'). Participants were asked to 'tick the statement that applies to you'. Ratings were on a 4 point likert scale from '1', I never use this strategy, to '4', I use this strategy often. Higher scores indicated higher enactment. A blank box was also provided for participants to provide any additional techniques used. The measure, overall, demonstrated good internal consistency ( $\alpha = .80$ ). The sub-category of cognitive techniques also had good internal consistency ( $\alpha = .73$ ) and demonstrated acceptable internal consistency for behavioural techniques ( $\alpha = .68$ ).

#### 6.5.2.7 Confidence to Enact Cognitive-Behavioural Techniques Questionnaire

A questionnaire was developed to measure confidence to enact CB techniques, which assessed fidelity to receipt (Appendix N). The same techniques were selected and worded identically to those in the CB techniques enactment questionnaire (Section 6.5.2.6). Participants were asked to 'read the list of techniques and tick how confident you feel in our ability to apply the strategies now or in the future'. A 5 point likert-scale was used ranging from, '1' I really don't feel confident in my ability, and to '5' I feel very confident in my ability. Higher scores indicated higher confidence in ability to enact techniques. Cronbach's alpha demonstrated good internal consistency for the measure overall ( $\alpha = .84$ ). The sub-category of cognitive techniques had acceptable internal consistency ( $\alpha = .65$ ) and good internal consistency for behavioural techniques ( $\alpha = .77$ ). A space was also provided for participants to write any reasons why they did not feel confident and anything that would need to be changed within the MI-CB intervention to improve their confidence.

#### *6.5.2.8 Cognitive-behavioural Techniques Comprehension Question*

To assess participant comprehension of CB techniques for PA maintenance, an open question was added at the end of the CB techniques enactment questionnaire administered post-intervention (Appendix N). The question asked: "From the list above, if there are any strategies that you do not understand, please circle them. What do you think can be done to help us improve the way the intervention is delivered?" Each technique was then discussed with the participant at the end of the MI-CB intervention.

### ***6.5.3 Procedure for Treatment Fidelity Implementation***

After randomisation into the MI-CB intervention group (See Chapter 5), each participant received a 1hr face-to-face assessment followed by five telephone follow-ups tapered across three months with a final face-to-face exit interview in week 12. A detailed description of the intervention is provided in Chapters 4 and 5. TF questionnaires were taken post-intervention (i.e., at 3 months). The methods and implementation procedure for each component of the TF framework are described below.

#### *6.5.3.1 Treatment Fidelity: Design*

Table 6.3 outlines the methods implemented to assess fidelity to design of the study. These methods ensure that the study can adequately test the theoretical hypotheses and whether the MI-CB dosage was adhered to according to protocol. Fidelity to theory and processes are discussed in detail in Chapter 4 and 5.

**Table 6.3.** Treatment Fidelity Definition and Methods for Assessing Design of Study

<b>Treatment fidelity component</b>	<b>Definition<sup>†</sup></b>	<b>Treatment fidelity techniques</b>
Fidelity to theory	Treatment fidelity methods are used to assess that a study can adequately test its hypotheses in relation to the underlying theory and clinical processes.	<ul style="list-style-type: none"> <li>• Adopted intervention mapping to ensure intervention is underpinned by theory and theoretical determinants.</li> <li>• Implemented a RCT design (blinded).</li> <li>• Evaluated intervention efficacy and outcomes (Chapter 5).</li> </ul>
Ensure same treatment dose within MI-CB intervention	Ensure that treatment 'dose' (measured by number, frequency, and length of contact) is adequately described and is the same for each subject within the MI-CB intervention.	<ul style="list-style-type: none"> <li>• A fixed specified dose was stated from the outset: 2 x 1hr face-to-face and 5x 15-30 minute telephone follow-ups tapered across three months.</li> <li>• Dose was monitored using attendance records and audiotapes to assess duration.</li> </ul>
Ensure equivalent dose across conditions	Ensure that treatment dose is the same across conditions.	<ul style="list-style-type: none"> <li>• The duration of the intervention and UC control groups lasted for equal time (i.e., 3 months with follow-up at 6 months).</li> <li>• The length of contact and frequency for the UC group is not the same for the MI-CB group. The UC group had brief contact to complete questionnaire battery at 0, 3 and 6 months).</li> </ul>
Plan for implementation setbacks	Address possible setbacks in implementations (e.g., treatment providers dropping out).	<ul style="list-style-type: none"> <li>• Only 1 intervention provider was available. Any missed sessions due to adverse weather or illness were re-scheduled for the next available date.</li> </ul>

<sup>†</sup> Definitions are taken from Bellg et al., (2004) and Resnick et al., (2005).



### 6.5.3.2 Treatment Fidelity: Training

Table 6.4 outlines the methods used to assess fidelity to training. This ensures the intervention provider is adequately trained to deliver the intervention techniques by engaging in a standardised training programme and on-going supervisor. On-going supervision consisted of two supervised coding session of 20 minute segments of audio-recorded intervention sessions which encouraged reflexive practice where recommendations for further improvement were made. The latter session was also used in an additional supervision meeting to assess the integration of MI-CB techniques. The sessions were transcribed verbatim to aid reflections (see Appendix O for an example).

**Table 6.4.** Treatment Fidelity Definition and Methods for Assessing Provider Training

Treatment fidelity component	Definition <sup>1</sup>	Treatment fidelity techniques
Standardise training	Ensure that training is conducted similarly for different providers	<ul style="list-style-type: none"> <li>• Provider trained to advanced level of motivational interviewing according to a standardised curriculum provided by a member of the Motivational Interviewing Network of Trainers (MINT).</li> <li>• Provider trained in cognitive behavioural BCTs and theory at Masters Level (MSc Health Psychology) accredited by the British Psychological Society (BPS).</li> <li>• CPD workshop in coding behaviour change techniques delivered by Susan Michie.</li> </ul>
Ensure provider skill acquisition	Train providers to well defined performance criteria	<ul style="list-style-type: none"> <li>• Performance criteria outlined by training provider MINT</li> <li>• Included a total of 48 hours of training consisting of theory, supervised role-plays and practice, educational videos/audiotapes, and practice coding of the MITI.</li> <li>• Feedback given on audio-taped role-play sessions coded and reviewed by trainer throughout the course using the MITI.</li> <li>• On-going supervision and coding of sessions using MITI with highly trained MI supervisor (JB). Sessions were transcribed verbatim to aid training. Recommendations were provided for intervention provider improvement.</li> <li>• Three sessions coded by independent coder.</li> </ul>
Minimize "drift" in provider skills	Ensure that provider skills do not decay over time	<ul style="list-style-type: none"> <li>• Regular review and feedback of audio tapes on a bi-monthly basis by MI and CB trained supervisor which prompted reflexive practice.</li> </ul>

<sup>1</sup> Definitions are taken from Bellg et al., (2004) and Resnick et al., (2005).

### 6.5.3.3 Treatment Fidelity: Delivery

Fidelity to delivery assesses whether the MI-CB intervention was delivered as intended. Table 6.5 outlines the TF techniques used to assess fidelity to delivery.

**Table 6.5.** Treatment Fidelity Definition and Methods for Assessing Intervention Delivery

Treatment fidelity component	Definition <sup>1</sup>	Treatment fidelity techniques
Ensure adherence to treatment protocol	Ensure that treatments are being delivered in the way in which they were conceived with regard to content and treatment dose.	<ul style="list-style-type: none"> <li>• MITI coding performed with SS and JB during supervisions to assess MI delivery. Sessions were transcribed verbatim.</li> <li>• MITI coded by independent coder.</li> <li>• CB technique checklist used to assess adherence to protocol and identify technique omissions</li> <li>• Check list completed at the end of each session.</li> </ul>
Minimise contamination between conditions	Minimise contamination across treatment/control conditions, especially when implemented by the same provider.	<ul style="list-style-type: none"> <li>• Protocol stated that UC group was to not receive any intervention. No MI or CB techniques were delivered when collecting data from the UC group.</li> </ul>

<sup>1</sup> Definitions are taken from Bellg et al., (2004) and Resnick et al., (2005).

#### 6.5.3.4 Treatment Fidelity: Receipt

Fidelity to receipt ensures that participants are satisfied with, and understood, the intervention, including having the confidence to perform the CB techniques. Table 6.6 outlines the TF methods implemented.

**Table 6.6.** Treatment Fidelity Definition and Methods for Assessing Intervention Receipt

Treatment fidelity component	Definition <sup>1</sup>	Treatment fidelity techniques
Ensure participant comprehension.	Ensure that participants understand the information provided in intervention, especially when participants may be cognitively compromised, have a low level of literacy/education, or not be proficient in English.	<ul style="list-style-type: none"> <li>• CEMI scale was used to assess participant's satisfaction of MI delivery</li> <li>• Attendance statistics</li> <li>• At exit interview and follow-up, 30 minutes was set aside to go through each technique with the participant to assess technique comprehension.</li> <li>• MI skills were used (i.e., OARS) to elicit comprehension.</li> <li>• Completed self-monitoring logs (e.g., activity diaries) were reviewed by the provider. Feedback was given.</li> </ul>
Ensure participant ability to use cognitive strategies.	Make sure that participants are able to use the cognitive skills taught in the intervention (e.g., reframing, problem solving, preparing for high-risk situations, etc.).	<ul style="list-style-type: none"> <li>• Same TF techniques used as above.</li> <li>• Questionnaire was used to assess participant confidence to enact cognitive strategies.</li> </ul>
Ensure participant ability to perform behavioural strategies.	Make sure that participants are able to use the behavioural skills taught in the intervention (e.g., self-monitoring, activity diaries, etc.).	<ul style="list-style-type: none"> <li>• Same TF techniques used as above.</li> <li>• Questionnaire was used to assess participant confidence to enact behavioural strategies.</li> </ul>

<sup>1</sup> Definitions are taken from Bellg et al., (2004) and Resnick et al., (2005).

#### 6.5.3.5 Fidelity to Enactment

Fidelity to enactment assessed whether the participants actually enacted the CB techniques provided during the intervention. Table 6.7 outlines the TF techniques used. The CB technique enactment questionnaire was administered at post-intervention (3 months) and follow-up (6 months).

**Table 6.7.** Treatment Fidelity Definition and Methods for Assessing Enactment

Treatment fidelity component	Definition <sup>1</sup>	Treatment fidelity techniques
Ensure participant use of cognitive skills	Ensure that participants actually use the cognitive skills provided in the intervention in appropriate life settings	<ul style="list-style-type: none"><li>• CB technique enactment questionnaire developed and administered to assess the techniques used by participants post-intervention.</li></ul>
Ensure participant use of behavioural skills	Ensure that participants actually use the behavioural skills provided in the intervention in appropriate life settings	<ul style="list-style-type: none"><li>• Same TF methods used as above</li></ul>

<sup>1</sup> Definitions are taken from Bellg et al., (2004) and Resnick et al., (2005).

#### 6.5.4 Data Analyses

Descriptive statistics were used for attendance, independent coder ratings of the MITI, and all questionnaire data. Specifically for attendance, adherence to  $\geq 80\%$  of the intervention is assumed to be an adequate dosage for successful behaviour change (Bellg et al., 2004; James et al., 2008). Responses to the open question for comprehension of CB techniques were summarised using frequencies.

### 6.6 Results

#### 6.6.1 Treatment Fidelity: Design

##### 6.6.1.1 Attendance (Dose)

Attendance was assessed to explore how much of the MI-CB intervention was actually delivered according to the protocol. Participants received an average dose of 6 sessions ( $SD = 1.10$ ), ranging from 3 to 7 sessions. Fifty-nine percent received  $\geq 80\%$  of the intervention. Out of the total 270 minutes available to each participant (i.e., 4.5 hours), the average total minutes received was approximately half ( $M = 142.57$ ,  $SD =$

35.93). Overall, only 53% of participants received the total amount of time specified in the protocol.

### **6.6.2 Treatment Fidelity: Training**

#### **6.6.2.1 Reflections from On-going Supervision**

Initially, the first coded session demonstrated that the intervention provider was not adhering to MI as intended, despite using a number of reflections ( $n = 8$ ). Instead, the intervention provider asked too many open questions ( $n = 18$ ) during the engagement phase of MI as a result of adhering to the assessment sheet outlined by the intervention protocol (See Chapter 4). Simple reflections were offered and quickly followed by an open question thereby limiting the time for the participant to respond to the initial reflection: *"So you started the gym and that seems to not have worked out and you're getting into walking (Simple Reflection), but what are your expectations from being active (Open question)?"* Supervisor recommendations were to leave a space between reflections and questions to allow the participant to respond. As a result of the number of questions used, missed opportunities were identified where complex reflections and affirmations could have been offered. This would have enhanced empathy and cultivated the 'spirit' of MI. An example of a missed opportunity is provided below:

**Participant:** *Exactly, you go [to the gym] and then your knees would be killing and your ankle and then I'd be thinking why am I doing this?*

**Intervention Provider:** *Okay, so how does all of this compare to your past physical activity behaviour before you started the referral scheme?*

(Missed opportunity- the open question ignores the emotional content of the utterance).

Instead, an empathic response could have been used to acknowledge the pain and discomfort the participant experienced during the gym. The intervention provider could have responded with: *"So on the one hand, your experience of the gym sounded like a task of endurance (Complex reflection), but despite this you persevered for as long as you could (Affirmation)".* Without such empathic responses, the intervention provider only just reached beginner proficiency for global scores ( $M = 3.6$ ).



Overall, a number of recommendations were made to enhance the engagement phase: (1) offer more complex reflections and empathic responses, (2) allow time between a reflection and questions to allow the participant to respond, (3) limit the number of questions and avoid rigidly adhering to assessment schedule, and (4) limit the number of utterances, such as 'okay' and 'umm'.

A second session was coded at a later date with a different participant and demonstrated an improvement in MI delivery. The results indicated that the intervention provider used more complex ( $n = 9$ ) than simple reflections ( $n = 3$ ) demonstrating competent proficiency for complex reflections (75%). Also, more open questions ( $n = 9$ ) than closed questions ( $n = 2$ ) demonstrating competent proficiency for open questions (82%). Additionally, the intervention provider was proficient in offering empathy ( $M = 4$ ) and demonstrated competence in the 'spirit' of MI ( $M = 4.3$ ). Supervisor recommendations were to offer more reflections of emotional content. For example, a complex reflection was offered without emotional content:

**Participant:** ...I just don't want to push it just yet so I will give it a couple of days and hopefully get there on Friday and do a session but, again, if it starts twinging then obviously I'll have to stop and come out.

**Intervention provider:** So I suppose it's a case of trial and error isn't it. It's just about having a bit of rest, not pushing it...

An alternative response reflecting the emotional content could have been:

**Intervention Provider:** You seem to be disheartened by your symptom flare-up but, despite this, you continue to learn about your capabilities and limitations through a trial and error process.

MI non-adherent behaviours were also identified ( $n = 2$ ), such as tagging reflections with open or closed questions. Additionally, advice was also offered without an invitation from the participant, which was met with sustain talk:

**Intervention Provider:** So when would you be starting to put that into motion?

**Participant:** After Christmas.

**Intervention Provider:** *So, get Christmas out the way first.*

**Participant:** *Yeah, I'm not that sadistic*

**Intervention Provider:** *Okay I've got one other idea, which some people find helpful, just see what you think. Sometimes, trying to keep a food diary just for a week can help identify what you do it and don't eat, the good things and the bad things (MI non-adherent)*

**Participant:** *Yeah, I've done that before (sustain talk).*

Instead, the Elicit-Provide-Elicit (EPE) method was recommended. The intervention provider's response could have been rephrased to: *"I've got an idea that may help you with your goal. Would you like to hear it?"* Overall, an improvement in MI delivery was found but further improvements were still needed to increase intervention provider's competency. These recommendations were: (1) to use EPE when offering advice or refrain until the participant requests it; (2) continue to limit the tagged reflections with open questions; (3) provide a clearer meta-structure and discuss the aim of the session at the beginning; and, (4) provide more complex reflections with emotional content.

### **6.6.3 Treatment Fidelity: Delivery**

#### **6.6.3.1 Intervention Provider Competence in MI Delivery**

The results from the independent coder revealed that, overall, the intervention provider demonstrated a level that was almost at beginner proficiency for global "spirit" ratings of MI ( $M = 3.44$ ,  $SD = 0.19$ ) and reflection-to-question ratio ( $M = 0.99$ ,  $SD = 0.35$ ). Beginner proficiency was achieved for delivering empathy ( $M = 3.67$ ,  $SD = 0.58$ ) and for displaying MI adherent behaviours ( $M = 96.67$ ,  $SD = 5.77$ ). The intervention provider demonstrated a level of competence in open questions ( $M = 86.46$ ,  $SD = 13.64$ ). For complex reflections, the intervention provider did not reach beginner proficiency ( $M = 33.45$ ,  $SD = 11.95$ ).

#### **6.6.3.2 Reflections from Intervention Provider's Delivery of Integrated MI and CB Techniques.**

Results of the MI-CB coding task are displayed in Figure 6.1. The participant initially discussed reasons for not exercising due to the onset of sciatica and so, through

collaboration with the intervention provider, the participant decided to discuss options around healthy eating. The coding task demonstrated that the CB techniques were delivered using MI skills as stated in the protocol. For example, MI skills, such as open questions and reflections were used to support barrier identification and problem solving:

**Intervention Provider:** *So what I'm hearing you say is that you have been making conscious decisions...it's just when you're out and about. That's the most problematic... (Summary/complex reflection of barrier identification)*

**Participant:** *yes*

**Intervention Provider:** *So what do you think you could do to kind of make sure that some of the times you make healthier options? (Open question supporting problem solving technique)*

**Participant:** *Well I do a lot of the time, for instance coming back from London, I stop off at services and I get those pots of fruits.*

The results demonstrated, however, a lack of a meta-structure as the session jumped between the evocation of change talk, focusing, and planning phases of the MI-CB approach. Also, the intervention provider's decision to move from MI skills into CB techniques was not in response to the participants change talk, such as action, commitment or taking steps, as the protocol suggested. Instead, the point to move into using CB techniques was decided when the client, himself, began to use CB techniques, such as setting his own 'if-then' plans for condition management or identifying barriers to healthy eating. For example:

**Participant:** *Yeah, yeah definitely, definitely! I mean, like I said, the business- If I'm working in one place then I'm fine...but... now I'm on the road, trying to get to meetings...I just grab something, which is usually a sandwich or a meal deal ... and that's over a thousand calories. (Barrier identification)*

**Intervention Provider:** *So what I'm hearing you say is that you have been making conscious decisions...it's just when you're out and about, that's the most problematic... (Summary/complex reflection of barrier identification)*

Additionally, missed opportunities for implementing affirmations were identified, particularly when the participant offers change talk around his reasons and abilities to engage in self-monitoring between 8.35 to 10.39 minutes. Supervisor recommendations were to use more affirmations. A further training point was concerned with eliciting the strength of commitment language for behaviour change from the participant. For example, when the participant discussed physical activity, there was weak commitment talk: "I'll *hopefully* get there (the gym) on Friday". Training recommendations to strengthen commitment were to focus on clear goals and use rating rulers. For example, rating rulers were used to discuss techniques for implementing a healthier diet, which elicited stronger commitment talk:

***Intervention provider:*** So, how likely is it that you would be able to that?  
(open question)

***Participant:*** From 1 to 10? Ten being highly likely? Yeah, it's a ten!  
(Strong commitment)

***Intervention provider:*** Okay, so do you foresee any barriers that get in the way of you being able to do that? (Closed question/Barrier identification)

***Participant:*** No, because it's conscious. When I set my mind to something I'll do it! (Strong commitment).

## MI-CB Coding Form

Length of Coded Segment: 0.00 - 13.34

<b>Change talk</b> <ul style="list-style-type: none"> <li><i>DARN CAT</i></li> </ul>	<b>CB Techniques</b> Action planning ( <b>AP</b> ) Barrier Identification ( <b>BI</b> ) Problem Solving ( <b>PS</b> ) Goal setting (Behavioural) ( <b>GS</b> ) Review of Goals (Behavioural) ( <b>RG</b> ) Self-monitoring ( <b>SM</b> ) If-then plans
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Client / Practitioner

MI Skills

Open Question (OQ)  
 Closed Question (CQ)  
 Simple Reflection (SR)  
 Summary (S)  
 Affirmation (A)  
 Complex Reflection (CR)  
 Gave Time/Space (T)  
**Change Talk (CT)**  
**Sustain Talk (ST)**

<b>MI</b>	<u>S/Review</u>	<u>OQ</u>	<u>UTT</u>	<u>ST (illness)</u>	<u>Info/Advice</u>	<u>CR/A</u>	Time: 0-1.50
<b>CB</b>							
<b>MI</b>	<u>ST (illness)</u>	<u>CR/A</u>	<u>CT(action)</u>	<u>CR</u>	<u>ST (barriers)</u>		Time: 1.55-3.45
<b>CB</b>						<u>If-then plans</u>	
<b>MI</b>	<u>Info (tag)</u> →	<u>SR</u>	<u>S/Recap</u>	<u>S/Recap</u>	<u>OO(tagged)</u> →	<u>CQ</u>	Time: 3.58-4.43
<b>CB</b>				<u>RG</u>	<u>RG</u>	<u>RG</u>	
<b>MI</b>	<u>(Commitment)</u>		<u>S/CR/A(tag)</u> →	<u>SR</u>	<u>OO (strategies)</u>		Time: 4.48-6.45
<b>CB</b>		<u>BI</u>	<u>BI</u>	<u>BI</u>	<u>PS</u>	<u>PS</u>	



MI	CT (desire)	UTT	CT (ability)	CO	CR(Tag)	→	OQ	CT(ability)	CO	BI/PB	Time: 7.03-8.30
CB	GS	GS	GS						BI		
MI	CR	OQ	Commitment	Advice	ST		CO	CT (reason)	CT(ability)	CT(action/ability)	Time: 8.35-10.39
CB	AP	AP	AP	SM				SM	SM	SM	
MI	OQ (tag)	→	CT(reasons)	CR	CT(reason)		CR	ST	OQ		Time: 10.43-11.50
CB	SM	SM	SM	SM	SM		SM	SM	BI/SM	BI/SM	
MI	CR	OQ		S/CR	CT(Need)		OQ	(Commitment)			Time: 12.06-13.34
CB		BI	BI	GS	GS		GS				

Figure 6.1. Results of coding task assessing MI-CB integration

### 6.6.3.3 *Delivery of Cognitive-Behavioural Techniques*

Table 6.8 provides a list of all possible 38 CB techniques that could be delivered according to the protocol (See Chapter 4) and the frequency of delivery across all sessions in total. The most frequently used techniques were barrier identification ( $M = 6.23$ ,  $SD = 1.88$ ), problem solving ( $M = 6.23$ ,  $SD = 1.88$ ), review of goals ( $M = 5.29$ ,  $SD = 1.49$ ), action planning ( $M = 2.58$ ,  $SD = 1.22$ ) and self-monitoring ( $M = 2.52$ ,  $SD = 1.32$ ). The techniques that were delivered the least were prompting a social comparison ( $M = 0.05$ ,  $SD = 0.24$ ), prompting rewards ( $M = 0.17$ ,  $SD = 0.39$ ), and discussing pros and cons of behaviour change ( $M = 0.29$ ,  $SD = 0.46$ ). Visualisation and the distraction technique were not delivered at any point. Overall, 94.7% of the CB techniques were delivered.

**Table 6.8.** Mean, SD, and Total Amount of Cognitive-behavioural (CB) Techniques Delivered During The MI-CB Intervention.

<b>CB Techniques</b>	<b>Mean (SD) Techniques delivered</b>	<b>Total (n) Techniques Delivered</b>
Prompt barrier identification	6.23 (1.88)	106.00
Prompt problem solving	5.70 (1.82)	97.00
Prompt review of goals (behavioural)	5.29 (1.49)	90.00
Prompt action planning	2.58 (1.22)	44.00
Prompt self-monitoring (behavioural)	2.52 (1.32)	43.00
Prompt goal setting (behavioural)	2.29 (0.84)	39.00
Elicit PA outcome experiences	2.29 (0.84)	39.00
Provide information about behaviour-health link	2.11 (1.65)	36.00
Prompt cognitive reframe	1.94 (1.88)	33.00
Prompt realistic goal setting	1.88 (1.11)	32.00
Prompt seeking health professional support	1.58 (1.58)	27.00
Exploration of satisfaction with PA outcomes	1.41 (0.71)	24.00
Provide information about consequences of exercise/ PA (in general)	1.41 (0.93)	24.00
Prompt activity pacing	1.23 (1.64)	21.00
Elicit outcome expectations	1.17 (0.39)	20.00
Prompt time management techniques	1.17 (1.42)	20.00
Elicit ambivalence	1.11 (0.33)	19.00
Elicit values	1.11 (0.48)	19.00
Provide instruction on how to perform the technique (e.g., self-monitoring)	1.11 (1.11)	19.00
Encourage acceptance of situation	1.05 (1.08)	18.00
Elicit priority of PA outcome expectations	1.05 (0.24)	18.00
Plan social support or social change	0.82 (1.13)	14.00
Prompt goal-setting (outcome)	0.70 (0.84)	12.00
Provide feedback on performance	0.64 (1.27)	11.00
Prompt trial and error approach	0.64 (0.78)	11.00
Provide information about consequences of diet (individual)	0.58 (1.00)	10.00
Set/encourage graded tasks	0.58 (1.12)	10.00
Prompt portion control	0.52 (1.06)	9.00
Provide information about consequences of condition management (individual)	0.35 (0.70)	6.00
Prompt if-then plans	0.35 (0.86)	6.00
Provide link between cognition and behaviour (i.e., CBT)	0.29 (0.58)	5.00
Discuss pros and cons of behaviour change	0.29 (0.46)	5.00
Prompt food-diary	0.23 (0.43)	4.00
Prompt rewards	0.17 (0.39)	3.00
Prompt variety	0.05 (0.24)	1.00
Prompt social comparison	0.05 (0.24)	1.00
Visualisation	0.00 (0.00)	0.00
Distraction technique	0.00 (0.00)	0.00

## 6.6.4 Treatment Fidelity: Receipt

### 6.6.4.1 Comprehension of the Cognitive-Behavioural Techniques

Participants ( $N = 17$ ) were asked whether they understood the CB techniques discussed throughout the intervention. Participants stated they understood the techniques but suggested that 9 techniques were not applicable. Reasons provided were that they were not suited to the participant's situation or health condition (see Table 6.9).

**Table 6.9.** Cognitive-behavioural (CB) Techniques That Were Not Applicable To Participants

CB Techniques	<i>n</i>
Implementing visualisation (cognitive)	1
Seeking health professional support (behavioural)	1
Seeking support for exercise (behavioural)	1
Finding an alternative exercise activity if cannot do what originally planned (behavioural)	1
Finding an alternative way of being active during symptom flare up (behavioural)	2
Implementing own rewards (behavioural)	2
Weighing up the pros and cons of PA engagement (cognitive)	3
Implementing own if-then plans (e.g., prompts) (cognitive)	4
Implementing distraction technique (cognitive)	6

### 6.6.4.2 Satisfaction of the Intervention Provider's Skills

A total of 14 participants were included in the analysis for participant satisfaction given that three did not return a completed postal questionnaire. Participants rated the competence of the intervention provider to be highly proficient in intervention delivery ( $M = 54.79$ ,  $SD = 4.19$ ). Participants also rated high proficiency for relational ( $M = 25.86$ ,  $SD = 4.88$ ) and technical components of MI ( $M = 28.93$ ,  $SD = 2.30$ ), suggesting further improvements could be made.

#### *6.6.4.3 Confidence to use Cognitive-Behavioural Techniques*

Participants reported being confident in their ability to use CB techniques overall ( $M = 4.54$ ,  $SD = 0.39$ ). Specifically, participants were slightly more confident to use cognitive techniques ( $M = 4.59$ ,  $SD = 0.33$ ) compared to behavioural techniques ( $M = 4.49$ ,  $SD = 0.50$ ).

### **6.6.5 Treatment Fidelity: Enactment**

#### *6.6.5.1 Enactment of CB Techniques*

Table 6.10 displays the descriptive statistics for CB techniques enacted at three months. Analyses were not performed for CB technique enactment at six months given that only 4 individuals returned a completed questionnaire. At three months, the most enacted behavioural techniques were action planning ( $M = 3.64$ ,  $SD = 0.70$ ), graded tasks ( $M = 3.76$ ,  $SD = 0.43$ ), pacing ( $M = 3.64$ ,  $SD = 0.60$ ), and adding variety to PA to avoid the plateau ( $M = 3.70$ ,  $SD = 0.46$ ). The most enacted cognitive techniques were cognitive reframing ( $M = 3.76$ ,  $SD = 0.43$ ), SMART goal setting ( $M = 3.35$ ,  $SD = 0.86$ ), and being flexible with time ( $M = 3.47$ ,  $SD = 0.87$ ). The behavioural technique enacted the least was implementing own rewards ( $M = 2.41$ ,  $SD = 1.32$ ) and the cognitive technique enacted the least was the distraction technique ( $M = 2.29$ ,  $SD = 1.44$ ).



**Table 6.10.** Frequencies of Enacted Cognitive-behavioural (CB) Techniques

<b>CB Techniques</b>	<b>Mean (SD) Techniques Enacted</b>
<b>Cognitive Techniques</b>	
Implementing own cognitive reframe	3.76 (0.43)
Implementing goal-setting	3.35 (0.86)
Implementing visualisation	3.11 (1.16)
Implementing distraction technique	2.29 (1.44)
Implementing time management	3.58 (0.79)
Implementing own if-then plans (e.g., prompts)	2.52 (1.41)
Weighing up the pros and cons of PA engagement	2.88 (1.36)
<b>Time management (Cognitive)</b>	
Prioritising PA	2.88 (0.99)
Flexible with time	3.47 (0.87)
Giving self 'Me Time'	3.41 (1.00)
<b>Behavioural Techniques</b>	
Implementing action planning	3.64 (0.70)
Implementing self-monitoring	3.58 (0.79)
Implementing activity pacing	3.64 (0.60)
Performing graded tasks/exercise	3.76 (0.43)
Implementing own rewards	2.41 (1.32)
Adding variety to exercise to overcome the plateau	3.70 (0.46)
<b>Condition Management</b>	
Finding an alternative way of being active during symptom flare up (behavioural)	3.23 (1.09)
Finding an alternative PA activity if cannot do what originally planned (behavioural)	3.53 (0.87)
Non-avoidance (behavioural)	3.47 (1.00)
Assessing own capabilities and works within those (cognitive)	3.52 (0.79)
<b>Social Support (behavioural)</b>	
Seeking health professional support	3.70 (0.77)
Seeking support from friends or family	3.47 (0.87)
Seeking support for exercise	2.76 (1.25)

## 6.7 Discussion

The overall aim of this study was to implement a TF framework and assess its components (i.e., design, training, delivery, receipt, and enactment) within the MI-CB intervention for PA maintenance. The previous chapter (Chapter 5) demonstrated favourable results towards the MI-CB intervention. This chapter adds to that by establishing an understanding of the effective or ineffective intervention components. Such knowledge can more precisely guide intervention adaptations and facilitate specific directions for research and practice (Bellg et al., 2004). A number of research questions are presented in section 6.7.5. Each component of TF will be discussed in turn.

### **6.7.1. TF: Design**

Evaluating TF of design assessed the extent to which the MI-CB intervention was underpinned by theory and delivered according to the specified dose in the protocol. The intervention was derived from theory because it was developed using intervention mapping, which ensures the developmental process is theory-driven (Bartholomew et al., 2006). Chapter 4 discusses this process in depth and will not be discussed further here.

In terms of dose, approximately half of all participants did not receive the adequate dose (i.e.,  $\geq 80\%$ ; Bellg et al., 2004) for successful behaviour change. Instead, the majority of participants received just over half of the total intervention contact time. Nevertheless, the MI-CB intervention demonstrated efficacy (*cf.* Chapter 5) suggesting that half of the specified intervention time (i.e., approximately 2.30 hours) is sufficient for behavioural maintenance across three months. Additionally, the participants attended the majority of intervention sessions, which suggests that frequent intervention contact across three months is more important than total intervention time. This might be because the intervention length was too long and not feasible for all participants due to time constraints or other commitments, which has presented as an intervention barrier in previous research (Gidlow et al., 2005). Instead, short but frequent intervention contact appeared feasible for participants over a longer time. This is consistent with previous research indicating that increased contact over time is more likely to achieve maintenance than shorter interventions with fewer contacts (Fjeldsoe et al., 2011; Hardcastle & Hagger, 2011). Therefore, future MI-CB intervention amendments could include reducing the total intervention time by 50 percent and increase the number of contacts across 12 weeks to reduce barriers associated with time to an intervention while still encouraging PA maintenance.

### **6.7.2 TF: Training**

Evaluating TF of training assessed the extent to which the initial training and on-going supervision led to competence in all components of MI, including relational (e.g., empathy) and technical skills (e.g., reflections). The reflective coding sessions were conducted with a MI trained supervisor (JB) throughout the duration of the intervention. This task was able to detect early on that the intervention provider failed to meet beginner competence levels for some technical and relational components of MI. By addressing further training needs, such as increasing reflections and empathic responses,

MI competence was improved over time for some relational (e.g., empathy) and technical components (e.g., open questions) but not others (e.g., complex reflections and reflection-to-question ratio). This finding supports that on-going supervision after initial MI training is important for increasing competence in PA settings (Breckon et al., 2008; Miller & Rollnick, 2013) and TF implementation is needed to address such issues early on.

Given that research suggests that increased MI competence predicts behaviour change (Guydish et al., 2013), it is necessary to understand how much on-going supervision and training is needed to reach beginner competence after the initial training. Previous research has highlighted that 84 hours of bi-weekly supervision of up to two years is needed within a smoking cessation service (Forsberg, Forsberg, Lindqvist, & Helgason, 2010). Alternatively, studies have shown that a minimum of six sessions of feedback delivered via telephone across four months was sufficient to develop practitioner's MI skills to a proficiency suitable for clinical trials compared to those without any on-going training (Miller, Yahne, Moyers, Martinez, & Pirritano, 2004). The duration needed to maintain proficiency, however, is likely to be dependent on the needs of the learner (Miller & Rollnick, 2013). Regardless, without on-going training, practitioners are likely to lose proficiency.

Within this study, the intervention provider completed MI training one and a half years prior to intervention delivery and then only two supervisions were conducted during intervention delivery. Attempts at maintaining skills were made through self-guided study (e.g., books and videos), but evidence has not support such methods in sustaining MI proficiency after initial training (Miller et al., 2004). Such findings can be applied to healthcare services as evidence suggests that healthcare organisations struggle to implement on-going supervision, particularly if delivering MI is not seen as a primary goal of healthcare (Heaven, Clegg, & Maguire, 2006; Madson, Loignon, & Lane, 2009). Longer training courses that focus on the more difficult MI skills to implement (e.g., complex reflections and challenging sustain talk) have been suggested as an alternative to on-going supervision (Forsberg et al., 2010). Either way, more needs to be done to ensure adequate training or on-going supervision is implemented within health services to ensure MI proficiency and effectiveness in promoting PA maintenance and other health behaviours.

### 6.7.3 *TF: Delivery*

Evaluating TF of delivery assessed the extent to which the MI and CB techniques were delivered. The results from the independent coder confirmed that some relational (e.g., empathy) and technical aspects (e.g., open questions) were delivered with proficiency but other skills (e.g., complex reflections) needed further development. Previous research has found that micro skills, such as reflections, are more easily learned and delivered by MI practitioners, particularly with on-going supervision (Forsberg et al., 2010). Therefore, with more supervision across a longer intervention period, it is likely that these micro skills would have been developed and implemented with competence over time.

Furthermore, the results indicated that MI and CB techniques were not completely integrated and delivered in accordance with the meta-structure outlined by Miller and Rollnick (2013). Although, the CB techniques were delivered using OARS, the intervention content and sessions were not entirely delivered in accordance with the meta-structure (e.g., engaging, evoking, and planning) and specified prompts (e.g., client change talk and strength of commitment language) for MI-CB integration (*cf.* Miller & Rollnick, 2013 and Chapter 4). A reason for this is that the intervention structure and overall session goals or agendas may have hindered the intervention provider's ability to use client change talk as prompts to deliver the CB techniques. Previous research has identified similar barriers to effective MI implementation when health-related services have different needs or goals (Williams et al., 2013). Furthermore, integrating MI with other therapies is suggested to be an advanced stage of learning MI (Madson et al., 2009); therefore, specialist training is needed over and above the current MI training provided and should aim to reduce the barriers to effective delivery within healthcare services.

The results must be interpreted with caution, however, as the assessment of MI-CB integration was conducted using a measure adapted for the purpose of reflexive training. Consequently, the psychometric properties were not tested and so the assertion that MI-CB was not integrated is speculative. Only one measure, to date, has been developed to assess MI-CB integration, although focused on MI and cognitive behavioural therapy (CBT) in psychosis (*cf.* Haddock et al., 2012). This measure could not be implemented in the current study due to the different integration method and use



of CB techniques rather than CBT. Therefore, future research is needed to test the MI-CB integration measure used in the current study.

Given that MI components were not all delivered at beginner proficiency, it should follow that the MI-CB intervention was not successful in accordance with previous MI research (Guydish et al., 2013; McCambridge et al., 2011). This is not the case, however, as Chapter 5 revealed efficacy for the MI-CB intervention in promoting PA maintenance. In fact, TF research from a range of psychotherapeutic arenas, including MI, demonstrates that low fidelity can be related to improved outcomes (e.g., Hardeman et al., 2008; Moyers et al., 2005; Perepletchikova, 2011). Such deviations from the protocol have been argued to better address participants' needs, thus adhering to person-centred intervention protocols (Moyers et al., 2005; Perepletchikova, 2011). As a result, low integrity does not necessarily mean that the intervention is weak or ineffective but, rather, the delivered intervention differs from the original protocol (Perepletchikova, 2011). Consequently, the effective and ineffective MI-CB intervention mechanisms become difficult to disentangle.

In conjunction with this, Miller and Rollnick (2004) have suggested that the causal chain between therapist skills, client change talk, and behaviour change is too simplistic and is likely to be a result of a third mediating variable. Example mediating factors for low TF and improved outcomes have been concerned with the common factors of psychological interventions (Perepletchikova, 2011). Although there is no definitive list of the common factors, they are thought to include: client characteristics and expectations (e.g., satisfaction with therapy), setting (e.g., hospital), therapist characteristics (e.g., age, gender, and education), and the therapeutic alliance (e.g., empathy, respect, and collaboration; Carpenter et al., 2012; Peck, 2010). Such variables are said to account for more variance (around 30%) than the specific 'active' ingredients of behaviour change (Messer & Wampold, 2002). Emerging data also revealed that the relational components of MI (e.g., empathy and encouraging autonomy) might be more important than the technical skills or CB techniques for evoking change and supporting client self-exploration of sustain talk (Apodaca, 2013). Given that the intervention provider demonstrated proficiency in displaying empathy and MI adherent behaviours, such findings might support the role of the common factors of psychological interventions in producing the MI-CB efficacy for promoting PA maintenance, found in Chapter 5.



In terms of CB techniques, however, results revealed that the majority of the 38 techniques were delivered, thus representing high fidelity to CB technique delivery. Specifically, techniques such as barrier identification, action planning, self-monitoring, and goal-setting were largely delivered, which have been found to effectively promote PA and self-efficacy in previous studies (Michie et al., 2009; Olander et al., 2013). It follows that these CB techniques helped maintain barrier self-efficacy compared to the UC group in Chapter 5 and is in line with the protocol outlined in Chapter 4. Furthermore, the protocol specified that prompting self-monitoring of a prioritised outcome expectation (See Chapter 4) might influence PA outcome experiences. Chapter 5 also found support in favour of the MI-CB intervention for influencing outcome experiences and PA maintenance; thus providing further support that self-monitoring of prioritised outcome expectations might be one method to experiencing beneficial PA outcomes (Scott et al., *in press*).

In contrast, CB techniques for prompting social support and coping strategies (e.g., acceptance) were delivered less, which could explain why the MI-CB intervention did not change these determinants in Chapter 5. This emphasises the need for adequate intervention delivery, which if adhered to, could enhance intervention efficacy or facilitate change within psychological determinants; thus supporting the need for TF implementation within PA research (Breckon et al., 2008). To confirm such an assumption, however, future research is needed to assess the causal and mediating variables between MI-CB techniques, psychological determinants and PA maintenance.

#### **6.7.4 TF: Receipt**

Evaluating TF of receipt assessed the extent to which participants understood the CB techniques; were confident to use the CB techniques; and, were satisfied with the intervention. Participants stated they understood the CB techniques, although some were not applicable to the participant's situation or needs (e.g., visualisation and the distraction technique) and were, therefore, not employed. It could be concluded that such techniques should be omitted from future research or services but this is not advisable. Different techniques might be useful for different patients with different needs or circumstances (van Houtum, Rijken, Heijmans, & Groenewegen, 2013). Therefore, multiple techniques should be tailored to individual care for chronic disease self-management and PA maintenance, which utilises the notion of a 'therapist tool-box' (Hogden et al., 2012).

Participants also reported high satisfaction with receiving the intervention and highly rated intervention provider competence for the relational and technical components of MI. This contrasts the on-going supervision reflections and independent coder results mentioned in the above sections. This is consistent with previous research, which found that clients were likely to be more satisfied with MI treatment than the therapist (Magill et al., 2010). Explanations for this were concerned with the different expectations and processes between client and therapist. For example, it is likely that the therapist would be disappointed if a particular outcome for that session was not achieved, whereas the client might be satisfied with the non-judgemental nature of the session (Magill et al., 2010). Consequently, client satisfaction has been found to mediate the relationship between the therapeutic alliance and treatment outcomes (Dowling & Cosic, 2010), and further supports the importance of the therapeutic alliance on intervention efficacy (Peck, 2010).

The findings also provide evidence that the MI-CB intervention ensured that all participants were confident to use CB techniques, which is important for intervention enactment (Bellg et al., 2004). Nevertheless, although the confidence scale in this study demonstrated acceptable internal consistency, it lacked rigorous psychometric testing. Additionally, the high confidence scores across all participants might be due to a social desirability bias given that the intervention provider also administered the questionnaire (Taber et al., 2009). One method to counter-act response bias in TF research is to employ a separate TF researcher who is blinded to the intervention conditions (Bang, Flaherty, Kolahi, & Park, 2010), which future TF research should consider.

#### **6.7.5 TF: Enactment**

Evaluating TF to enactment assessed the extent to which the participants enacted the CB techniques delivered during the intervention. The techniques that were the most enacted were action planning, goal setting and cognitive re-framing, pacing, graded-tasks and time-management, which previous research suggests are effective for initial PA behaviour change and condition management (Kralik et al., 2004; Michie et al., 2013; Olander et al., 2013). This study adds to that suggesting these techniques are also beneficial for promoting PA maintenance. In contrast, participants enacted the distraction technique and used rewards the least, which were likely to be inapplicable to their needs at that time (as described in section 6.7.4). It is likely that different techniques would be called upon depending on the individuals' condition management

needs, which are suggested to vary in accordance with symptom fluctuations and severity (van Houtum et al., 2013). Therefore, understanding how technique enactment varies over time will provide insight into how the effects of a PA intervention are maintained. Given that technique enactment was only assessed at three months follow-up within this study, it is unclear how technique use changes over time and warrants further research.

The findings also revealed that some of the techniques that were delivered the most, were also largely enacted (e.g., goal-setting) compared to those that were not. This suggests a link between frequently delivered techniques and enactment. In contrast, specific techniques, such as pacing was largely enacted but was not delivered as frequently. One reason for this discrepancy is that the delivery of specific techniques, during an intervention might not be the techniques employed after an intervention if additional techniques are found to be more useful to meet a patient's needs (Bair et al., 2009). Therefore, participants might choose to adopt and implement a range of CB techniques depending on the stage of their disease and the perceived function or benefit of such techniques.

In addition, specific techniques outlined in the taxonomy of behaviour change techniques (e.g., Bird et al., 2013; Michie et al., 2011b) do not explicitly differentiate between technique delivery and enactment. Consequently, it is unclear whether the effective techniques identified by reviews are effective because they were delivered, or because they were enacted. Nevertheless, the reliability of the questionnaire used within the current study to measure CB technique enactment needs to be questioned and further research is required to validate the measure. Regardless, understanding the factors that prompt technique enactment might be important for the long-term PA engagement, particularly after an intervention has ended (Marcus et al., 2000) and warrants further research.

#### **6.7.6 *Recommendations for Future Research***

Throughout this section (6.7), a number of recommendations have been suggested for future research and modifications of the MI-CB intervention. For example, total session duration throughout the intervention could be reduced by 50 percent and, instead, increase the number of contacts over time in line with previous research (Fjeldsoe et al., 2011). This research also highlights a number of CB techniques that might promote PA maintenance or the specific psychological



determinants (e.g., barrier identification and goal-setting), although future research needs to distinguish between technique delivery and long-term enactment after an intervention has ended. Future MI-CB intervention delivery requires on-going supervision of at least six sessions (Miller et al., 2004) or longer training (Forsberg et al., 2010). Furthermore, given the low fidelity to MI-CB technique delivery but MI-CB intervention efficacy for promoting PA maintenance, it is likely that confounding mediators are present. Such factors were suggested such as the therapeutic alliance (e.g., empathy), patient satisfaction and therapist/client characteristics (Messer & Wampold, 2002). Future research, and training, should focus on such common factors of psychological interventions, as these factors might be more important than the active ingredients (e.g., theories and determinants) of behaviour change interventions (Peck, 2010).

Additionally, a number of recommendations have also been suggested to improve the methodological quality of TF research (e.g., blinding of external treatment fidelity assessors, and developing and testing the psychometric properties of specific MI-CB fidelity measures). If TF research is to progress, the validity and reliability of measures is necessary (Bond, Becker, & Drake, 2011; Zvoch, 2012). Specifically, multi-level structural equation modelling has been recommended to explore TF components as mediators of intervention outcomes (Zvoch, 2012). Such research is warranted to more accurately explore the effective and ineffective intervention components within PA maintenance interventions.

#### ***6.7.7 Recommendations for Healthcare Practice and Training***

This research identified a number of theoretically derived MI-CB techniques that could be delivered and enacted to promote successful PA maintenance (e.g., goal setting, time management skills and cognitive reframing). Some techniques were identified as less applicable such as visualisation but it has been suggested that all techniques within the MI-CB intervention could be applicable to a clinically heterogeneous population in order to meet the needs, values, and resources of each individual; thus, a person-centred "tool-box" approach is recommended (Hogden et al., 2012; van Houtum et al., 2013; Williams et al., 2013). Nevertheless, the MI-CB intervention was conducted within a PARS setting, which could limit the generalisability of the findings to other healthcare settings; thus, further multiple-site testing of the MI-CB intervention is required (Mowbray et al., 2003).

The challenge, however, is not in the adaptation of strategies, but the implementation of an MI-CB approach within existing services (e.g., PARS). Previous research has indicated a number of barriers with the acceptance of integrative therapies, such as organisational acceptance, time restraints, and available resources (Hogden et al., 2012; Williams et al., 2013). Therefore, it is recommended that training providers should support existing healthcare services to implement the MI-CB approach to meet organisational needs and goals, including overcoming barriers to implementation (e.g., lack of trained MI supervisors within the organisation; Williams et al., 2013). Frequent assessment of the fidelity of the implementation procedure would also need to be conducted to ensure barriers are identified and dealt with early on, thus ensuring successful implementation (Resnick et al., 2005).

MI is increasingly being implemented within health care settings for behaviour change and is suggested to be a skill that can be learned regardless of profession or background (Madson et al., 2009). The notion that MI can be easily learned by anyone and applied to healthcare has been questioned within the current study. This study found that intensive training and continual close supervision is needed for practitioners to meet MI-CB proficiency in line with previous research (Britt & Blampied, 2010; Forsberg et al., 2010). Without the on-going supervision, it is likely that competence will diminish and could limit the effectiveness of service delivery (Miller & Rollnick, 2004). Within the UK, on-going supervision is often received within the workplace if the MI practitioner is an allied health professional who requires regular clinical supervision (*cf.* Care Quality Commission, 2013). As a result, on-going MI supervision would need to be embedded within this service structure. The supervisor would also need to be a highly trained MI or MI-CB therapist, which is not always the case. Where on-going supervision is not feasible, an alternative suggestion is to develop longer training courses, which concentrates on more advanced skills, such as complex reflections, eliciting change talk and MI-CB integration (Forsberg et al., 2010; Madson et al., 2009). Indeed, the cost implications of adopting on-going supervision or longer training courses need to be considered for service commissioners. A factor influencing commissioning of integrative approaches will be dependent on further research which should test whether integrative MI-CB is any more effective than single therapeutic interventions (e.g., MI or CBT). Despite this, healthcare services promoting PA need to consider the role of adequate training and supervision when applying therapeutic techniques such as integrative MI-CB.



## 6.8. Limitations

A number of methodological limitations need to be considered when interpreting the study results. One limitation is concerned with the pertinent issue of the validity and reliability of fidelity measures (Mowbray et al., 2003; Bond et al., 2011). Given the novelty of the MI-CB intervention within a PA context, selecting valid measures was not always possible. Reliable measures were selected where possible (e.g., MITI), or existing measures were adapted (e.g., CB technique checklist) and assessed for internal consistency as previously recommended (*cf.* Mowbray et al., 2003). Nevertheless, if the MI-CB intervention were to be translated into a large scale RCT, or embedded into healthcare practice, then standardised measures are essential.

Following this, the validity of the CEMI scale needs to be called into question. The relative novelty of the CEMI means that the psychometric properties are yet to be tested (Madson et al., 2013). To the best of our knowledge, this is the first PA study utilising the scale and the internal consistency was barely acceptable for the overall measure. This might have been influenced by the low sample size. Nevertheless, further testing of the scale is warranted in a PA setting and within larger samples. Additionally, social desirability bias could have affected the responses within the CEMI and other self-reported TF measures employed (Taber et al., 2009), particularly as the intervention provider administered the measures. Consequently, individuals engaging in less PA could have over reported their satisfaction with intervention receipt. To reduce such bias, TF research would benefit from an independent and objective intervention outcome/fidelity assessor (Bang, et al., 2010). This methodological strategy is likely to be costly, however, and is associated with higher levels of TF implementation, which need to be considered during the intervention planning phase (*cf.* Pereplechikova, 2011).

Coding of the MITI could not be conducted by the primary researcher (SS), which limited the level of TF implemented and analysis. To achieve acceptable coder competency using the MITI scale, at least 40-hours of training with weekly supervision and stepped learning is required (Moyers et al., 2010). This was not feasible within this study for pragmatic reasons concerning cost, limited resources and time. Consequently, researchers using the MITI need to be mindful of the level of training involved to adequately reach a standard for inter-coder reliability. Future research would benefit from developing TF measures that are accessible to a range of researchers without the

need for such intensive training. Following this, inter-coder reliability was not conducted for CB techniques because this also required training of an independent coder; thus limiting the reliability of such measures.

In line with training, only standardised training was received for MI techniques but not CB technique delivery. At present, no standardised training exists for the delivery of CB techniques as outlined by the taxonomy of BCTs (Michie et al., 2011b). While the taxonomy aims to ensure a standardised and consistent reporting of intervention techniques within publications, it does not provide the information needed to ensure consistent delivery of techniques in practice. According to evidence, there are different perspectives on how goals, for example, should be set; with some research arguing the case for multiple goals rather than single goals (Estabrooks et al., 2005) and other research suggesting that goals need to be small, specific, meaningful and positive (Cepeda & Davenport, 2006). Furthermore, it is suggested that goals should be described in relation to positive changes (e.g., "I want to increase my PA") as opposed to being described in the absence of something negative (e.g., "I want to stop sitting and watching so much TV"; Cepeda & Davenport, 2006). Consequently, whether or not a technique is effective might be dependent on how that technique is implemented, given the variation that exists in methods for CB technique delivery. Therefore, standardised training is needed to ensure consistent delivery of CB techniques within research and practice.

Finally, the content validity of assessing participant comprehension of the intervention has been criticised by Leventhal and Friedman (2004). They argued that the TF framework does not specify what 'understanding' means and asking participants if they understand specific CB techniques is too simplistic. Understanding involves different methods of cognising, such as hearing what is mentioned, retaining the information, or understanding the importance of CB technique implementation (Leventhal & Friedman, 2004). In this study, all of the above points were discussed during the exit interview but only assessed with one question that did not distinguish between these different methods of cognising. Consequently, the study findings need to be interpreted with these issues in mind.

## **6.9 Chapter Summary**

This chapter presented the results of the TF framework for the MI-CB intervention, including, design, training, delivery, receipt, and enactment. The chapter

reveals that the MI-CB intervention was not completely delivered to a level of proficiency or necessarily integrated in accordance with a meta-structure (*cf.* Miller & Rollnick, 2013). It is likely that confounding mediators influenced the intervention efficacy (Chapter 5), such as the therapeutic alliance (e.g., empathy), participant satisfaction, therapist characteristics, and CB techniques (e.g., barrier identification). On-going supervision and training were suggested to ensure practitioner competence and training recommendations were suggested, such as longer duration of courses. The TF evaluation identified effective techniques for PA maintenance (e.g., goal setting) but enactment of techniques might play a key role in long-term PA engagement after intervention completion. The complexity of identifying 'what works' within PA maintenance research, however, calls for multi-site research to understand the mediating effects of TF components on treatment outcomes. Limitations were identified that are prevalent within current TF research, such as the lack of reliable measures. Additionally, the lack of standardised training for CB techniques, in accordance with the taxonomy of BCTs, was acknowledged. Consequently, future directions for research are provided and it is proposed that applied practice adopts a flexible "tool-box" approach to promote PA maintenance for adults with chronic health conditions.

# **Chapter 7**

## **Thesis Synthesis, Recommendations, Reflections and Conclusions**

## **Chapter 7: Thesis Synthesis, Recommendations, Reflections and Conclusions**

### **7.1 Thesis Aims and Chapter Purpose**

The aim of this thesis was to advance the understanding of the mechanisms that promote PA maintenance in adults with chronic health conditions through the development, delivery and evaluation of an intervention. This was achieved by following the principles of intervention mapping (Bartholomew et al., 2006). Methodological limitations of previous PA interventions were also addressed, including specifically targeting the PA maintenance phase, exploring the factors that determine both successful and unsuccessful PA maintenance and comprehensively evaluating the outcomes and processes (i.e., treatment fidelity) of an intervention (*cf.* Marcus et al., 2000; 2006; Breckon et al., 2008; Chapter 1). Specifically, three main research questions were explored throughout the thesis: (1) what are the theories, determinants and techniques that promote PA maintenance in adults with chronic health conditions? (Chapter 2 and 3); (2) to what extent can integrated counselling interventions promote PA maintenance, such as motivational interviewing (MI) and cognitive-behavioural techniques (MI-CB)? (Chapter 4 and 5); and, (3) what can the implementation of a comprehensive treatment fidelity (TF) framework inform us of the processes within an MI-CB intervention for PA maintenance (Chapter 6)? The purpose of this chapter is four-fold: (1) to provide a synthesis of the key findings from all studies throughout this thesis (Chapter 2-6); (2) to discuss implications for future research and practice; (3) to present a reflection on the research development and process throughout the PhD; and, (4) to conclude the thesis.

### **7.2 The Theories, Determinants and Strategies for PA Maintenance: Synthesis of Findings from Chapter 2-4.**

When developing PA maintenance interventions, theory is often selected to inform the determinants and behaviour change techniques (BCTs) to implement to change or maintain PA behaviour (Bartholomew et al., 2006; Michie & Prestwich, 2010). To achieve this, a scoping review (Chapter 2) and qualitative study (Study 1, Chapter 3; Scott et al., *in press*) collectively explored the theories, determinants and BCTs for PA maintenance in adults with chronic health conditions. The findings from



both of these studies were further synthesised during the intervention mapping process detailed in Chapter 4.

### **7.2.1 *Theory for PA Maintenance***

It is largely considered that theory-based interventions are more effective than interventions without theory given that they outline the mechanisms of behaviour change, such as the determinants and strategies (Brug et al., 2005; Michie & Abraham, 2004). As a result, chapters 2-4 explore the effective theories for PA maintenance in adults with chronic health conditions. The results of the scoping review (Chapter 2) questioned whether theory-based interventions were more likely to effectively promote PA maintenance given that theory-based interventions were both effective and ineffective. A suggested reason was concerned with the inadequate reporting of interventions found within the scoping review meaning that specific theories could have been used but not reported; thus biasing the results, consistent with previous reviews (Greaves et al., 2011). Consequently, there is a need for more adequate reporting of PA maintenance interventions in clinical populations, which supports previous research (Abraham & Michie, 2008). What was consistently evident across studies (Chapters 2-4), however, was the need for multiple theoretical components for PA maintenance, such as expectancy value theory (Janis, 1984; Sears & Santon, 2001), relapse prevention model (Marlatt & Donovan, 2005), theory of behavioural maintenance (Rothman et al., 2011), disconnected values theory (Anshel & Kang, 2007), and social cognitive theory (Bandura, 1986). Initially, it was considered that the use of multiple theories was because a single empirically tested theory does not exist for PA maintenance (Hutchison et al., 2012). Instead, chapters 3 and 4 highlighted that PA maintenance is a complex process and multiple theoretical components were needed to explain the determinants involved in successful PA maintenance; thus, supporting previous research (Amireault et al., 2012). Furthermore, it was suggested that multiple theoretical components were important to understand PA maintenance in a clinically heterogeneous population and should be used to guide the development of PA maintenance interventions.

### **7.2.2 *Determinants for PA Maintenance***

In terms of the determinants for PA maintenance, the scoping review identified a vast array of psychological, behavioural and health-related determinants meaning that the factors for PA maintenance were unclear (Chapter 2). Additionally, the scoping

review identified that studies rarely focused on differentiating between the factors that determine successful and unsuccessful PA maintenance. Given that previous research had suggested that exploring both successful and unsuccessful PA maintenance would enable more specific PA maintenance interventions to be developed (Marcus et al., 2000), a qualitative study was conducted (Study 1, Chapter 3, Scott et al., *in press*). The study supported that PA maintenance is a complex process and identified a number of determinants for successful PA maintenance in adults with chronic health conditions, including: outcome expectations, outcome experiences, social support, a trial and error learning process, attitudes, values and barriers (i.e., physical, psychological and environmental).

The findings also added to previous research by highlighting the factors that determined successful PA maintenance or relapse (e.g., Hutchison et al., 2012; Sears & Santon, 2001; Rothman et al., 2011). These factors included: the level of congruence between PA outcome expectations, experiences and values; the ability to seek social support after an intervention ends; the ability to accept physical limitations or capabilities through a trial and error process; the ability to overcome barriers; and the ability to cognitively reframe negative attitudes, such as 'I can't be bothered'. Specifically for social support, the findings demonstrated that a dependency on social support (e.g., health professionals) can be detrimental to PA maintenance, particularly if the support discontinues. This finding supported previous research suggesting the need for on-going support from services (Eakin et al., 2010), although the promotion of autonomy for PA and self-management of health conditions also appeared necessary for long-term PA participation (Midtgaard et al., 2012). Overall, it was considered that these determinants could inform the development of PA maintenance interventions in adults with chronic health conditions and prevent relapse in those who had already increased their PA levels. Furthermore, it was evident from the complexity of the findings that a person-centred counselling based intervention was needed to explore the processes and determinants to promote PA maintenance in a clinically heterogeneous population.

### **7.2.3 Behaviour Change Techniques for PA Maintenance**

The need for a counselling approach for PA maintenance was further supported by the multiple strategies that were identified in the scoping review (Chapter 2) and qualitative study (Chapter 3). A range of cognitive-behavioural (CB) techniques were

often used for PA engagement and self-management or coping with chronic health conditions. While many of these techniques could be categorised by the 40-item taxonomy of BCTs (Michie et al., 2011b), additional techniques were found for coping and condition management (e.g., pacing, active planning). This suggested that PA maintenance interventions developed for a clinical population could not necessarily be informed completely by the taxonomy of BCTs (e.g., Michie et al., 2011b). Additionally, this finding supported that effective long-term PA engagement is also determined by effective condition management in clinical populations, suggesting a bi-directional causal relationship exists which supports emerging evidence (*cf.* Plow et al., 2012). Furthermore, the notion that common effective strategies or BCTs exist for PA maintenance (e.g., Piette et al., 2004) was challenged by the fact that multiple strategies were often used and in multiple ways, depending on the individual's health needs and circumstances. Consequently, it was evident that multiple CB techniques were needed for PA maintenance and supported previous evidence suggesting the need for a person-centred "tool-box" counselling approach for the self-management of chronic health conditions (Hogden et al., 2012).

#### ***7.2.4 The Development of a Counselling Intervention for PA Maintenance***

By synthesising the findings from Chapters 2 and 3, Chapter 4 detailed how the theories, determinants and strategies for PA maintenance were translated into a person-centred counselling intervention. Chapter 4 adds a transparent and detailed description of the intervention; thus proving a more scientific reporting of PA maintenance interventions. It was argued that to change the theoretical determinants for PA maintenance outlined in Chapter 3 (e.g., congruence between outcome expectations, experiences and values), and tailor CB techniques (e.g., self-monitoring) to the individual, an integrative motivational interviewing (MI; Miller & Rollnick, 2013) and cognitive-behavioural (MI-CB) approach was required. Integrated MI-CB interventions are largely adopted in the mental health field and are suggested to complement each other; thus creating a more effective therapy (Westra & Arkowitz, 2011). For example, CB interventions are often criticised for being expert driven and lacking empathy, leading to poor adherence rates within therapy (Flynn, 2011). Instead, empathic approaches, such as MI, can counterbalance the directive nature of CB interventions; thus increasing effectiveness (Burke, 2011). Integrated MI-CB interventions were previously suggested for maintenance of health behaviour change but remained



theoretical (Naar-king et al., 2013). An understanding of the efficacy of MI-CB interventions for PA maintenance can encourage future research and help the development of services promoting PA as a common treatment component for a range of chronic health conditions (Piepoli et al., 2010). The remainder of the thesis (i.e., Chapters 5 and 6) was dedicated to understanding the preliminary effectiveness, feasibility and effective or ineffective processes within the MI-CB intervention.

### **7.3 Synthesis of Findings from Chapter 5 (Study 2a): The MI-CB Intervention**

Chapter 5 contributed to the evidence base in two ways: (1) the study evaluated the preliminary efficacy and feasibility of the novel MI-CB intervention specifically for PA maintenance in adults with chronic health conditions; (2) the intervention addressed a gap within the literature by specifically focusing on PA maintenance which has been recommended to gain a better understanding of the factors that promote PA maintenance (Crain et al., 2010; Marcus et al., 2000; and see scoping review in Chapter 2). The chapter reported the implementation of the RCT pilot study entitled the Keep Active South Yorkshire Trial (KASY). The findings supported the efficacy of the MI-CB intervention for promoting self-reported moderate-vigorous PA (MVPA) and all intensities of PA across six months compared to usual care after completing a physical activity referral scheme (PARS). The study reported that the MI-CB intervention group were four times more likely than the UC group to continue to meet the recommended guidelines for MVPA at six months post-PARS. This evidence supported previous research suggesting that integrated MI-CB is effective for health behaviour maintenance (Naar-king et al., 2013). Nevertheless, findings did not support the efficacy of the MI-CB intervention for promoting PA maintenance as objectively measured by a pedometer (i.e., average steps/day). Limitations of using pedometers in adults with multiple chronic health conditions were suggested and included issues with walking gait and speed associated musculoskeletal conditions. Future research was recommended to include more advanced technology, such as accelerometers and/or GPS devices (McCluskey, et al., 2012). Future research with a longer follow-up post-intervention was also suggested to more accurately assess the long-term effectiveness of an MI-CB intervention for PA maintenance.

A secondary aim of the KASY trial was to explore the relationship between the MI-CB intervention and psychological determinants; particularly as previous PA

counselling research has highlighted the lack of focus on psychological outcomes (Breckon et al., 2008). The study provided support for the short-term effect of the MI-CB intervention on promoting or maintaining barrier self-efficacy, and physical and psychological outcome experiences at the end of the intervention (three months). This provided support for employing MI-CB techniques to regulate these determinants as hypothesised within Study 1 (Chapter 3) and using the methods outlined during the intervention mapping process (Chapter 4). At six months, however, the MI-CB intervention influenced only physical outcome experiences for promoting PA at six months suggesting that the experience of such outcomes (e.g., weight loss and increased physical fitness) are important for PA maintenance. The fact that the MI-CB intervention was not related to any other psychological outcome at six months may suggest that the MI-CB intervention only produced short term effects, which deteriorated after the end of the intervention. Alternatively, additional determinants were also suggested for PA maintenance (e.g., perceived satisfaction with outcomes; Rothman et al., 2011) or alternative types of self-efficacy (e.g., recovery self-efficacy; Luszczynska & Sutton, 2006). Future PA maintenance research exploring these additional variables was recommended, including mediational analysis in larger samples, to explore the influence of MI-CB interventions on psychological outcomes.

The findings did not provide efficacy for the MI-CB intervention to influence coping strategies and social support, which contradicts the assumption that integrated MI-CB can promote active seeking of social support and enhance coping strategies (*cf.* Chapter 2 and 4). One reason for this lied with fidelity to the delivery of the MI-CB intervention (discussed in Chapter 6) and further TF research was recommended to explore whether the intervention delivery protocol had been adhered to. A negative correlation was also found between increased PA at baseline and decreased instrumental social support at three months. It was suggested that increased exercise mastery and autonomy associated with person-centred support (*cf.* Moore et al., 2011) can reduce the need for practical support in the long-term. This finding might provide some evidence for the role of MI-CB in promoting autonomy and reducing dependency on support as was identified during chapter 3 (Scott et al., *in press*), but further research was suggested to explore this.

Another secondary aim of the MI-CB intervention was to also assess the impact of the MI-CB intervention on epidemiological outcomes, such as weight and BMI, given the importance of PA maintenance on health (DoH, 2011). The MI-CB



intervention found no support in the reduction of weight or BMI and contradicts previous research (Hamer et al., 2013), particularly at six months post-intervention. The role of BMI as an accurate measure of weight was questioned and it was suggested that future research could assess lean body mass as a more accurate physiological measure in active participants (Berrington et al., 2010).

The feasibility of the MI-CB intervention was also addressed in accordance with previous recommendations for pilot studies (Lancaster et al., 2004). Findings revealed that the MI-CB intervention was generally feasible and supported efficacy for the intervention to improve adherence and retention rates, consistent with previous research (Flynn, 2011). Specifically, older adults were likely to adhere to the intervention sessions than younger adults, consistent with previous research (Gidlow et al., 2005). Suggestions were made to enhance younger adult participation in PA maintenance interventions, such as including flexible intervention delivery to accommodate those who work full-time and regularly attend medical appointments. Further refinements to the KASY trial were suggested to employ suitable measures for an older adult and chronically ill population, such as more specific social support for exercise scales

Limitations of the RCT pilot study were identified. The study was underpowered due to the small sample size and limited the types of analyses that could be performed, such as sub-group analyses on health and socio-demographic variables. This limited the ability to interpret who the intervention worked for or not. Additionally, large variances were also found within the study, often due to small sample sizes which can inflate effect sizes; thus, it was recommended to interpret the confidence intervals around effect sizes as a more accurate measure of practical significance (Maxwell, 2004). A large scale RCT was proposed to more accurately test the effectiveness of an MI-CB intervention, specifically for sub-groups within a heterogeneous clinical population. Before doing so, however, it was argued that an assessment of treatment fidelity (TF) was needed to draw firm conclusions with regards to the effective and ineffective intervention components for PA maintenance (Resnick et al., 2005). This was suggested to enable further refinements to the MI-CB intervention and prevent a potentially ineffective intervention from being translated into research or practice (Breckon et al., 2008).

#### 7.4 Synthesis of Findings from Chapter 6 (Study 2b): Treatment Fidelity

Following Chapter 5, a TF framework was implemented to assess five areas of fidelity: (1) design; (2) training; (3) delivery; (4) receipt; and (5) enactment (Bellg et al., 2005). Given that the MI-CB intervention provided evidence for supporting PA maintenance, it was important to disentangle the intervention factors that contributed to its effectiveness. Additionally, a TF assessment also provided a stronger understanding of the factors that contributed to ineffective results, such as the lack of regulation of coping skills and social support. It was concluded that implementing a TF framework enhances the internal validity of an intervention and prevents a Type III error; where the intervention is assumed to be ineffective when, in fact, inadequate delivery was the cause (Saunders, et al., 2006).

Chapter 6 provided a comprehensive reporting on TF implementation methods, which was lacking within PA counselling and PA maintenance research (Breckon et al., 2008). Consequently, the transparency of the methods enables future PA research to replicate or modify TF implementation. The results also revealed a number of modifications that would need to be made to the MI-CB intervention. For example, the findings revealed that the frequency of session contact across time (i.e., 7 sessions across three months) was important for PA maintenance, rather than session duration consistent with previous research (Fjeldsoe et al., 2011). Intervention amendments were suggested to reduce the MI-CB total intervention time by approximately 50 percent (i.e., 2.25 hours).

The findings also revealed the importance of implementing on-going training or supervision to prevent skill drift and supported previous research (Breckon et al., 2008; Forsberg et al., 2010; Guydish et al., 2013; Miller et al., 2004). In the MI-CB intervention, the intervention provider initially did not meet beginner proficiency for MI skills but, with on-going supervision, the technical (e.g., open questions) and relational skills (e.g., empathy) were enhanced over time. Nevertheless, the fact that the intervention provider still did not meet beginner proficiency for some MI components (e.g., complex reflections) after on-going training questioned the duration of training or on-going supervision needed to ensure MI proficiency. It was suggested that between six sessions across four months to 84 hours across 24 months could be required to sustain clinical skills (Forsberg et al., 2010; Miller et al., 2004). Such findings need to be considered in the commissioning and implementation of

services that use MI or integrative approaches for PA maintenance and health behaviour change, overall. Without on-going training it is likely that an MI-CB intervention will not be delivered proficiently, thus decreasing the internal validity and effectiveness of the intervention.

Despite the low fidelity of delivery, the MI-CB intervention still demonstrated efficacy (See Chapter 5), which introduced a complexity into understanding the effective components of the intervention. One suggested reason was that the high fidelity to CB technique delivery, such as barrier identification and self-monitoring of a prioritised outcome expectation, might have influenced the psychological determinants for PA maintenance (e.g., self-efficacy and physical outcome experiences reported in Chapter 5), thus, influencing PA maintenance. Consequently, this finding suggested that low fidelity of intervention delivery does not necessarily lead to decreased efficacy (Moyers et al., 2005; Pereplechikova, 2011). Instead, it was suggested that the therapeutic alliance and the common factors of psychological interventions (e.g., empathy and therapist characteristics; Peck, 2010; Pereplechikova, 2011) might be more influential in counselling-based PA maintenance interventions than the 'active ingredients' (e.g., theories and BCTs; Messer & Wampold, 2002). Nevertheless, further research is needed to test the role of the therapeutic alliance in MI-CB interventions for PA maintenance.

Additional factors influencing the effectiveness of the MI-CB intervention could have been associated with fidelity of receipt, such as participant comprehension of the intervention, confidence to implement CB techniques, and participant satisfaction with receipt/delivery of the intervention. Findings demonstrated that the intervention was largely understood by participants, although certain techniques were not applicable to some participants (e.g., visualisation techniques). Findings also revealed that participants were highly satisfied with the intervention, providing evidence that a mismatch between intervention provider and client's perceptions of therapy can exist (Magill et al., 2010). Findings also provided evidence that the MI-CB intervention enhanced confidence to use strategies although limitations with the scale were acknowledged. Furthermore, findings revealed that the MI-CB intervention encouraged enactment of specific techniques, namely action planning, goal-setting, cognitive reframing and pacing. Collectively, these findings demonstrated the complexity of PA maintenance interventions and suggested that factors associated with receipt and enactment should be considered more within PA promotion. Specifically, findings



revealed a difference between techniques that were delivered (e.g., problem solving) and those enacted (e.g., pacing). Thus, distinguishing between technique delivery and technique enactment was suggested to better understand the factors that influence PA maintenance, particularly after an intervention ends but is currently not specified within taxonomies (e.g., Michie et al., 2011b).

## **7.5 Implications for Practice and Research**

Throughout this thesis, implications for practice and research have been made within each chapter and for each study (Chapters 2 to 6). The following section will provide an overview of such implications which are needed to further enhance our knowledge or practice with regards to promoting PA maintenance in adults with chronic health conditions and comorbidities.

### **7.5.1 Implications for Practice**

During the intervention mapping process (Chapter 4), one step is to consider how an intervention can be adapted and adopted by a healthcare service. It was stated that this was an on-going process with PARS co-ordinators. Since then, one research site (Barnsley Premier Leisure: [BPL]) experienced funding cuts by the NHS and PARS was discontinued in April, 2013 (*cf.* <http://www.bpl.org.uk/bpl-community-health/barnsley/exercise-referral>). The need to promote PA maintenance in individuals with chronic health conditions, however, still remains and so a new service was developed employing MI-CB techniques. This service is currently called the Integrated Condition Management Programme but is available under a membership package entitled Flex Care Plus (*cf.* <http://www.fitnessflex.org.uk/memberships>). BPL are now considering how the findings from this thesis, and other evidence-based research, can be implemented. This section will discuss the key considerations, which might also be generalisable to other condition management services promoting PA.

The findings from Chapter 2 to 5 demonstrate the need for healthcare professionals to focus on delivering multiple techniques employing a person-centred approach to promote PA maintenance. It is unlikely that any one approach (e.g., MI) can solely meet the needs of a heterogeneous clinical population and so integrative or 'tool-box' therapeutic approaches, such as MI-CB were suggested (Hogden et al., 2012; Naar-king et al., 2013; Westra & Arkowitz. 2011). Additionally, health care professionals should aim to influence theoretical determinants of PA maintenance which can facilitate

change as demonstrated throughout Chapters 2 to 5. Furthermore, integrated MI-CB techniques are encouraged for their potential to enhance adherence to an intervention (e.g., PARS) and behavioural maintenance after an intervention (Flynn, 2011; Naar-king et al., 2013). Nevertheless, services need to consider the cost-effectiveness of implementing integrative approaches compared to single therapies (e.g., MI or CBT).

Services or healthcare professionals either adopting, or considering the adoption, of integrative interventions can draw from a number of lessons learned through evaluating TF. In terms of dose, PA maintenance can be achieved with frequent contacts over time (e.g., seven 10 minute sessions across 3 months) rather than longer or intensive sessions, which supports previous research (Fjeldsoe et al., 2011). In terms of training and delivery, on-going supervision is necessary to ensure continual provider competence and effectiveness of intervention delivery (Forsberg et al., 2010). Previous research would suggest a minimum of six sessions across 4 months following initial training is enough, although it is likely to depend on the individual learner and previous skills/qualifications (Miller et al., 2004; Miller & Rollnick, 2013). Therefore, services need to ensure that any organisational barriers to MI-CB implementation are addressed and that appropriately qualified practitioners are available to provide on-going supervision (Heaven et al., 2006; Madson et al., 2009). Learning through books and videos was not sufficient to enhance skills (Miller et al., 2004). Training courses should also be longer in duration or focus more intensively on the more complex skills, such as complex reflections, client change talk and integration of therapies (Forsberg et al., 2010). This is particularly the case as evidence suggests that a 3 to 5 day training workshop is not sufficient to enable practitioners to integrate skills into their service (Forsberg, Earnst, & Farbring, 2011). Service commissioners will need to consider the cost implication of providing suitably trained MI practitioners that can provide frequent supervision to healthcare professionals compared to the provision of adequate training with a longer duration.

### **7.5.2 *Implications for Research***

Recommendations for future research have been suggested throughout this thesis. While some of those recommendations were addressed (e.g., developing interventions focusing specifically on PA maintenance), further research is needed to enhance the understanding of the PA maintenance process in adults with multiple chronic health conditions; a clinical population under represented within the literature (van Spall et al.,



2007). Further qualitative research is needed to explore the PA maintenance determinants and strategies in different contexts, cultures and socio-demographic factors to enhance the transferability of the findings (See Chapter 3). Exploring the factors that influence both successful and unsuccessful PA maintenance in adults that had initially increased their PA is one method of exploring the maintenance process (Marcus et al., 2000). Research should also provide a transparent description of intervention components to enhance intervention evaluations, modifications and replication, in line with previous recommendations (Michie & Abraham, 2008). TF should be assessed within PA interventions to identify deviations from protocol and provider skills 'drift', which can be corrected early on; thus preventing an ineffective intervention from being implemented (Bellg et al., 2004). Evidence suggests that interventions inadequately explore, or report TF procedures (Breckon et al., 2008), which might be due to the barriers associated with implementation (e.g., time and resource intensive). Thus, researchers would benefit from being mindful of the different levels of TF implementation (Pereplechikova, 2011), which could enhance the quality of TF evaluations.

The future research directions for integrated MI-CB interventions for PA maintenance were documented throughout the thesis. Primarily, a large scale RCT is warranted with a longer follow-up post-intervention (i.e.,  $\geq 1$  year) to truly assess MI-CB effectiveness (Eakin et al., 2010; Marcus et al., 2000). Specifically, research would benefit from including a comparison group with a single therapy; thus evaluating whether MI-CB is any more effective than a single therapy (e.g., MI; Michie & Prestwich, 2010). A larger sample size would also permit subgroup analyses on socio-demographic and/or multi-morbid risk factors to evaluate 'what works' for whom within a clinically heterogeneous sample (Tinetti et al., 2007). Such comparative effectiveness research is important for limiting the risk of ecological fallacy, where sample means do not accurately reflect the means of sub-groups within the sample (McHugo et al., 2006). Furthermore, mediational analysis between TF components and outcomes (e.g., behavioural, psychological and epidemiological) were also recommended to better assess the influence of integrated MI-CB on PA maintenance promotion (Mowbray et al., 2003). PA maintenance research in adults with co-morbidities would better enhance the knowledge of the effective and ineffective interventions by considering these research recommendations.

An important factor to consider in future PA maintenance research is the low recruitment and response rate to the study. One factor that likely impacted on recruitment rates was concerned with the funding cuts and service restructure to both GP practices and leisure centres across South Yorkshire. Consequently, this would have affected PARS referral rates. While previous PARS research has also observed low response rates (Gidlow et al., 2005), it is likely that the response rates found in the KASY trial are specific to South Yorkshire; thus not necessarily generalisable to other services or research. Nevertheless, recommendations were made to achieve larger samples, such as multi-site recruitment conducted over longer recruitment periods (e.g.,  $\geq 6$  months; Gidlow et al., 2005). Additionally, when recruitment response rates are expected to be low, then minimisation rather than randomisation could be considered from the outset (Altman & Bland, 2005). Barriers to recruitment and intervention delivery also need to be accommodated, such as bereavements, caregiver duties and illness, within such a clinical population (James et al., 2008). A recommendation for ensuring adherence to an MI-CB intervention was for researchers/intervention providers to be flexible enough to support individuals through barriers (e.g., delivering an MI-CB session at another time).

If a large scale RCT were to be implemented, this pilot study has provided insight into the modifications that would need to be made to the evaluation of the MI-CB intervention. More reliable objective measures of PA, such as GPS/GIS tracking, in conjunction with accelerometer data and activity diaries are needed to assess intensity, mode and environmental factors associated with PA (Maddison & Ni Mhurchu, 2009; McCluskey et al., 2012). Nevertheless, the cost and limitations (e.g., battery life and accuracy) of GPS devices need to be taken into consideration. Psychological variables associated with PA maintenance not measured in this study should be assessed, such as perceived disability (Plotnikoff et al., 2011), perceived satisfaction (Rothman et al., 2011), and recovery self-efficacy (Luszczynska & Sutton, 2006). Participant fatigue bias within a chronically ill, and often older adult, population needs to be considered when collating and delivering questionnaire batteries (Hardy et al., 2009). For this reason, the COPE scale was not recommended for use and an alternative should be sought for use. Additional measures specific to PA should also be selected, such as the social support for exercise habit scale (Stevens et al., 2003) rather than generalised scales. This will enable a more accurate assessment of the constructs in relation to PA maintenance. Measurement of lean body mass was also suggested instead of BMI, given

that BMI does not account for the changes in body composition associated with aerobic and resistance training (Berrington de Gonzalez et al., 2010).

Specific research recommendations were made for TF implementation and evaluation. Measures assessing the five areas of TF (e.g., delivery) and integrated MI-CB need to be either developed or existing measures validated. Such measures have poor reliability as they are often created for the sole purpose of the intervention without rigorous psychometric testing (Mowbray et al., 2003). Given that the purpose of TF measures is to evaluate the factors that can affect the internal validity of research, without reliability measures this cannot be achieved and warrants further research. Blinding of TF assessors also needs to be implemented in RCTs to prevent researcher bias and social desirability bias (Taber et al., 2009). On-going supervision of researcher skills also needs to be implemented to prevent skill 'drift' and ensure the MI-CB intervention protocol is adhered to (Forsberg et al., 2010). Research also needs to explore the role of the common factors (e.g., empathy and therapist characteristics) associated with psychological interventions, specifically for health behaviour change interventions (Messer & Wampold, 2002). It was argued that the common factors could be more important than the 'active ingredients' (e.g., BCTs and theory) of PA interventions. Additionally, PA maintenance research could benefit from distinguishing between technique delivery and enactment to more accurately assess the effectiveness of CB techniques.

Specific research recommendations were also made throughout this thesis but were beyond the scope of this thesis. The scoping review (Chapter 2) identified that PA maintenance was rarely explored, if at all, in patients with neuromuscular conditions, respiratory conditions or male only samples with chronic health conditions. These specific populations were not researched within this thesis given that the aim was to enhance the ecological validity of findings to a heterogeneous clinical population. The qualitative study (Study 1, Chapter 3) also identified a specific barrier to the PA maintenance phase; 'the plateau'. Participants reported noticing a plateau in physiological benefits and gains from PA which was found to be de-motivating, specifically if one did not know how to overcome the barrier. Such a plateau is documented in weight management literature (Fabricatore et al., 2007) and athlete training (Bompa & Carrera, 2005) but not in PA maintenance research. Future research is warranted to explore the psychological impact of the physiological plateau on PA maintenance.



## 7.6 Limitations of this thesis

The limitations of each chapter (Chapters 2 to 6) were discussed. This section will discuss the general limitations of the thesis as a whole. The small sample size of the RCT (Study 2a, Chapter 5) questions whether the findings are representative to the general clinical population. While the population was largely heterogeneous in terms of health conditions, the ages largely represented that of older adults (e.g., 50-75 years). Although a small number of younger adults were included (e.g., 35 years), the generalisability of the findings to younger patients is questionable. Nevertheless, previous research has demonstrated that older adults are largely referred to, and attend PARS (Gidlow et al., 2005; James et al., 2008), therefore, the findings are likely to be representative of PARS completers.

The thesis aimed to explore PA maintenance in individuals who had initially increased their activity in order to disentangle the factors that promote PA maintenance from PA initiation. Nevertheless, as participants were successful completers of PARS, this might suggest that they were more motivated to engage in PA, particularly as the MI-CB group had more barrier self-efficacy, adaptive coping skills, sought more instrumental social support and more physical outcome expectations at baseline (See Chapter 5). This was due to randomisation being unsuccessful because of the small sample size, and warrants further research with larger sample sizes. Furthermore, most participants reported receiving additional support from other healthcare professionals due to their health condition, such as nurses, physiotherapists, occupational therapists, and nutritionists during the intervention. These factors are likely to be confounding variables within the MI-CB intervention, which were not controlled for because it is likely that most individuals with a health condition receive some form of additional health support associated with their condition(s).

Finally, the definition of PA maintenance employed throughout this thesis is consistent with previous research, suggesting that it is a continuous variable that must be maintained for at least six months after an intervention ends (e.g., Amireault, Godin, & Vézina-Im, 2012; Eakin, Lawler, Vandelanotte, & Owen, 2007; Fjeldsoe, Neuhaus, Winkler, & Eakin, 2011; Kroeze, Werkman, & Brug, 2006; Marcus et al., 2000; 2006). Other definitions, however, might be more appropriate given that PA maintenance is considered a complex process consisting of regular starting and stopping (Marcus et al., 2000). It has been suggested that PA might be more accurately reflected if considered as

a categorical variable consisting of 'maintenance', 'fluctuation', 'early drop-out', and 'late drop-out' (Seelig & Fuchs, 2011). Such a definition was not adopted as more research is needed to verify such a PA process over time (Marcus et al., 2000), including an evaluation of whether the categories demonstrate any meaningful and reliable clinical change (*cf.* Jacobson & Truax, 1991).

## **7.7 Reflexive Practice**

The purpose of this section is to present a brief reflexive account of the development of the research and the researcher. Reflexive practice is often encouraged to help researchers and health professionals bridge the gap between theory and practice by reflection on and in action (Taylor, 2011). Reflecting on researcher judgements, assumptions, and motivations can enable an assessment of the trustworthiness and credibility (internal validity) of the research, which aims to minimise any subjective bias (Morrow, 2005). To achieve this, I will discuss three things: (1) the influence of my background and previous experience with adults with chronic health conditions; (2) the lack of blinding throughout the research process and the potential impact of the research; and, (3) competence of working with adults with chronic health conditions.

Prior to undertaking the PhD, my experience consisted of working in mental health and as a Cruse bereavement counsellor. Within these roles, I was trained in, and delivered, CBT and person-centred counselling. Early on in the research process, however, I learnt the importance of preventing my previous experiences from guiding the PhD. The support of my supervisors reminded me to allow the PhD to unfold and shape itself; thus ensuring each study was connected by a 'golden thread'. Nevertheless, my previous experience certainly enabled me to gain deeper insight during qualitative interviews and develop the therapeutic alliance with the intervention participants. This is particularly important as the thesis discusses the importance of the therapeutic alliance, which is suggested to account for more variance in outcomes compared to specific intervention ingredients (Messer & Wampold, 2002). Ultimately this might have accounted for intervention efficacy despite the low adherence to the MI-CB intervention protocol as discussed in Chapter 6 (Study 2b).

Throughout the research, I was the primary researcher for the qualitative study; developing, delivering and evaluating the RCT; and assessing my own treatment fidelity. As a result of a lack of blinding throughout these studies, there was much potential for subjectivity to impact on the 'neutrality' of the research (Krefting, 1991). Within



qualitative research, procedures were implemented for the management of such subjectivity during Study 1, Chapter 3. These strategies included triangulation of the data, member checking, independent coding, providing thick descriptions, and bracketing of assumptions through a non-biased interview guide (Krefting, 1991; Patton, 2002). Consequently, any subjective bias was controlled for as much as possible.

The struggle came, however, when implementing the intervention and assessing treatment fidelity (TF). As I was evaluating myself, I became preoccupied with 'getting it right'. The intervention delivery process became about adhering to an intervention protocol, techniques and checklists, which cultivated pressure to meet targets and achieve outcomes. Lists of questions filled my mind before, during, and after every session: was I using enough reflections per questions? Was I responding to client change talk enough? While this is, to some extent, a natural process of reflection essential for the on-going learning process within MI (Miller & Rollnick, 2013), TF monitoring seemed to introduce rigidity into an approach that was intended to be flexible and person-centred (See Chapter 4). Such rigidity associated with TF implementation has been recognised as a limitation of the TF framework, which is suggested to interfere with the delivery of the therapeutic and theoretical mechanisms of change (Bellg et al., 2004; Leventhal & Friedman, 2004). Nevertheless, by engaging in reflexive practice concerning such an issue, my development as a researcher and practitioner continued to develop. I have learned that while on-going training and feedback is one recommendation to overcome the issue of rigidity (Leventhal & Friedman, 2004; Chapter 6), another approach is to allow for deviations from the protocol, thus meeting the needs of the client whilst removing any fear of achieving 'low fidelity' (Pereplechikova, 2011).

Since the beginning of the PhD, I have developed as a researcher and as an individual. The process has been as much about conquering me as it has been about conquering the research process. Two key lessons were learned throughout the PhD. First, I learned that research rarely goes to plan, such as recruitment, and time should be allowed for this, including strategic plans for potential recruitment issues. In study 1 and 2a (Chapter 3 and 5), recruiting participants was challenging due to the referral schemes providing incorrect information to calculate the sampling frame. I developed problem solving skills in relation to this by thinking of new ways to recruit such participants (e.g., purposive sampling and multi-site research). This experience will benefit me in the development and recruitment of future trials and research.

Second, I learned the importance of considering the time it takes and pragmatic considerations for conducting high quality research. While some research ideas seem like the best thing to do, this might not be the case due to time, resources and training, which could limit the quality of the research. For example, for Study 2b (Chapter 6), I initially implemented a level 4-5 TF procedure (Pereplechikova, 2011) and spent months of time coding each session with the aim of assessing inter-coding reliability to enhance the quality of my coding. After completing the process, I discovered I was not even sufficiently trained or competent to use the MITI coding form to achieve a standard for inter-rater reliability (Moyers et al., 2010). Instead, I implemented a level 2 TF procedure, which was in keeping with the resources available and my own competence. The process was frustrating and disheartening, but in the face of such challenges I developed resilience, which is a quality that will serve me well beyond the PhD. Additionally, such experience offered a critical reflection which then formed the critical discussion within Chapter 6. The issue of competence to implement specific measures is rarely mentioned within PA studies that report TF. Consequently, TF reporting in interventions should also include a description of the training involved to reach a proficient level that can reliably achieve inter-rater reliability, similar to that outlined within the MITI coding manual (*cf.* Moyers et al., 2010).

Finally, resilience is something I have come to associate with the academic process through the criticism associated with the peer review process and writing of the thesis. I am learning (it's an on-going process!) not to take such critical comments personally and, instead, remind myself of the scientific philosophy of falsification (Okasha, 2002) within which academics work.

## **7.8 Thesis Conclusions**

This thesis has provided a unique contribution to knowledge of the factors (e.g., theories, determinants, strategies, and intervention components) that promote PA maintenance in adults with chronic health conditions and comorbidities. This was achieved through the development, delivery and evaluation of a novel integrative MI-CB intervention, underpinned by multiple theories. A number of conclusions can be made:

- PA maintenance is a complex process and is underpinned by multiple theoretical components, determinants and BCTs. This supports previous suggestions that single theories might not be sufficient to explain the behaviour in question (Brug et al., 2005).
- The theories that explain PA maintenance, included; expectancy-value theory (Janis, 1984), social cognitive theory (Bandura, 1986), Rothman's theory of behavioural maintenance (Rothman, 2000) and relapse prevention model (Marlatt & Gordon, 1985). Much overlap existed between theories, making theory selection a complex process (Michie et al., 2005).
- The determinants that influence successful or unsuccessful PA maintenance include: congruence between PA outcome expectations, experiences and values; ability to seek social support after an intervention ends; accepting limitations and capabilities through a trial and error process; identifying and overcoming barriers to PA; and the ability to cognitively reframe negative PA attitudes.
- A specific barrier for PA maintenance was identified; 'the plateau', which warrants further exploration (Fabricatore et al., 2007).
- Multiple cognitive-behavioural strategies can be used in multiple ways for PA maintenance but consists of both self-management strategies for PA and condition management, suggesting the two behaviours are reciprocal and a bi-directional relationship exists (Plow et al., 2012).
- Due to the multiple determinants and strategies, integrative or 'tool-box' approaches are needed for PA maintenance promotion in healthcare to meet the varying needs, capabilities and limitations that exist within a heterogeneous clinical population. This supports the emerging evidence (Hogden et al., 2012; Naar-king et al., 2013).
- Integrated MI-CB for PA maintenance demonstrated preliminary efficacy for promoting self-reported MVPA and all intensities of PA, but not average

steps/day. Accelerometers and GPS devices are suggested for use instead of pedometers in adults with chronic illness associated with disability (McCluskey, et al., 2012).

- The integrated MI-CB intervention demonstrated preliminary efficacy for barrier self-efficacy and outcome experiences but the influence of these determinants on PA maintenance is unclear. Other determinants might be more important, such as perceived satisfaction or recovery self-efficacy.
- The integrated MI-CB intervention did not demonstrate preliminary efficacy for coping skills or social support. Intervention provider proficiency in MI skill delivery and deviations from delivery protocol might have influenced this and supports the need for TF implementation and assessment in PA research (Breckon et al., 2008).
- The integrated MI-CB intervention did not demonstrate preliminary efficacy for changing epidemiological outcomes (e.g., weight and BMI), although longer follow-ups might be needed to recognise change and measures of lean body mass might be more appropriate in highly active individuals (Berrington et al., 2010).
- An MI-CB intervention in adults with chronic health conditions to promote PA maintenance is feasible and can enhance adherence to interventions in the face of barriers (e.g., bereavement), thus supporting previous research (Flynn, 2011; Naar-king et al., 2013).
- Evaluations of TF should be implemented within PA interventions to enhance the understanding of the intervention processes that contribute to effectiveness or ineffectiveness of PA maintenance interventions (Breckon et al., 2008).
- Employing brief (i.e.,  $\leq 30$  mins) but frequent face-to-face and telephone contacts over time (i.e., 3 months) is sufficient to promote PA maintenance and is consistent with previous research (Fjeldsoe et al., 2011).

- When delivering MI-CB interventions, on-going supervisions and training is essential to ensure adherence to intervention protocol and intervention effectiveness (Forsberg et al., 2010). Theories and determinants are likely to be unsuccessful in interventions if one cannot adequately delivery the techniques to promote change (Brug et al., 2005; Messer & Wampold, 2002).
- Interventions might still be effective when fidelity of delivery and intervention provider competence is low due to the common factors of psychological interventions, such as the therapeutic alliance, participant receipt of the intervention (e.g., understanding and satisfaction) and enactment of techniques (Peck, 2010).
- Intervention receipt (e.g., participant satisfaction and understanding of CB techniques) and technique enactment are important facets of PA maintenance interventions. Although rarely explored, these factors could provide further insight into the techniques that promote long-term PA participation.
- Further understanding of how to integrate MI-CB and development of TF measures is needed, which further supports previous research (Haddock et al., 2012; Mowbray et al., 2004).
- The scientific and transparent reporting of interventions enables evaluations, modifications and future replication of interventions (Michie & Abraham, 2008) and intervention mapping is one method to achieve this (Bartholomew et al., 2008).

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**Appendix A:**  
**Institutional Ethics Approval (Study 1)**



Faculty of Health and Wellbeing Research Ethics Committee  
Sport and Exercise Research Ethics Review Group  
Report Form

Principal Investigator: Sarah Scott

Title: The Determinants and Strategies Underlying Physical Activity Maintenance and Relapse  
in Adults with Chronic Health Conditions: a Qualitative Study.

Checklist:

Application form	✓
Informed consent form	✓
Participant information sheet	✓
Risk assessment form	✓
Pre-screening form	n/a
Pre-screening form (under 18)	n/a
Collaboration evidence/support	n/a
CRB Disclosure certificate	✓

Recommendation:

Acceptable:

✓

Not acceptable, see comments:

Acceptable, but see comments:

Comments:

Thank you for providing a written response to the comments you received.

Your application is now Acceptable and you may commence your study.



Signature : ..... Date: 27/05/2011

David Binney

Chair, Sport and Exercise Research Ethics Review Group

**Please remember that an up-to-date project file must be maintained for the duration of the project and afterwards. The project file might be inspected at any time.**

**Note:** Approval applies until the anticipated date of completion unless there are changes to the procedures, in which case another application should be made.

Name of Supervisor : Jeff Breckon

**Appendix B:**  
**Participant Information Sheet (Study 1)**



*Sheffield Hallam University*

**Faculty of Health and Wellbeing Research Ethics  
Committee**

**Sport and Exercise Research Ethics Review Group**

**Participant Information Sheet**

<b>Project Title</b>	<b>What happens after attending a Physical Activity Referral Scheme (PARS) in the UK? The post-PARS experience.</b>
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<b>Supervisor/Director of Studies</b>	Dr. Jeff Breckon
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<b>Principal Investigator</b>	Sarah Scott
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<b>Principal Investigator telephone/mobile number</b>	Tel: (0114) 225 5627 Email: S.E.Scott@shu.ac.uk
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<b>Purpose of Study and Brief Description of Procedures</b>
This project is being undertaken within the Centre for Sport and Exercise Science (CSES), based at Sheffield Hallam University.

The benefits of regular physical activity are clear and there is a need to develop better ways of helping people become more active and then stay active. To help us achieve this, we are trying to gather information about the factors which promote long-term physical activity participation and understand the experiences of people living with different health conditions.

The overall purpose of this study is to explore your experiences of physical activity before, during and after a physical activity referral scheme (PARS), like the one you attended at your leisure centre. We would like to hear from anyone who joined PARS six-months ago or more, regardless of whether or not you are still physically active.

To show our appreciation for your interest in the study, if you return a completed questionnaire and consent form by the PUT DATE HERE, you will be entered into a **prize-draw** where **two** winners will receive a **£50 high-street voucher**. Travel costs will be reimbursed and a complimentary pedometer (device designed to measure your daily step count) will be offered.

If you would like to contribute to this research, you will be asked to attend an informal, one-to-one discussion with the researcher at either the university, your leisure centre or over the telephone. The discussion will last *up to 1 hour* and will explore your experiences of physical activity before, during and after your involvement in PARS, including the successes and challenges involved. The questions are not of a sensitive nature but, if you do find anything emotionally difficult, you are free to decline an answer. Your participation is completely **voluntary** and free to withdraw your consent at any time without giving a reason, or affecting any current services you are involved with.

The interview will be audio-taped, and transcribed to aid the research analysis. Transcriptions will be available on request. The data will remain completely confidential and only the principal researcher, and her supervisors, will have access to the data. The information will be password protected and stored on a computer, separate from any consent form to ensure anonymity. Any names mentioned will be replaced with a pseudonym (false name). All information will be disposed of at the end of the study. You are also free to withdraw your consent for the use of information at any stage.

If you would like to know any more information about the study, please contact the principal researcher at the contact details given above. If you are happy with the

information provided and are keen to participate, simply return the consent form and fully completed background information questionnaire by PUT DATE HERE. You will be contacted to arrange an interview at a time and place that is convenient to you.

I shall look forward to hearing from you soon,

Yours Sincerely,

Sarah Scott (Principal Researcher)

It has been made clear to me that, should I feel that these Regulations are being infringed or that my interests are otherwise being ignored, neglected or denied, I should inform Mr David Binney, Chair of the Faculty of Health and Wellbeing Research Ethics Committee (Tel: 0114 225 5679) who will undertake to investigate my complaint.



**Appendix C:**  
**Background Information Sheet (Study 1)**



Sheffield Hallam University

## Centre for Sport and Exercise Science

**Background Information-** All information is strictly confidential so please answer as honestly as you can.

**Name:\*** \_\_\_\_\_ **Date of Birth:** \_\_\_\_\_

**Gender :** \_\_\_\_\_ **Post Code (e.g., S1):** \_\_\_\_\_

**Telephone:\*** \_\_\_\_\_ **Email:\*** \_\_\_\_\_

**Address:\*** \_\_\_\_\_

**Preferred location for interview** (please tick or provide response):

- ☐ Sheffield Hallam University
- ☐ Local Leisure Centre (please state): \_\_\_\_\_
- ☐ Telephone

**Health condition (s)** (Please tick all that apply or state any other condition(s)).

- |   |  |
|---|--|
| <input type="checkbox"/> Hypertension                                 | <input type="checkbox"/> Rheumatoid Arthritis        |
| <input type="checkbox"/> Hypercholesterolaemia                        | <input type="checkbox"/> Joint Replacement           |
| <input type="checkbox"/> Stable Angina/Ischaemic Heart Disease        | <input type="checkbox"/> Back pain                   |
| <input type="checkbox"/> Arrhythmias                                  | <input type="checkbox"/> Depression                  |
| <input type="checkbox"/> Peripheral Vascular Disease                  | <input type="checkbox"/> Stress                      |
| <input type="checkbox"/> Ashma  | <input type="checkbox"/> Anxiety                     |
| <input type="checkbox"/> COPD (Chronic Obstructive Pulmonary Disease) | <input type="checkbox"/> Diabetes (Type I/ Type II)  |
| <input type="checkbox"/> Stroke                                       | <input type="checkbox"/> Osteoporosis                |
| <input type="checkbox"/> Parkinson's Disease                          | <input type="checkbox"/> Obesity                     |
| <input type="checkbox"/> Multiple Sclerosis                           | <input type="checkbox"/> Other (Please state): _____ |
| <input type="checkbox"/> Osteoarthritis                               | _____  |

**Ethnicity** (Please tick or fill in the blank):

- |  |  |
|--|--|
| <input type="checkbox"/> White British         | <input type="checkbox"/> Bangladeshi                 |
| <input type="checkbox"/> White/Black Caribbean | <input type="checkbox"/> Somali                      |
| <input type="checkbox"/> White/Black African   | <input type="checkbox"/> Chinese                     |
| <input type="checkbox"/> Black Caribbean       | <input type="checkbox"/> Other (Please state): _____ |
| <input type="checkbox"/> Black African         |  |
| <input type="checkbox"/> White Asian           |  |
| <input type="checkbox"/> Indian                |  |
| <input type="checkbox"/> Pakistani             |  |

**Appendix D:**  
**Consent form (Study 1, 2a & 2b)**



*Sheffield Hallam University*

**Faculty of Health and Wellbeing Research Ethics Committee**

**Sport and Exercise Research Ethics Review Group**

**INFORMED CONSENT FORM**

**What happens after attending a Physical Activity Referral Scheme (PARS) in the UK? The post-PARS experience.**

**The participant should complete the whole of this sheet himself/herself**

Have you read the Participant Information Sheet?	YES/NO
Have you had an opportunity to ask questions and discuss this study?	YES/NO
Have you received satisfactory answers to all of your questions?	YES/NO
Have you received enough information about the study?	YES/NO

<p>To whom have you spoken?</p> <p>.....</p> <p>Do you understand that you are free to withdraw from the study:</p> <ul style="list-style-type: none"> <li>• at any time</li> <li>• without having to give a reason for withdrawing</li> <li>• and without affecting your future medical care</li> </ul>	<p>YES/NO</p>
<p>Have you had sufficient time to consider the nature of this project?</p>	<p>YES/NO</p>
<p>Do you agree to take part in this study?</p>	<p>YES/NO</p>
<p>I understand I need to be free from the influence of alcohol or drugs when I attend the interview, unless the medication is prescribed.</p>	<p>YES/NO</p>
<p>Signed ..... Date .....</p> <p>(NAME IN BLOCK LETTERS).....</p>	
<p>Signature of Parent / Guardian in the case of a minor</p> <p>.....</p>	



# **Appendix E:**

## **Interview Guide (Study 1**

### **Interview Guide- Study 1.**

#### **Past PA behaviour, health and illness.**

1. Can you tell me what physical activity and exercise mean to you?
2. Can you think back to when you were a child and tell me a bit about your exercise behaviour?

*-Prompts: How much? What?*

3. Can you tell me about what prompted you to be physically active then?

*-Prompts: Could you tell me more about X? What do you mean by X?*

4. Can you think about a time when you weren't physically active?

*-Prompts: What were the reasons/ triggers? What did you do instead? How did you feel/what happened?*

5. Can you tell me a bit about your experiences of physical activity, health and illness?

#### **PARS experiences (evaluative, contextual & diagnostic) (Introduce next set)**

1. Can you tell me about your reasons for joining PARS? What prompted you? (*Prompt for clarification*)

2. What were your experiences of PARS? (*Prompt: Explore the positive/negative*)

3. What were the things that you found helpful from PARS?

*-Prompt: Do you still use those things now, if so how, why?*

4. What were the things that you found unhelpful from PARS?

*-Prompt: What would you change?*

5. If you could change anything about PARS (or other services) what would you change?

#### **Post-PARS behaviour and present behaviour (contextual, diagnostic, relapse triggers/exercise prompts). (Introduce next set of questions)**

1. Can you tell me about your experiences of physical activity post-PARS?  
(Prompts- Challenges? Successes? How do you feel?)
2. In the times when you don't exercise, what prompts you to not exercise? (Prompts:  
How do you cope with those situations? How do you feel?)
3. Can you tell me about your expectations from engaging in physical activity?  
(Prompts- positive/negative? Can you tell me a bit more about that?)
4. What would have to have happened during PARS to keep you physically active now?  
(Relapser question).

**Future/maintenance behaviour (Contextual and diagnostic)**

1. How do you see exercise fitting into your life in the future?
2. Evidence suggests that some people are more likely to maintain physical activity in the long-term than others, what are your thoughts about why this is?

**Strategy Questions.**

*(Introduce next set of questions)*

1. Can you tell me about the strategies you use to keep you motivated to exercise?
2. What are the strategies you use to overcome any barriers?  
(Elaboration prompt-Why did they work/not work? What could you do?).
3. What do you think will help you maintain physical activity in the long-term?
4. Technology-What do you think to using technology such as pedometers/APPs/internet to help you stay active?

**Conclusion** *(Summarise interview)*

Is there anything else that you would like to add that we haven't discussed?

**Appendix F:**  
**Example Transcript (Study 1)**

### Male Successful Maintainer Transcript

I: (introduces questions- Participant has not heard of PARS and so interviewer substitutes PARS for the classes he goes to.)

P: What did you call it (.) PARS?

I: I call it PARS yeah (.) Physical activity referral scheme [where

P: [yeah

I: you sort of get discounted [(.) rates yeah

P: [ Yeah yeah

I: I don't know, what do you call it?

P: (1) I just call it cardio exercise class

I: cardio exercise (.) yeah brilliant (.) erm and then sort of just looking and now and then maybe future and sort of just strategies (.) erm that you might use to keep yourself motivated (.) erm (1) things like that basically (1) *(researcher describes confidentiality and the participant's right to withdraw)*. (2) Okay so erm (1) can you (.) tell me what physical activity and exercise means to you ?

P: (2.5) well it's keeping fit

I: okay

P: yeah it's just keeping fit

I: just keeping fit, yeah

P: I mean it's only recently that I've been er (1) sort of slowed down in that direction with er (.) having a new heart valve fitted

I: oh okay (.) so slowed down being you were a bit more active before (.)

P: yeah

I: yeah (.) can you tell me more about that?

P; well (.) erm (.) before I had them er heart done (.) I used to er (.) do quite bit of gardening (.)

I: okay

P: car mechanic-ing (.) and er things like that you know (.) DIY etc but er (.) I've had to slow down a bit because I can't do it



I: right ok

P: if I get stuck into anything I've gotta watch what I'm doing and pace myself (.)

I: umm mmm

P: otherwise (.) I feel knocked out the next day, you know

I: right so fatigue (.) [is that something that you experience ?

P: [ umm (.) yeah (2) I mean I feel alright and I sort of push myself and think (.) oh I'll just finish this and I'll just finish that (1) but over the last few months (.) I've come to realise that if I do push it (1)

I: right (.)

P: I'm not very good the next day

I: so it's more of the day after (.) rather [ than at the time (.) okay

P: [yeah (.) yeah (.) yeah (.) OH I feel like I can climb mountains and I know I can't (.) and I used to put it down to old age (.) but (1) as I know now it's it wasn't old age

I: yeah yeah (.) it was the heart?

P: yeah yeah

I: okay (.) so can you think back then (.) I know we've just covered a little bit then (.) you said you used to do a bit of gardening and (.) DIY and you were quite active but can you think back sort of longer erm (1) up to five years if not longer right from being a child if you can remember and tell me

P: well from being a youngster physical activity was no problem (.)

I: yeah

P: I mean I er (.) going right back to er (.) infant school (.) junior school (1) er (.) cricket (.) football (.) riding (.) a bike (.) I mean I had a beautiful light weight racing bike. Well no body else had one (.)

I: yeah

P: you know (.) and er (.) I got pulled in for speeding a couple of times (*both laugh*) with a police man on a motor bike

I: wow [(.) going that fast?

P: [yeah (.) yeah yeah (.) erm (1) football (1) erm (.) cricket mainly football really. Er (.) I used to like athletics (.) I run for er (1) south yor-(.) YORKSHIRE then

I: oh ok

P: I run for Yorkshire and er (.) in the. Is it the (three A's) I forgotten now, it's such a long time ago

I: yeah

P: and er (1) I remember one particular incidence, I'll tell you about this. We were at a college or (.) some big education place at Hull(.) and it was a new (.) a new er (.) establishment (1) and we went, a team of us went, in a coach (.) from Barnsley and er we were watching er (.) each other in the different (.) whatever they were doing (.) high jump, ling jump(.) sprints, hurdles (.) whatever (.) and er, in those days we used to do er hundred yards and two twenties (.) not of this metres [ and er

I: [ oh right still in Yards

P: and this corner of the playing field there was a stone wall which was the boundary and was in the corner and there's these two guys there in their green outfits and their big gold badges on the (.) on the you know peaked hats (1)

I: yeah

P: and smoking their pipes and booking everybody off (1) and er (1) this chap (.) on our coach (.) he er came along with an old tatty vest on and he were doing the shot put (.) and er (1) they went through a few throws(1) and he said right (.) your turn young man so he got hold of his weight and got in the circle (1) couple of nice spins, did it correctly (.) not just (.) did his nice spins and threw it (2) and it went straight over the wall

I; wow

P: and the guy dropped his pipe out of his mouth (*both laugh*). He didn't know what to say (.) and he looked round and he says 'right', cos there was one or two people there in these er (.) athletic outfits (.)

I: yeah

P: well WE COULDN'T AFFORD these athletic outfits in those days and er (.) and he says 'CAN ANYBODY BEAT THAT?' (.) 'no, no', 'right then we'll throw for second and third'. And that was the world champion, Arthur (Roe)[(1) when he first started(.) he's dead now unfortunately

I: [oh really (.) oh wow

P: oh we had some (1) heavy weights in our little team (.)

I: yeah (.) I can imagine

P: yeah (.) but my (.) my forte was er (.) hundred yards and two twenty

I: ok

P: and relay (.) and in the school inters ports and, and (.) the town sports and some of the Yorkshire matches (.) I the two twenty (.) I used to weigh up the opposition (.) and watched the starter to see if I could (.) pick any tips up from the starter (1) er (.) and by that I mean. Do you know what I mean ?

I: (1) as in sort of how to get (.) do a bit better

P: jumping the gun

I: ph jumping the gun [ oh right ok

P: [ yeah (.) cos if you got a bit of a starter who didn't know the game (.) a good starter varies (.) I shouldn't be telling you this (*research laughs*). A good started used to vary his times from SET to firing the gun

I: yeah

P: and if he was a novice (.) he used to the (.) SET, BANG(1) SET, BANG

I: right

P: and it was roughly about two seconds and if you were in the blocks (.) and and he said SET, YOU COUNTED TWO SECONDS AND YOU WERE OFF.

I: yeah

P: now if you got pulled back then tough you gotta watch it next time (.) but more often and not if you got away (.) it was that SPLIT SECOND and half a yard (.) meant all that difference on a two twenty

I: yeah (.) I can imagine

P; and I found, I found (1) er when I got to be about fourteen, fifteen (.) I found that er (2) I'd be half way down and I maybe out in the front and some long legged (1) guy who was good

I: yeah

P: he knew how to design (.) er streamline his body and put his arms in the right place and really power for it (1) I could hear him coming

I: yeah

P: I could hear him coming (.) grit my teeth (.) up on the balls of me feet (.) er toes (.) and put everything in and he used to overtake me

I; Oh

P; and (.) about six year ago (.) I had prostate cancer

I; oh ok

P: and somebody said to me, ' Do you know you've got a heart murmur?' (1) ' No' (1) ' Oh yes, you've got a heart murmur (.) we'll look into it when you've got your operation' (.) so fair enough (1) anyway aft-b after about twelve months they er (.) grabbed hold of me and took me in and give me some tests and goodness knows what (.) and said (.) er (.) 'you need a stent (1) and also you've got er (.) a bicuspid valve', (.) he said, ' instead of a tricuspid valve'. In other words from birth I only had two valves pumping

I; oh wow

P; on he aorta side is it

I; yeah I'm not entirely sure[ it sounds about right

P: [ yeah (.) so I thought well glancing back (1) at the struggle I used to have in athletics (.) I used to thought ' I'm not surprised'

I; yeah

P: I were firing on five cylinders instead of six (*researcher laughs*) with the heart you see, you know

I: yeah

P: So, er you know (.) lots of things have sort of dropped into place [(1) in the last few (.) in the last two or three years

I: [ Yeah (2) so you can understand a bit [ why you were struggling

P: [ yeah (.) why I was struggling when I was youngster (.) but I mean I got away with that up til' what (*participant begins to work out his age until the heart surgery*) about sixty, five, sixty six, sixty seven, when they started to pin point I'd got a problem

I; right

P: and er (.) the er (.) the consultant er (1) (*mentions name of consultant*) said (.) that he didn't want to operate straight away and he were gonna put me a stent in (.) so he put the stent in that eases it a little bit (.) you know (1) and er (1) and then they said ' well leave it , because we don't want to er, do er open heart surgery to put your new valve in (.) you know make the valve ups (.) until , you know later on'.

I; um

P: so anyway they left it for three, three and a half year and decided right (1) YOU'RE IN (.) because I kept pushing you see (.) so they took me in (1) and put this new er (.) new valve in (.) so this new valve in

I; oh ok

P; so (.) and the after I've had the valve in (1) I was smashing for about twelve months and then I had problems (1) er (1) I had this terrific pain (1) going in on the right hand side here (.) and coming out on the shoulder blade on the right-hand side (2) and er, I didn't know what it was and I thought 'Oh god I'm having a heart attack', but the hearts on the other side

I; Umm

P; anyway I went into A & E and they did all the tests and said no your heart's ok (1) you know it's functioning (1.5) great you know

I : ok

P; they did all the tests they could (.) and er apparently I'd got er (1) costochondritis

I; oh right what's that?

P: It's er (.) inflammation of the er (.) rib muscles (.) and apparently you get it after er erm (3) what is it when you get (.) I can't think of the name (3). anyway (.) there was that and also there was (.) usually after you've had had heart surgery where it's more or less in the first few weeks not twelve thirteen months after you know (.)

I: [it's a bit strange

P;[ or a virus if you've [ had a virus it can affect (.) affect it if you've head a virus

I: [ Oh ok

P: so you know over the last er two or three years since I had the operation (.) I've had one or two ups and downs. But it's taught me to (.) not push it too much , you know (.)

I; umm mmm

P; I mean I have er (1) er(1.5) a race road car that I used to use a lot er (.)in er on the track and I've had to cut that down because my reactions are slowing down and I use it as a concourse car as well so, you know, there's nothing lost there but (.) I don't like driving it round the track at high speeds in case something happens and you know, I go across the field and through a wall or something ( *starts laughing*) like that , you know (.) so

I: ok (.) so its sounds as if (.) you've been very active in the past



P: [ YEAH yeah yeah

I:[ and you've done a lot of different things (.) erm (.) can I just ask can you pin point a reason for being active, you know what (.) what the reasons for that?

P: (3) well (1) right from a youngster, I mean (1) we had no (.) of these electronic gizmos

I; umm

P: we used to go and make us own entertainment

I: yeah

P: cricket, football, tig, you name it (.) you know all these games we used to play in the streets or on the playing fields. We'd no modern (1) you know we were lucky if we got hold of a decent tennis racquet or a decent cricket bat and a ball

I: yeah yeah

P: but er you know it's er (1). At the advent of electronic sand their getting more sophisticated now (.) people can sit on their fat backsides and (.) not even budge. Don't even have to go to work. They just sit watching television all day

I: so it was something that you just did, it was something [quite specific to you

P: [yeah (1) yeah everybody did.  
We kept us selves busy and healthy in those days (1) and once you start doing that (.) it just passes on as you grow up

I:yeah ok (1) so it just becomes a part of you and its what you're used to

P: Yeah (.) it's your lifestyle yeah [always been busy and doing things

I: [yeah erm (2.5) can you then (.) prior to erm (2) you finding out about your heart and all the operations and things like that and prior to perhaps the prostate cancer. Can you think of times when you might not have been physically active

P: no not really (.)

I: no so there wasn't really anything that got in the way

P: no no

I: okay erm (2)

P: see like with the car, if there were anything wrong with the car and I could fix it (.) I'd get out and under myself and get it sort it (.) get the parts and sort it all out cos if you tek it to BMW it'll cost you an arm and a leg

I: yeah okay

P; you know so (.) and I used to take the cars to the (concourse) shows and I used to put a lot of hard work into it (.) polishing and cleaning and all this business so it was all physical (.) exercise and you know. You lost the car down several times, you pull it in the garage to make sure there's no just flying on it. You prep the paintwork (.) you then seal the paintwork (.) you then seal it again ( *describes preparing his car in detail*). I can't do that now. It knocks me up a bit

I; yeah ok so it sounds as if just being active then is related to your interests and it's just something that you're interested in (.) erm okay

P: when I was a youngster we had the scouts, the cubs

I: and that's all quite hands on

P: well yeah camping and things like that you know. Climbing, camping (.) you name it. Building rafts, you know. The good old world, you know (.) they don't seem to do it these days (*says with a smile on his face*)

I; no I [ know, it seems to be a dying sort of thing

P: [ not unless they're in a club you know (.) I don't know it seems to be all arts and crafts these days ( *both laugh*)

I: erm (.) ok (.) so (2) there were no times when you sat there and thought 'oh god, I just don't want to do any of this'?

P: [NO no

I:[so you were just always, quite motivated to erm

P: after the war, after the war we were very lucky with what we had (.) some of us, some of the other people I used to play with, like friends (.) father's didn't come back from the war and we all looked on things as (.) we were LUCKY with what we got

I: you appreciated what you had

P: YEAH, yeah yeah (1) you know and that was a sort of way of life (.) you managed with what you got. In those days you couldn't stick your hand out and somebody would stick some money into it. You know, it's all gone

I; yeah

P: you know (.) I don't know if it's a good thing or a bad thing. I think it's a bad thing myself but there you go

I: umm (3) it's er (.) it's certainly different (.) I think it's both equally good and bad (.) isn't it (.) it's got it's disadvantages and its positives

P: what we used to do was work hard and play hard (.) and that was an ethic that's in (.) that's built in (.) you'll probably find this as you talk to the older end(.) Its the same sort of ethic at work. You work hard, you play hard

I: yeah

P: the more you put into it the more you get out of it (.) it's as simple as that but these days (*laughs*) but when I see somebody like that tennis star (*participant and researcher discuss a tennis player and how the participant disagrees with him and his job*)

I: okay so (.) we've talked a little bit about your health

P: yeah

I: in the past few years (.) can you tell me a bit about your physical activity, health and illness, and how they all might be related or not?

P; (3) no not really

I; so can you see (.) do you see physical activity as being a benefit to health

P: of course it is (.) yeah I mean during my life (.) the first big knock back I had a (inaudible) in one of my ears which I had operated on before they stopped it discharging er (1) one of the other early thing was having the tonsils removed on the kitchen table

I: umm okay

P: by a surgeon from Barnsley, you know er (.) on the kitchen table not in a fancy hospital you know (*both laugh*) and er yeah (.) apart from that probably a couple of broken limbs (.) I think well I've been lucky in life (.)

I: okay so other than just the [odd

[ WELL how can I put it (1) it's how you've been brought up. You study your grandparents (1) on both sides on both sides. You study your mother and father

I; umm

P: when I was a lad, we were all involved in the church, scouts, cubs, scouts and the guides on the females side. And we used to go to church three or four times er, on a

Sunday. We used to go to the bible class and knew right from wrong ( *phfff* ) need I say more

I; that's another issue (*laughs*)

P: EXACTLY, (.) yeah it's just the way you were brought up you know

I: yeah definitely okay so it sounds as if, cos what this, if you compared I suppose what you say, you're past and how you've been brought up and compared to now (.) now physical activity is there for health reasons (.) you know you must be doing (.) you're erm (.) five times a week, thirty minutes a day type of thing because this is going to benefit your health where before, for you it sounds as if that wasn't the thing. You were just naturally active

P: YEAH

I: erm [ and as you say a way of life

P: [ well in those days we all were

I: yeah (.) umm. Okay okay

P: mean back at school I can't remember anybody (.) right way through to er (.) fifteen. Anybody disrupting a class. We wouldn't dare (.) we had respect for us teachers and not only that if you stepped out of line, you soon got wacked back into line (.) and I think we were better off for it (.) and today if you come to exercise classes you pay (.) you've put yourself out to do it (1) Where then we automatically did it without thinking you know

I: yeah

P: I mean we've moved on strides, particularly in the last ten years health wise, by study and they've been teaching us about er healthy practices, foods, you know it all comes in

I: is that up here or or is that somewhere else?

P: well no, just general life (.) looking at magazines and reading newspapers etc er (.) Different types of cholesterol, what's good, what do you eat to keep your cholesterol down. As well as you're tablets your taking. I mean its no good pumping tables down you're throat if you're not doing your bit by eating healthily, you know.

I: yeah yeah (1) so you're finding that just in general, in society, there's quite a lot of new information and education out there

P: we;; yeah, it's in my interest to find these things out. You know (.) I mean I started these er gym classed down here with Mr. B. And I think they're great, I mean I had to knock off when I had that costochondritis cos I couldn't move (*laughs*) but I've

gradually got me back into training and I come down twice a week and I've seen (.) I've seen people come into these classes and you know they look terrible and they could see they're frightened and 'oh am I doing too much and will it hurt me' and all this business and after a few weeks the difference in them is unbelievable. I mean I've got a guy that comes down. He's not been down this morning (.) he's eighty four and he used to come in and he was stiff and he used to say to me after about 5 weeks 'you know I'm sure these classes are doing me good'

I: yeah ( *laughs* )

P: I mean if he goes home and reads his newspapers and I know his wife watches what he eats (.) what he drinks. I mean these youngsters that go out and get themselves blathered every weekend, they're not only coggling the hospitals up, they're killing themselves off but they haven't got the sense to see it

I: um um (.) its something about the culture there isn't there

P: yeah yeah

I: so how do you, has there been (.) I know you say you've seen other people progress, what about yourself in terms of coming to the classes

P: YEAH (.) I feel better. Much better

I: is that, what do you mean by [feel better?

P: [physically(.) mind (.) yeah

I: mind in what way

P: well its mind over matter and you know you're doing the right thing unless someone tells you different or you read an article that's different

I: umm mm (.) How do you see, cos like you were saying before (.) before when you were active it was just a way of life, it was free where now you have to come and you've got to pay

P: yeah but you don't have to pay (.) you can go out walking on your own

I: yeah

P: or er doing exercises on your own. You can buy your own bit of kit (2) and do it in your own lounge or in the hall

I: umm and is that something that you do?

P: occasionally but I usually wait while I come down here yeah (.) Instead of cluttering the place up with stuff



I: umm, so coming here is a bit more practical then (.) would you say ?

P; well I think so, yeah

I: yeah ok

P: you see I didn't know that this er (.) this costochondritis (1) I'm (.) I'm not sure how to pronounce it ( *both laugh*) I thought it were just elderly people that caught it but apparently not

I: it was just what sorry?

P: elderly people

I: oh elderly people okay

P: yeah but, apparently youngsters get it after heart operations and the reason I know this is that er my niece who lives in America, she's a (2) er (.) now then (.) She's a consultant and this is what she deals with (1) over there )

I: oh right

P: and I was quite surprised when she told me about it you know (.) and there's me thinking its just the old fogies like myself you know (*laughs*) and another point on that is that my brother in law, who is her father (1) suffered from diabetes and er (.) he used to go regularly to the clinic or hospital and er they used to give him tables and they used to check his blood levels and what have you . And he used to walk probably about a mile and a half every morning and a mile and a half every night, every day er 365 days a year and he did this for years. Even when he goes on holidays, they went on cruise ships and he'd go on the running track in the gym (.) and he's got to the stage now. He's er (3) seventy, maybe about sixty eight and he's got to the stage now by doing it himself (1) with working with the medical people (.) that he's off his, all his tablets now(.) it's just done purely b exercise (.) I mean that is sheer dedication

I; yeah yeah (.) it just goes to show as well[ how much of an impact it can have

P: [ yeah yeah (.) you see these are type of people who are around me and in our family you know(.) you can think ' they're doing well' you know ( *laughs*)

I: yeah so actually you've got a lot of people around you who have a positive influence on you

P: yeah yeah (.) I mean I er (.) my youngest son. He's a right keep fit junky (2) you name it he does it. Climbing, table tennis, football er (.) tennis er badminton, swimming ( Climbing, you name it they're there

I: how do you think that's had an influence or has it had an influence on you or your activity

P: well not really because I keep telling him he's about 41, 42 now and I keep saying 'ey' slow down, you can't keep doing that at your age' Which I'll not tell you what he said

I: I can imagine (*laughs*)

P: and the other one, he's older (.) he's fifty and he's busy building additions to his house and reshaping gardens and doing all sorts inside so he gets plenty of activity. So yeah I've got a lot of positive people around (.) My Mentor, the wife (*interviewer laughs*) watches what I eat (.) and drink (.) everything.

I: yeah

P: and that does help(.) I try and sneak an odd chocolate now and again but (. I've been finding out recently that they're all in bags and they're all counted and what have you (*researcher laughs*) and when my two granddaughters come they go through the bags counting and see grand dads had one (*both laugh*). Oh yes

I: well monitored!

P: yeah (.)yeah so you know. RIGHT, Next (*both laugh*)

I: ok so, moving on to the erm (1) can you tell me a bit about your reasons for coming to these classes then erm (.)

P: well general wellbeing (.) I thought I'd already explained all this (.) general wellbeing

I: yeah how did you find out about it though?

P: er (.) well it was through when I was discharged from hospital er (.) the hospital sent me down to see somebody. Oh somebody came to see me(.) somebody rang me up on the phone a couple of times and then they sent me down to er (.) now then (1) just in the city boundaries. This is Concord (.) I can't remember the name of the place [and I went down (1)

I: [ Firth Park is it?

P: FIRTH PARK (.) and I went down there for probably (3) for about three months (.) and we had us heart monitored and er blood pressure taken every day and they really kept an eye on us and we went through these physical exercises and goodness knows what and then we progress to here. I got a choice of coming here or er (.) or er Hillsborough (.) I mean I think these are great. I think they're great

I: How did you find the thing down and Firth Park then?

P: All right (.) yeah (.) I mean they were really interested in what you did (.) and looked after you. They monitored you you know. You were really under the eye glass.

I: how did that affect you? What did you think to all of that, the monitoring?

P: well it was (.) It was great. I thought well, you know, somebody's showing an interest in me. They're interested in my physical wellbeing as well as mental wellbeing and I thought it was a good thing. THE ONLY CRITICISM THAT I HAVE WITH ALL THIS SET UP (1) is that you leave hospital. You go down to Firth Park, you come here and then I had to keep going to the hospital every (.) month or so and the (inaudible) and then I got signed off and I got signed off with two nurses, I can't remember their names now (.) and then that was it (.) CHOP. CUT CLEAN

I: all the support gone

P: all the support gone (.) and I felt (1) personally I felt a little bit (wingy) about that. I thought why, what if anything happens and this that and the other (.) so we sat down and we said look (.) well I, I'm not ringing for ambulances if I have (1) er (1) heart attack or whatever. WE jump in the car and we're straight down to A& E (.) we're not going to be messing about waiting for ambulances coming (.) touch wood. This has not happened (.) The only time I've been down to A& E is when this costochondritis came. I came in here one morning and Derek was away at the time, and a young lady who was taking his class. And I told her I got these pains and that. She wouldn't let me in and she says 'look the best advice I can give you is go down to A&E and let somebody check you over' which is what I did and I came up with this (1) costochondritis

I: right ok

P: but like I say (.) you feel CHOP, GONE. Where's all me support gone? After having all that support for those months, suddenly you're on your own.

I: yeah yeah, did that happen before or after or during you coming to these classes up here ?

P: what?

I: all the support, you know when you got signed off

P: oh yeah (.) before I started here yeah

I: OK okay (.

P: and I (1) there were some people who were a little bit windy about this and I thought it's not a good thing really because some of the people I felt sorry for. A couple of the guys there (1) er (1) they were struggling with the class down at Firth Park and for some reason the doctor wouldn't sign them off and they had to start work (1) oh he signed them off rather (. And I'm not sure how old this lot were but they had to start

work (.) Well one of them, I didn't think he was fit enough to (.) to start work, you know . I'm not a medical man but you know, you're all common sense. You know, flags up that there was something wrong

I: yeah yeah

P: so but er (.)

I: so what kind of support would you have wanted to continue?

P: (1) well somewhere where I could pick a pho- If I had any worries or problems I could pick a phone up (.) and talk to somebody like one of those nurses or whatever (.) but you see you don't like pestering somebody at the hospital because they're enough on (.) keeping an eye on those people on those wards (.) having been there (.) a couple of times. They have enough on there

I: what do you think then (1) what would have been the main things then that you've taken from Firth park and from Coming to these classes that will help you maintain your health in the future

P: (1) well its a case of what we're being taught here, exercise. I mean this is going back to me youth again isn't it. You know, it's in built (.) exercise.

I: so regardless of this you would still be doing something .

P: yeah (.) I'd still be doing something yeah ( *an announcement comes across the tannoy*)

I: you get that every now and then ( *both laugh* )

P: well I mean are you from the university or you a medical (.) person

I: just from the university. I'm not medical (.) I'm psychological ( *laughs*)

P: Ah right

I: health psychology

P: Trick psychology, yeah ( *laughs*)

I: psycho babble and all that sort of stuff (.)

P: well if I lay on abed and a buxom blond came in and she was a psychologist and I thought ' you'd do me a power of good, you know' ( *both laugh*). It's a lifter.

I: exactly. Erm (.) so we actually talked a little about your experiences, whether positive or negative and it sounds as if you're getting something from it but at the



same time the support in general, not just physical activity, but the help you're getting  
(.)

: yeah but by saying that, I'm not just looking after my own interests. I'm thinking back to what happened to those other people down there that didn't get the same. I mean nobody twisted their arm and forced them to come up here (.) and er (.) so

I: some how everyone's treated differently

P: yeah (.) I mean surely everybody can afford three pound fifty a session (.)

I: umm

P: that's what I think anyway (2)

I: umm (.) ok

P: but you see with the best will in the world. Temptations are there right

I yeah

P: you get up in the morning, you've got to watch what you have for your breakfast and then lunch, you've got to watch what you have for your lunch. You go out shopping, you've got to watch what you buy (.) and (.) there's all these fast food places all over the place that's killing us off. Mac Donald's and (.) pizzas and Chinese this and Chinese that and it's BAD. And its bad. And everybody, you know. When you finish work, you come in and you're starving and you have a big meal. Again you have to watch what you're having and then you plonk your backside down in front of the television for about another four of five hours (2) I mean I must admit that I like watching television on an evening and a bit. I what I do is I'll have a look through and see what I want to watch and record ( *an announcement comes over the tannoy*). So I might look at it again and say I'm not bothers about that now and flick it over. I mean I don't watch those silly soaps.

I: no

P: things like that you know

I: so it sounds like there's a few temptations in there in terms of food

P yeah of course there is. It's all motivated by money

I: yeah . so what then motivates you to get back up (. And doing getting out and doing things then .



P; well just shut my eyes and ears to all that you know . Bargain at Morrison's, buy one get one free and you know, cartons of ale. You buy two and get one free

I; yeah

P: NOO, I'm not sucked into things like that

I: what gets you up and being active then?

P: well, doing things. I mean this weekend (.) er (2) we've got a show coming up. A car show coming up. Well I shall be prepping the car up and getting it all nice and shiny and clean and doing things to it and

I: so its having planned things. That then motivates you to get out and do things.

P: yeah, I have a calendar. A big calendar. A monthly calendar. Wife's got one and I've got one and I can see what I've got down and what's going off. Update it every month. I can tell you when I've been to the doctors. I can tell you when I've been down here. What have you. Who said what. What the doctor said. I've got it all down there (.) on computer. Wonderful thing. I've got it all down.

I yeah , okay, brilliant. Erm

P; when they start arguing , you just hit a key in and print several copies out and (1) you send t the doctor ( *discusses some confrontation between doctor and himself*)

I: keep on top of things.

P: yeah, why now

I: okay erm (3) so then (.) over the past. How long have you been coming to these classes up here, can I just ask?

P: nearly twelve month or just over twelve months (.) I've had a letter from somebody to go and receive a certificate at the town hall.

I: oh right

P: I shan't be going. Certificate. I do it for my own. I've got enough bits of paper.

I: ok so say in the past 6 months then, can you tell me about your experiences of being physically active and exercise, maybe any challenges or success that you might have had?

P: like what?

I: erm challenges in terms of anything that might have got in the way. Anything that you've had to overcome (.) erm (1)

P: yeah I could have said 'Oh (.) I could have been doing so and so this morning' but I've gotta go down to the (.) exercise class

I: so you've prioritised coming here

P: yeah yeah

I: Okay. So what are the reasons for prioritising this over other things.

P: well to me they might be more important (1) but then again this is more important than coming down here

I: so this is something that's [ really important to you

P: [ yeah, yeah yeah (.) what did I say earlier. You only get out what you put in.

I: exactly, yeah, yeah (.) so what about any successes. I don't know if that would apply to you. Anything that you've achieved

P: well you've, the success there is that your health is improving (.) slowly and at one time I used to put it down to 'oh I've got some aches and pains' and still have some aches and pains now but I think (.) OH it's old age, but there's only one way round that and that's to keep exercising and taking the tablets (*laughs*)

I: yeah, yeah, how do you know your health's improving (.) how do you know?

P: well I feel a lot better (.)

I: you feel better (.) ok. Erm (.) in terms of feel though can you (.) is there anything you can be really specific. Like if you were to say to somebody who was (.) new and had just had their operation and they'd just got their information to go to firth park and then to come up to here or whatever and they were like 'oh, I don't know, I don't really know how this would make me feel'. Could you break it down for the and say this is how you would feel? And what would that be?

P: no not particularly because everybody's different. They've got it in their mind that their (.) Their possible be frightened of something and that they'll do any damage or (.) you know am I going to over strain myself and things like that (.) I'm not coming over clear at all on this one am I?

I: no you are yeah. I'm just wondering in terms of you though. (.) What I'm trying to work out is for people who struggle to be physically active (.) cos by the sounds of things you don't struggle

P: yeah

I: erm (.) I'm trying to work out the different things that (.) we can learn from people like you (.) and then maybe apply it and get them to think about the things and look out for the different erm (1 things when they come to these exercise classes (.) So for example, when you feel better (.) I'm really intrigued to know, specifically how, how do you know you feel better?

P: (4) I don't know. It's difficult to put into words really (.) You feel a lot better. When I came into here this morning I felt eugh but I feel better now yeah

I: yeah so you feel more alert and [ energised

P: [ yeah like I've had a couple shots of whisky you know (*both laugh*)

I: I'll remember that one. Erm (2) we might have discussed it a little bit (.) so I was going to say in times when you haven't exercised, perhaps in the past six months erm, what have you. What have been the prompts to not exercise. What have you done instead?

P: well with this. When I've not been coming down to the gym (.) er (.) was this costochondritis and I had a pain here (indicates to his rib cage). And I had to watch what I was doing (.) and er they gave me pain killers because there was nothing else that they could do and just had to let it work its way out. I know it sounds silly but the can't do anything for it.

I: umm

P: its just time that heals itself. (.) and found all this lot out because not many people know much about it and if you get stuck anytime. I ask questions, within certain people in the family and if (.) I then (.) look at the er computer and shove it in there. It brings all sorts of answers up (.) You then weed out the weak from the chaff

I: yeah

P: cos there's a lot of American stuff on there (.) and er you know we're living in this country not in (*inaudible*). So we've got to you know. You've got to use a bit of common sense for goodness sake. That's what it boils down to.

I: yeah yeah. So it sounds like your quite an active people who will seek health information out for yourself

P: yeah, yeah

I: erm (2) can you tell me about your expectations then from engaging in exercise and physical activity

P: well I'm hoping to run another ten, twenty years on my life ( *both laugh*). Its as simple as that (.)

I: its as simple as that. Just keeping going

P: yeah (.) keeping going yeah (*researcher laughs*)

I: Ok erm (.)

P: I mean we've made great strides (.) in medicine and we've got these tablets. They keep getting reports. Statins for instance they're wonderful you know. They're great. They're going to keep your heart going longer and what have you but there's also a down side as well and you've got to steer that path through (.) the good and the bad. You know. Cos somebody'll come up one day and say (.) ah its brilliant you know and another day (.) too much of those are bad for you, you know (.) It'll kill you off and dull your brain so you've got to

I; so you've got to look at it yourself and work out what's going to be right for you

P: yeah everything in moderation (.) you know.

I: yeah erm

P: I mean I hope I can live as long as I can and if you don't keep exercising you're gonna get stiff and you're muscles are (.) not gonna be working properly and all the rest of it so yeah

I: umm (.) umm and how would that (.) why would you not want that to happen (.) I mean why would you but (.)

P: Well it's against my nature to not tek an interest in my body and exercise etc (.) you know. I mean I just don't want to waste away. I mean you see these idiots who weigh forty odd stone in a bed and they've gotta lift them out through the roof (.)why (.) why fool them (.)

I: so it sounds as if then, looking at how some people are and the state of some people (.) putting on weight , just doing nothing, not helping themselves (.) that to you and just letting themselves go, that to you is actually, seeing that is a motivator for you to go Pfft I don't want to be like that.

P; one of them yeah

I: one of them(.) one of them being (.) is there any other motivators



P: well there's loads of different motivations when you start casting your eyes around (.) you know I tend to like food ( *laughs*)

I: don't we all.

P: look at you, look at me (.) I keep trying to get weight down you know. And I think does it, is it at my time of life worth it (.) and then a little man in the background says yes it is (*laughs*) so there you go

I: okay erm (.) I mean maybe this is just a progression form as you say you know its who you are erm (.) and maybe this is just a continuing thing but how do you see exercise fitting into your life in the future.

P: well why not? I mean everything in moderation. Food, booze, exercise, you name it

I: yeah a balance

P: if you go over the top you're asking for trouble aren't you

I: okay erm (2)

P: I mean you've only got to go out of here and g to Meadow hall and stand in meadow hall and look at people walking past. I need I say more?

I; yeah, yeah erm (2) okay so from , like I say, from current research (.) we know that physical activity, its been around for years, being active is god for us, doing exercise is good for our health erm but (1) to get the health benefits it has to be maintained in the long term (.) for over the life span or if someone starts it now it's got to be maintained for at least a year and onwards (.) erm to get those benefits so (1) some people are struggling to do that. Some people find it easy you know, like yourself, something that you've always done, where other people are really struggling (*announcement over the tannoy*)

P: well I, It's put me off now.

I: (*laughs*) I was gonna say what was your thoughts about why (1) it is that some people struggle and why some people are able to maintain physical activity?

P; (2) well some of them don't want to do it. Some of them are lazy. (3) various reasons

I; so it's actually about who they are. Their attitudes and outlook in life

P: yeah, mind over matter. I mean you've got. There's a couple of guys in out class there (1) that's er (.) old guys and you can see they've had a hard life probably worked in the steel works in Sheffield (1) one of them's got a bad leg (.) but he still comes and he's still in that gym because he knows it does him good. And he feels the benefit of it. The guy that (1) I work with the eighty-four year old guy, he said, I feel better for coming for this. And he always makes sure I'm coming but he's (*laughs*)not been this



morning. It's just people's attitudes towards it (.) I mean I can't say why. I mean I don't know what they think.

I: yeah of course

P: I don't know what you think about this interview

I: of course yeah yeah (1) okay erm (3) so, how (3) would you (1) we haven't talked about work in particular (.) but do you see, is there a link between working and being physically active or, for you in particular or is it

P: well I don't work.

I: you don't work, I mean in terms of the past

P: well I've not worked for fifteen, sixteen years

I: okay

P: no I worked in a pressure job. I had pressure everyday. Deadlines to me. No ifs or buts (.) gotta be out on time. End off. So if you keep yourself alert (.) your mind alert. Your body and some kind of trim you're gonna stand up to it aren't you. If you don't you're going to go under

I: yeah yeah

P: physical breakdown (.) mental breakdown. I've seen this happen in (.) two or three cases. You know.

I: So it's something that helps you survive the job and help you perform at your best

P: yeah

I: erm (3) okay can you tell me about any possible strategies you've used to keep yourself motivated. I mean I know we've talked about how much it's naturally ingrained in you but I don't know if there's anything where erm (.) anything that you know, might, like you say, there's temptations there (.) erm (.) is there any kind of (.) anything that you do to (.) keep yourself remembering 'yep, no this is what need to do, I need to be going out and'

P: NO not particularly

I: no

P: no I've noticed since the last operation that the memories not what it used to be (.) I have noticed that. I mean they took me right down and put me on artificial heart apparently, and I think that knocked a few (*laughs*) it blew a few fuses somewhere (.) (*researcher laughs*) so you know. I mean I could go out of here now and think 'what did they call that young lady', you know things like that. Yeah and I think 'oh shit I've

forgotten that', you know. And I have to write things down otherwise I forget(. )  
( Discusses other things he forgets).

I: yeah yeah okay (.) okay (*both laugh*). Does that impact in any way on you coming here or (.)

P: no

I: you know just a symptom if you like of the operations and things like that

P: well this, this is not the be all and end all, it's just that you fit it into your life (.) because you know it's doing you some good

I: doing some good yeah (.) so to fit it into your life I suppose you have to prioritise

P: of course you do I mean I've said this already

I: umm definitely, okay. erm (.) going back then we mentioned, the question I was gonna ask is if you've noticed any barriers to you and obviously there's been some change and obviously one of them was fatigue you know, you go out and you do things and I'm wondering how have you negotiated that then (.) how have you got used to.

P: well you've got to pace yourself (.) If if, look If I went out of here and dug (.) er (.) a garden I'm going to be knackered the next day (.) and I think to myself, you over did it and I think next time, I'm only gonna do half of that (.) and you sort of (.) (*inaudible*) you don't over stretch yourself, otherwise you're asking for trouble.

I: umm

P: plus your age, so you've got to factor that in as well.

I: yeah

P: does that answer what you're after?

I: well yeah yeah, that's certainly

P: and if you can pass any information onto (.) anybody that you're working with in the gym or anything like that then fair enough

I: umm (.) information being?

P: umm give them some tips (.) don't overdo it

I: so it's interesting that it's almost common sense for you but to a lot of people it's something that they struggle with

P: well a lot of this boils down to common sense

I: umm

P: you're presented with a series of facts (.) you analyse the facts and you work it out for yourself

I; Um mm

P: you know what the score is. You know what will happen if you don't sort it out. It's as simple as that in my book

I: yeah, yeah, Okay erm (2) its almost coming to the end now, so what do you think then, in the context of age, of erm (1) health. Illness, what do you think will help you maintain physical activity in the long term then from now on.

P: me personally

I: yeah

P: getting a bit of weight down

I: getting a bit of weight down. so that's something that will keep you going.

P: yeah yeah, to feel fitter

I: yeah , okay

P: which coming down here helps.

I: yeah its got that real benefit then

P: yeah

I: okay then, so that's (.)

P: well I be honest with you at my age its hard to shift

I; yeah

P: is the weight so you know.

I: It takes a little bit more effort

P: zzzip it up or (*laughs*)

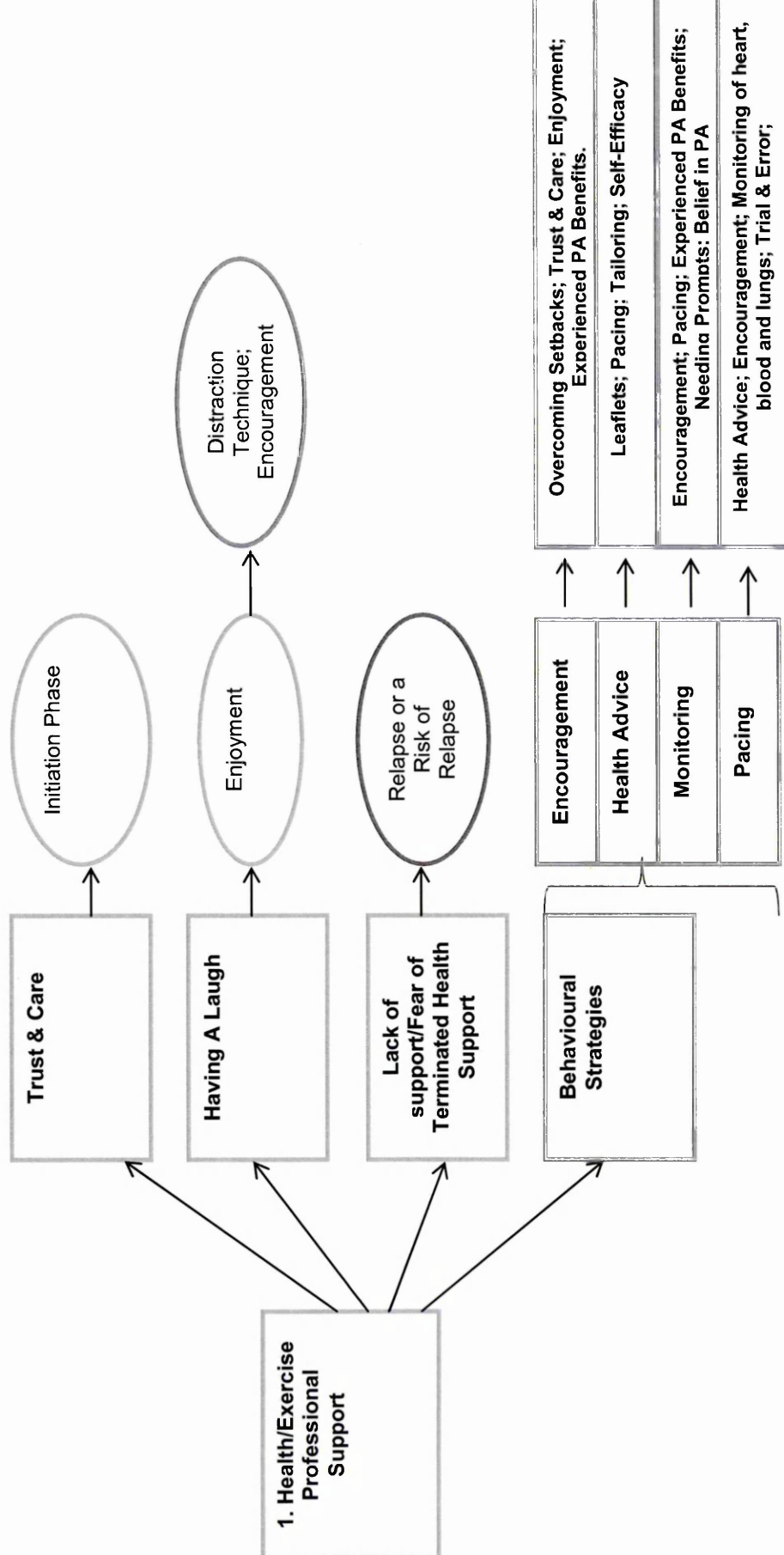
I: okay so that's pretty much all my questions that I've got. Erm (*debriefs participant*). So I'm just wondering have you got anything you'd like to say or add or talk about which might be of importance to add

P: no

I: no. Ok well excellent. Thanks for that. You've answered everything.

## **Appendix G:**

### **Example Process Map from Study 1 (Associations between Health & Exercise Social Support and Behaviour Change Strategies)**





**Appendix H:**  
**Full Matrices of Change Objectives for the**  
**MI-CB Intervention**

Personal Determinants						
Performance objectives: To maintain 30 minutes of moderate-vigorous intensity PA a day, participants will need to...	PA outcome expectations	PA experiences	Core Values	Psychological Barriers	Self-efficacy to overcome barriers	Trial and Error
1.1 Develop congruence between PA outcome expectations, experiences and values	OE1.1a- Explore the existing reasons (or outcome expectations) to engage in PA  OE1.1b- Explore most important outcome expectation	E 1.1a- Explore current experiences with PA (positive and negative)  E.1.1b- Explore experiences with prioritised outcome expectation  E1.1c- Explore level of satisfaction with experiences for prioritised	CV 1.1a- Identify core values  CV 1.1b- Explore how core values facilitate PA to enable continual engagement and experience PA outcome expectations  CV 1.1c- Explore how values hinder PA and prevent experience of PA outcome	PB 1.1a- Identify any psychological barriers that might prevent experiences of prioritised outcome expectation  PB 1.1b- think about possible strategies that could be used to overcome PB (these could be strategies used in the past)	SE 1.1a- Increase self-efficacy using affirmations to encourage participant to overcome specific barriers which may contribute to incongruence between expectations and experiences.	-

			outcome	expectations	<p>PB 1.1c- create an action plan to implement strategies</p> <p>PB1.1d- Implement strategies</p> <p>PB1.1e- review strategies and progress.</p> <p>PB 1.1.f - Identify if perception of values are a barrier to PA (e.g., family are the most important thing. This is what I will invest my time in)</p>		
			<p>E 1.1d- Explore any ambivalence with engaging in PA</p> <p>E 1.1e - use specific strategies which will enable experiences to be observed e.g., self-monitoring of prioritised goal.</p>	<p>CV 1.1d- Match core values with outcome expectations and experiences</p> <p>CV 1.1e- Explore ambivalence between core values and PA engagement</p> <p>CV 1.1f- Implement time management strategies to manage competing core values.</p>	<p>PB 1.2 - Identify any psychological barriers that might create discrepancy between prioritised</p>	<p>SE 1.2a- explore level of confidence to overcome barriers to engaging in</p>	-
1.2. Identify reasons for discrepancies between PA expectations, experiences and values	OE 1.2 a- identify any unrealistic expectations from outset.	E 1.2 a- Explore if Unrealistic expectations cause dissatisfaction	CV 1.2 a- identify if core values are being prioritised over PA (e.g.,				

		with experience  E 1.2 b- Explore if unrealistic expectations are source of ambivalence  E1.2c- cultivate realistic expectations by receiving knowledge of PA	family)	outcome expectations and experiences (e.g., ambivalence)	30mins of PA per day.	
2.1 Identify any psychological barriers to PA participation	-	E 2.1a- Explore any barriers that prevent positive experiences of prioritised outcome expectation  E2.1b- Explore any barriers that reduce satisfaction of experiences	CV. 2.1a- Explore how core values can be a barrier if prioritised over PA.	PB 2.1-a Identify any psychological barriers to PA	SE 2.1a- Gain understanding that overcoming barriers is a trial and error process.	-

3.1 Learn and develop cognitive-behavioural techniques and coping strategies to overcome barriers to PA participation-	-	E 3.1a- Identify potential strategies used in past or in collaboration with facilitator  E3.1b- Implement negotiated strategies	CV3.1a- Implement time management strategies if prioritise core value (e.g., family) over PA.	PB3.1a- Identify possible strategies to use to overcome barriers  PB3.1b- Plan to implement strategies using action plans  PB 3.1c- Implement strategies to overcome barriers	SE 3.1a- assess confidence to overcome barriers  SE 3.1b- Explore methods to increase confidence to implementing strategies	TE 3.1 a - Encourage a method of reflective trial and error learning which enables participants to reflect on past attempts, successes and failures.  TE 3.1 b- encourage that 'slips' are normal and to be overcome.
4. Enhance self-efficacy to overcome barriers to PA participation	-	-	-	PB 4a- explore level of confidence to overcome barriers to engaging in 30mins of PA per day.  PB 4a- reinforce any past attempts at overcoming	See SE 3.2 column	TE 4 a- Affirm attempts at overcoming barriers



					barriers			
5. Seek social and practical support for exercise	-		E 5a- encourage active seeking of social support for exercise from gym staff/ health professionals to experience benefits	-	-	-	-	-
6. Seek social and practical support for condition management.	-		-	-	PB 6a- Encourage seeking of practical and professional support for condition (e.g., injuries, health, depression) to overcome barriers (e.g., boredom)	-	-	-
7. Adopt a reflective trial and error approach to PA maintenance	-		-	-	See TE 3.2 a, b.	-	-	-
8. Increase positive attitudes towards PA	-		E 8a- Encourage positive attitudes (e.g., commitment and self-responsibility) needed to	-	-	SE 8 a- Encourage or reinforce positive attitudes towards overcoming barriers, such as	-	-

		experience PA benefits  E8b- Reinforce positive experiences and cultivate attitude that PA is good for health/ experiencing outcome expectations.			commitment and self-responsibility)	
9. Develop coping skills and condition management skills for PA	-	E9a- reinforce that condition management ( e.g., pain management) is essential to continuing in PA and experiencing benefits	-	PB 9a- Explore different coping strategies to help overcome psychological barriers such as cognitive restructuring and acceptance of limitations.	-	TE9a- Highlight that trial and error learning process is a method by which to manage health condition and continue in PA.

Personal Determinants		External Determinants		
Performance objectives: To maintain	Attitudes	Coping skills	Social and Practical	Overcoming physical Overcoming environmental

30 minutes of moderate-vigorous intensity PA a day, participants will need to...			Support	barriers	barriers	
1.1Develop congruence between PA outcome expectations , experiences and values	<p>A 1.1a- Explore any negative attitudes towards PA as a result of negative experiences of PA</p> <p>A 1.1b- Implement cognitive reframing to change negative attitudes</p>		<p>SS 1.1 a- Explore how family, friends or health professionals can influence achievement of PA goals.</p> <p>SS 1.1 b- Identify strategies of how social support from family or professionals can develop congruence between values and goals (e.g., exercising with family)</p> <p>SS 1.1c- Encourage</p>	<p>OPB 1.1a- identify any physical barriers that could cause a discrepancy between expectations and experiences</p> <p>OPB 1.1b- think about possible strategies that could be used to overcome PB (these could be strategies used in the past)</p> <p>OPB 1.1c- create an action plan to implement</p>	<p>EB 1.1a- 1.1a- identify any physical barriers that could cause a discrepancy between expectations and experiences</p> <p>EB 1.1b- think about possible strategies that could be used to overcome PB (these could be strategies used in the past)</p> <p>EB 1.1c- create an action plan to implement</p>	-

			implementation of specific social support strategies.	strategies  OPB1.1d- Implement strategies  OPB1.1e- review strategies and progress.	strategies  EB1.1d- Implement strategies  EB1.1e- review strategies and progress.	
1.2. Identify reasons for discrepancies between PA expectations and experiences	A 1.2a- Explore any negative attitudes towards PA as a result of negative experiences of PA		SS 1.2- Identify if lack of social support is a reason for discrepancy			
2 Identify any psychological barriers to PA participation		CS 2a- identify if lack of coping skills contributes to other barriers		OPB 2a- identify any physical barriers	EB 2a- identify any environmental barriers	
3. Learn and develop cognitive-behavioural techniques and coping		CS 3 a- Identify current coping skills (e.g.,	SS 3a- identify areas where social support can hinder	OPB 3a- Identify possible strategies to use to overcome	EB3a- Identify possible strategies to use to overcome	

strategies to overcome barriers to PA participation	acceptance/ active seeking for help)	or encourage PA	barriers	barriers
	CS 3b- encourage use of existing coping skills for	SS3b- prompt implementation of specific social support strategies here possible to overcome barriers.	OB3b- Plan to implement strategies using action plans	EB3b- Plan to implement strategies using action plans
			OPB 3c- Implement strategies to overcome barriers	EB 3c- Implement strategies to overcome barriers
4. Enhance self-efficacy to overcome barriers to PA participation	CS 4a- reinforce/affirm attempts at using coping skills and strategies		OPB 4a- explore level of confidence to overcome barriers to engaging in 30mins of PA per day.	EB 4a- explore level of confidence to overcome barriers to engaging in 30mins of PA per day.
			OPB 4b- reinforce any past attempts at overcoming barriers	EB 4b- reinforce any past attempts at overcoming barriers
5. Seek social and practical support for exercise	A 5a- Identify any negative attitudes towards seeking	See CS 5a	OPB 5a- educate around the plateau	EB 5 a- encourage social support in



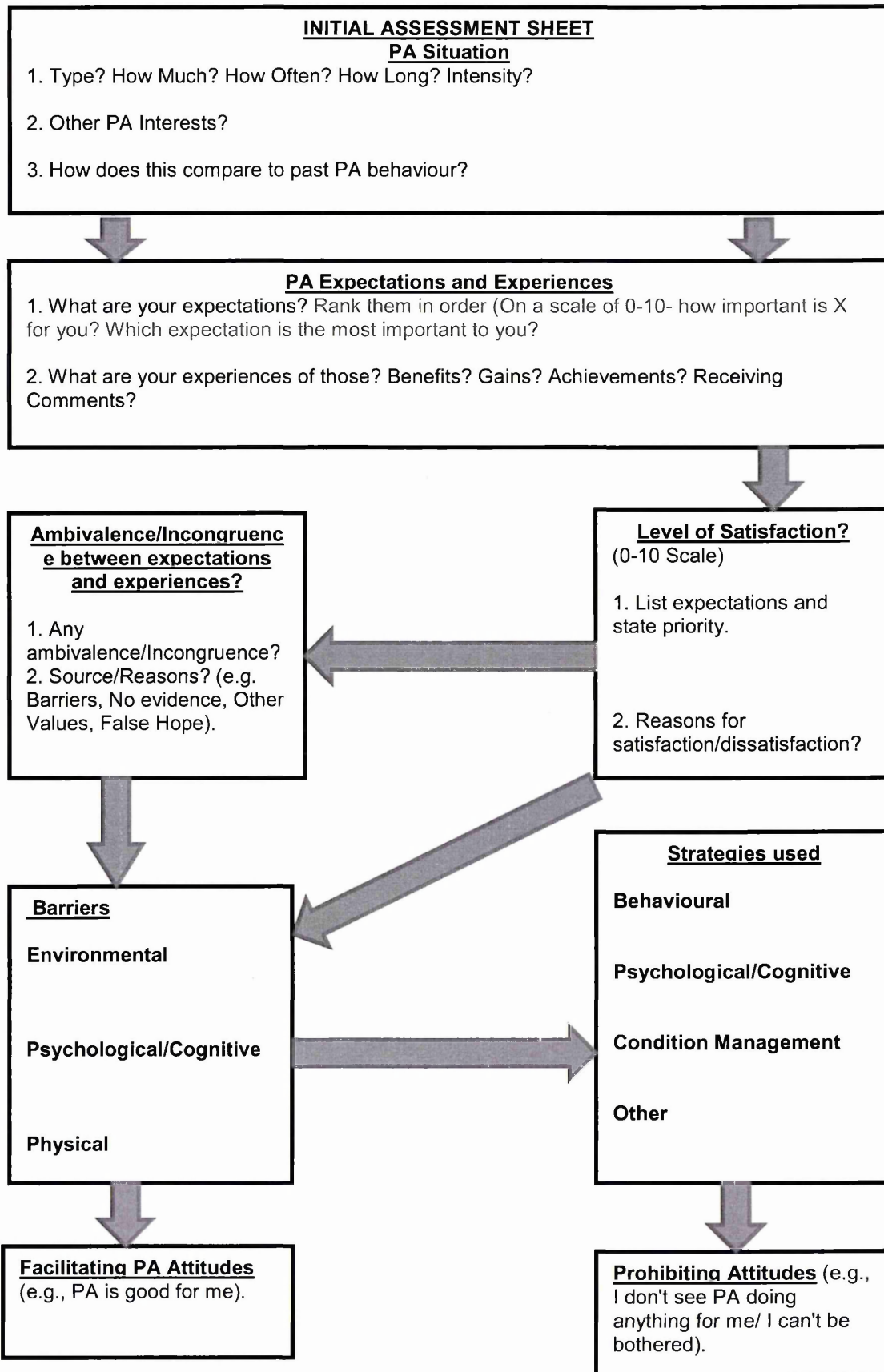
	social support (e.g., I don't need help) and implement cognitive reframing	support for exercise from family, friends and health professionals		and role of social support for overcoming plateau  OPB 5b- encourage implementation of seeking professional support for overcoming the plateau/ physical barriers	restructuring environment to be supportive for PA	
6. Seek social and practical support for condition management.	A 6a- Identify any negative attitudes towards seeking social support (e.g., I don't need help) and implement cognitive reframing	CS 6a- encourage seeking social support for exercise from family, friends and health professionals	See CS 6b.	OPB 6a- educate and encourage use of social support for condition management	EB 6a- encourage social support in restructuring environment to enable better condition management	
7. Adopt a reflective trial and error approach to PA maintenance	A 7a- encourage a trial and error attitude	CS7- encourage trial and error way of leaning coping skills such as pacing				



**Appendix I:**

**Materials for the MI-CB Intervention**

**(Initial assessment sheet, daily activity sheets,  
action planning sheets & instructions)**



# **ACTIVITY DIARY**

Date and time Mon (24/09)	Activity	Duration	Symptoms Experienced (scale 0-10)	Mood (scale 0 -10)
6-7am	<b>Get up and get a shower</b>	30 minutes	(0)	7
8am	<b>Pack Lunches School run</b>	1 hour	(0)	7
10am	<b>Clean the house</b>	40mins	Knee Pain (3)	6
12 noon	<b>Hair appointment</b>	1 hour	(0)	7
2pm	<b>Food shopping</b>	1 hour	Tired (3) & pain (6)	3
4pm	<b>Walk the dog</b>	30 mins	Knee pain (5)	6
6pm	<b>Take kids to football</b>	45 mins	(0)	7
8pm	<b>Go to Gym</b>	2 hours (0)	(1)	3



	8.30	10.30	12.30	2.30	4.30	6.30	8.30	10.30
Mon								
Tue								
Wed								
Thur								
Fri								
Sat								
Sun								

# ACTION PLANNING SHEET

Values (What influences you to exercise?)	Physical Activity Expectations (Prioritise the benefits you want to achieve from PA)	SMART Goal(s) (What you want to achieve based on values and expectations)	Action (Steps to take. When, Where, How, Who with?)	Progress (How far have you got so far? Barriers to Overcome?)	Outcome (Did you do it? If not, why not? what can you do to overcome any barriers?)

### **Action Planning Instructions:**

Questions to use when designing SMART Goals: You might have more than one goal to achieve but to avoid overloading yourself and being disappointed, try to stick to one goal.

- (1) **Specific:** Can you break your goals down into short-term and long-term goals creating specific steps which you can achieve?
- (2) **Measurable:** Are your goals measurable? How will you measure the progress of your goal?
- (3) **Achievable:** Are your goals achievable? How are you going to achieve your goal? What will you need to achieve your goal? How will you know when you have achieved your goal?
- (4) **Realistic:** Are your goals realistic? Have you set yourself enough time and considered the amount of time needed to achieve the goal (e.g., a lifestyle change needs to be adopted to achieve weight loss, not just a crash diet within a couple of weeks?). Have you thought of the steps you need to take towards achieving the goal? Have you considered the possible barriers you may encounter e.g., illness, fatigue, other commitments, weather? How might you overcome those barriers?
- (5) **Time:** Have you set yourself a realistic timeframe in which you expect to carry out the sub-goals and see results?

### **Activity Diary Instructions.**

Filling in an activity diary over a week or longer can help you identify the times when your symptoms (e.g., knee pain) flare up and look for patterns in your activity levels and when symptoms are at their worst or are better. For example, when we feel well and symptom free, it is easy to push ourselves or do too much resulting in further symptoms like fatigue or pain which may prevent you from stopping activity altogether in order to rest. The activity diary will help identify if any potential problem areas exist. If they do, we can implement specific strategies which might help you:

- Understand and work with your current capabilities and limitations
- Learn how to manage your activity levels and lessen symptoms
- Build up your tolerance to activity by slowly gradually increasing the length, amount and intensity of activity to help you reach your goals or achieve what you want to achieve.

### **How do I fill in the activity diary?**

Every day for one week, fill in the 'DAILY ACTIVITY DIARY'. You might want to print one off and carry it around with you so you can fill it in when you can. The diary is designed to be easy and simple to use.

An example has been provided so you know how to fill it in. You will need to write:

- The day and date
- The time you start to perform the activity
- What activity you did
- The duration of the activity
- Any symptoms you experienced AND a rating from 0-10 of the intensity of the symptom ('0' being no symptom to '10' being worse symptom)
- Your mood and how you felt at the time (e.g., happy, low, depressed, angry, frustrated) and a rating scale from 0-10 ('0' being low/depressed mood to '10' being most happy).

## **Pacing and Graded Activity**

When managing a health condition, it can be frustrating if it prevents you from doing what you want to do, like being active, doing household chores or engaging in the things you love doing. When you feel well, it is easy to set yourself a big task, like to do all the housework in one go or do that extra session in the gym. This is fine if you do not experience any fatigue, pain or symptom flare ups. If you experience symptoms during, after or even for days after the activity which prevent you from doing much afterward, then it is your body's way of telling you that you have overdone it and need to rest. This pattern is called the overwork-collapse pattern. There are two things you can try to help prevent this overwork-collapse pattern of behaviour:

1. Pacing.

Pacing is about learning how much you can do without experiencing symptoms when doing specific activities. To do this, first you need to identify when you over do it. Second, you need to learn how much you CAN DO without experiencing symptoms. Third, you need to identify when you need to rest. For example, if you learn that doing a full two hours of house work or a 2 mile run causes you too much pain or fatigue, but doing 1 hour straight of housework or 1 mile run is okay, then this is your current capability. The activity diary that will help you identify this.

2. Graded activity

Graded activity is about breaking down your overall larger goal into smaller goals, more manageable goals over time, and gradually building up to doing more strenuous, or longer periods of activity. For example, rather than setting large tasks like doing a full two hours or more of housework, or a 5 mile run, it is easier for the body to cope with 10 minute chunks of activity and build up to 15, then 20, then 25 etc. Or one alternative is to start off with less strenuous activity (like dusting or walking) and build up gradually to more strenuous activity after rest (like hovering, shopping or running).



**Appendix J:**  
**Ethics Approval (Study 2a & Study 2b)**

**Faculty of Health and Wellbeing Research Ethics Committee Sport and Exercise  
Research Ethics Review Group Report Form**

Principal Investigator: Sarah Scott

Title: The effective intervention components for promoting long-term physical activity in middle-older adults with health conditions

Checklist:

Application form	✓
Informed consent form	✓
Participant information sheet	✓
Risk assessment form	✓
Pre-screening form	n/a
Pre-screening form (under 18)	n/a
Collaboration evidence/support	✓
CRB Disclosure certificate	✓

Recommendation:

Acceptable:

Not acceptable, see comments:

Acceptable, but see comments:


Comments:

Thank you for addressing the comments you received.

Your application is now Acceptable and you may commence the study.

Signature :



Date: 24.07.12

David Binney

Chair, Sport and Exercise Research Ethics Review Group

***Please remember that an up-to-date project file must be maintained for the duration of the project and afterwards. The project file might be inspected at any time.***

***Note:*** Approval applies until the anticipated date of completion unless there are changes to the procedures, in which case another application should be made.

# **Appendix K: Participant Information Sheet**

## **(Study 2a & b)**



*Sheffield Hallam University*

**Faculty of Health and Wellbeing Research Ethics Committee  
Sport and Exercise Research Ethics Review Group**

**Participant Information Sheet**

<b>Project Title</b>	<b><i>Keep Active South Yorkshire Trial (KASY)</i></b>
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<b>Supervisor/Director of Studies</b>	Dr. Jeff Breckon
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<b>Principal Investigator</b>	Sarah Scott
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<b>Principal Investigator telephone/mobile number</b>	Tel: (0114) 225 5627 Email: S.E.Scott@shu.ac.uk
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**Purpose of Study and Brief Description of Procedures**

Congratulations for completing the GP Exercise Referral Scheme! The benefits of regular physical activity are clear and we know how hard it can be to get active. Staying active in the long term is equally important to continue experiencing positive changes. We would like to help support you in your efforts by offering you the opportunity to participate in an intervention that we're trialling. This intervention is being undertaken within the Centre for Sport and Exercise Science (CSES), based at Sheffield Hallam University. Please consider the information below before deciding.

**Why are we doing the research?**

There are many benefits to being physically active, including managing a health condition, but to keep experiencing the benefits it needs to be maintained in the long-term. To do this, people encounter many different obstacles over time which can affect motivation levels and produce a range of emotions, from happiness to frustration and disappointment. Sometimes people may not get the chance to talk about these experiences which can result in you stopping your exercise routine. Therefore, we want to compare whether giving people the chance to talk about their experiences with physical activity can help maintain motivation levels compared to those who receive their usual care and support. This way you can help us understand how to better design physical activity interventions for adults with health conditions. This research is called a randomised controlled trial.

**What is a Randomized Controlled Trial?**

A randomised controlled trial (RCT) is a type of research that enables researchers to test whether a new form of support is more effective than the support people currently receive. To do this, we will compare a group who receive the new support with a group who receive their usual support after completion of A GP referral scheme. The results are compared and if the group which receive the new support do better we know the new support is effective. To make this fair, we select people at random to either receive the new support or to continue receiving their usual support.

**What is the Keep Active South Yorkshire Trial?**

The Keep Active South Yorkshire Trial will have two groups. The intervention group will receive face-to-face and telephone support for physical activity for 3 months. The control group will continue with their usual support (discounted membership at a local leisure centre) and will be offered feedback on their physical activity after 6 months. Both groups will be required to fill out questionnaires at three time points: before the trial, at 3 months and at 6 months. Both groups will also be required to wear a pedometer (a device that measures your activity) for 1 week before the beginning of the trial and for 1 week at 3 months so that we can get a reliable measure of how active you are. The results are then compared to see whether the intervention has been effective. At the end of the intervention, the support you usually receive prior to the trial will continue as normal.

**What will I have to do, if I agree to participate?**

If you agree to participate, you will need to fill out the background information sheet and contact details and return it to the researcher, Sarah, as soon as you can. If you are eligible to participate, Sarah will contact you to discuss the research with you and arrange a convenient time for you to meet Sarah. At the meeting, you will sign a consent form and complete some basic questionnaires about confidence, physical activity, coping strategies and satisfaction with your physical activity expectations and experiences. You will be shown how to use the pedometer. You will arrange a time to meet with Sarah within the next week so that you can return the pedometer and then be informed on which group you have been placed in.

**Which intervention will I receive?**

You will be randomly placed into either the intervention group or the control group. You will be informed of this when you meet with Sarah to hand in the pedometer. You will be given further details of the group you have been placed in and what is required next.

**Do I have to participate and what if I change my mind?**

Participation in the trial is completely voluntary. If you decide to participate you will sign a consent form. You are free to withdraw from the research at any time without giving a reason. If you decided to take part, or withdraw at any point, this will not affect your usual standard of support in any way.

**Why have I been chosen?**

We are asking around 60 people who are about to complete, or have recently completed a GP Exercise Referral Scheme in Sheffield to take part. We are only asking people who have successfully completed at least 80% of the scheme and we think you may be interested in taking part.

**Will everything be confidential?**

Yes, everything will be confidential. All data will be stored securely on a computer or in a filing cabinet in a locked room. You will be given a unique research number so that your name and details cannot be matched to the questionnaire data. The Data Protection Act (1998) applies.

**What will happen to the results of the research?**

The results of the trial may be published at conferences and in journal articles which will be viewed by scientific communities. All results remain anonymous as we compare the results between the two groups rather than between individuals. If you want a summary of the findings then you can contact the researcher directly.

If you would like to know any more information about the study, please contact Sarah at the contact details given above. If you are happy with the information provided and are keen to participate, simply return the consent form and fully completed background information



questionnaire. You will be contacted to arrange a convenient time to meet the researcher.

I shall look forward to hearing from you soon,

Yours Sincerely,

Sarah Scott (Principal Researcher)

It has been made clear to me that, should I feel that these Regulations are being infringed or that my interests are otherwise being ignored, neglected or denied, I should inform Mr David Binney, Chair of the Faculty of Health and Wellbeing Research Ethics Committee (Tel: 0114 225 5679) who will undertake to investigate my complaint.

**Appendix L:**  
**Risk Assessment (Study 1, 2a & 2b)**



Sheffield Hallam University

**Faculty of Health and Wellbeing Research Ethics Committee**  
**Sport and Exercise Research Ethics Review Group**  
**Risk Assessment Pro Forma**

**\*\*Please ensure that you read the accompanying  
Risk Assessment Risk Ranking document before completing this form\*\***

<b>Title of research</b>	<b>Keep Active South Yorkshire Trial (KASY)</b>
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<b>Date Assessed</b>	29/06/2012
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<b>Assessed by (Principal Investigator)</b>	Sarah Scott
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<b>Signed</b>	<b>Position</b>
	Principal Investigator

<b>Activity</b>	<b>Risks</b>	<b>Control Measures</b>
Put in this box the activity which may cause harm.	<b>Risk</b> of [place in here the harm that may be caused] caused by [put in the hazard (source of danger) here]. Risk = consequence x likelihood. Identify risk category <b>Low Medium or High</b>	Place here what you would do to minimise the risk

<p>Sensitive subjects may be discussed during the intervention.</p>	<p>Risk of upset on uncovering emotional or distressing subjects caused by the questions asked during the interview. Risk=1, Low.</p>	<p>The physical activity intervention is not of a sensitive nature but may uncover emotions related to managing a chronic health condition. In the event that a participant becomes emotional, the participants will be reminded that they do not have to talk about anything they do not wish and will be asked if they would like to carry on and/or move onto the next question. At the end of the intervention, participants will be debriefed and reminded to contact their GP or PARS if they feel they need any extra support.</p>
<p>Disclosure of information that may lead to researcher needing to break confidentiality.</p>	<p>Risk of participant disclosure of harm to self or others such as suicide risk or abuse of an adult or child. Risk=3, low</p>	<p>In the event of such a disclosure, the participant will be informed that the researcher may need to break confidentiality due to duty of care and inform the appropriate person. In case of discussions around suicide, the GP will be informed immediately. In case of harm or abuse to self or another human, the police will be informed.</p>
<p>Actual or threatened violence, psychological harm, unwanted sexual advances towards the researcher.</p>	<p>The risk of aggressive, offensive and sexual abuse towards the researcher. Risk=3, low.</p>	<p>To manage any potential unwanted behaviour from the participant towards the researcher, the intervention will be conducted at a local leisure centre and over the phone, or during the day when other members of staff are around. Some interviews may be conducted in the evening but this will occur over the telephone. The researcher will also have a mobile phone and an emergency contact in case of an emergency.</p>

Participants/researcher accident whilst travelling to the interview.	The risk of a participant or researcher having an accident that causes injury and harm whilst travelling to the interview. Risk=4, medium	<p>The researcher will call the participant to arrange the interview and check the participant's travel arrangements. Participants will have the contact number of the University and leisure centre to contact in case of delay, accident or emergency. If appropriate, an ambulance will be called.</p> <p>The researcher will inform her supervisors and friend/family where she is going and what time she is expected to return. A fully charged mobile phone will also be carried at all times.</p> <p>If medical attention is needed, an ambulance will be called for. If the physiological state has been brought about by the questions asked then participants will be asked if they would like to continue or stop the interview. Participants will also be reminded that they should not be under the influence of alcohol or drugs for the interview unless the medication is prescribed and for their health condition.</p> <p>It will be made clear in the consent form that the participant should not attend the interview under the influence of drugs or alcohol unless it is prescribed medication for their condition. If the risk occurs, the researcher will discuss openly and assess if the participant is able to continue and if not the interview will be terminated. Appropriate transport will be arranged to take the participant home.</p> <p>If possible, SIV will screen all contacts for any information on</p>
Unforeseen changes in participant's physiological state.	The risk of a participant experiencing changes in their physiological state i.e. cardiovascular, anxiety etc. Risk=2, low.	
A participant attends the interview under the influence of alcohol or drugs.	The risk of a participant attending the interview under the influence of alcohol or drugs. Risk= 1, low	



**Risk Evaluation (Overall)**

The overall risks of the interviews are low and the procedures in place will be sufficient to manage any events that occur.

**General Control Measures**

Is a pre-screen medical questionnaire required? No ①

To control and minimise the above risks, the research will have appropriate supervision and support, will have been trained to advanced level in Motivational Interviewing and will have the appropriate listening skills to conduct the interview. Previous training and experience in dealing with such risks will ensure any harm to be minimised if any of the risks do occur.

**Emergency Procedures**

1. In the event where a participant needs emergency medical attention, the researcher is trained in First Aid and will call 999.
2. In the case of disclosure of issues around suicide, the researcher is trained to assess the severity of the issue and will call the participant's GP as a duty of care.
3. In case of a participant having an accident on the way to the interview, the participant will have the universities contact details in order to inform them if they can.
4. The researcher will carry a mobile phone at all times

**Monitoring Procedures**

The chair of the health and wellbeing ethics committee will be informed if any amendments to the control measures are made

**Review Period****Reviewed By (Supervisor)****Date**

**Appendix M:**  
**Cognitive-Behavioural Technique Delivery**  
**Checklist (An example)**

Participant ID:	Cognitive-Behavioural Technique Delivery Checklist							
Behaviour Change Techniques Delivered	Initial 1-1 session	Middle sessions 1	Middle session 2	Middle session 3	Middle session 4	Middle session 5	Final 1-1	FREQUENCY
1. Elicitation of PA Expectancies	1							1
2. Elicitation of priority of outcome expectation	1							1
3. Elicitation of PA experiences	1					1	1	3
4. Elicitation of satisfaction with experience	1							1
5. Elicitation of source of any ambivalence	1							1
6. Assessment of realistic/unrealistic expectations (e.g., around time, ability, effort, expected barriers)	1						1	2
7. Prompt Action Planning	1							1
8. Prompt goal setting (behaviour)	1	1					1	3
9. Prompt goal setting (outcome)								
10. Prompt review of goals		1	1	1	1	1	1	6
11. Provide information about behaviour-health link	1 (plateau)	1		1				3
12. Provide Education For Exercise	1 (plateau)	1					1	3
13. Provide Education for Diet		1		1				2
14. Provide Education for Condition Management								
15. Prompt barrier	1			1	1	1	1	5



# **Appendix N:**

## **Additional Treatment Fidelity**

### **Questionnaires**

(Cognitive-behavioural technique enactment questionnaire,  
Confidence to enact techniques questionnaire,  
Cognitive-behaviour technique comprehension question)



## **Cognitive-behavioural Technique Enactment Questionnaire**

We are interested in finding out how often you use the strategies outlined below to help you keep active. Please tick the statement that applies to you next to each strategy. Please remember to answer as honestly as you can as the questionnaire is completely confidential. There are no right or wrong answers.

<b>Technique</b>	1. I never use this strategy	2. I rarely use this strategy	3. I occasionally use this strategy	4. I use this strategy often
I distract myself from physical activity by listening to music or doing other things				
I gradually increase my activity as I see myself progressing				
I seek professional help for my health condition				
I seek professional help for exercise				
I ask for help from friends and family when I need it				
I set myself reminders to exercise				
I use pacing				
I give myself healthy rewards for my efforts				
I monitor my physical activity or goal (e.g. activity diaries, weight, run/walk distance)				
I manage my time so I can fit physical activity into my schedule				
I plan when to do physical activity				
I prioritise physical activity over other things				
I am flexible with my schedule so I can fit physical activity in				
I give myself 'Me' time by engaging in physical activity				
I find alternative ways to manage my condition to be physically active				

I choose alternative physical activities to do if I cannot do what I planned				
I get on with my physical activity rather than putting it off				
I engage in physical activity to be sociable and improve my mood				
I set myself SMART goals				
I visualise myself doing PA to help motivate me				
I weigh up the pros and cons of doing exercise when I don't feel like doing it.				
I think positively about doing physical activity				
I assess my capabilities and limitations and work within those				
I add variety to my physical activity if I get bored or plateau.				

1. Are there any other strategies that you use to help motivate yourself to be physically active that are not listed in the table above? If so, please describe the type of strategy you use and how often you use it in the space below.

2. From the list above, if there are any techniques that you do not understand what they mean, please circle them. What do you think can be done to help you better understand them? Please write any comments in the box below as this will help us improve the way the intervention is delivered.

## **Confidence to Enact Cognitive-behavioural Techniques Questionnaire**

Below is the same list of techniques mentioned in the intervention with some statements referring to how much you feel ***confident in your ability to apply the strategies now or in the future***. Please read each technique and tick the statement that applies to you.

<b>Technique</b>	I feel very confident in my ability	I feel slightly confident in my ability	I'm unsure	I don't feel confident in my ability	I really don't feel confident in my ability
I distract myself from PA by listening to music or doing other things					
I gradually increase my activity as I see myself progressing					
I seek professional help for my health condition					
I seek professional help for exercise					
I ask for help from friends and family when I need it					
I set myself reminders to exercise					
I use pacing					
I give myself healthy rewards for my efforts					
I monitor my physical activity or goal (e.g. activity diaries, weight, run/walk distance)					
I manage my time so I can fit physical activity into my schedule					
I plan when to do physical activity					
I prioritise physical activity over other things					

I am flexible with my schedule so I can fit physical activity in					
I give myself 'Me' time by engaging in physical activity					
I find alternative ways to manage my condition to be physically active					
I choose alternative physical activities to do if I cannot do what I planned					
I engage in physical activity to be sociable and improve my mood					
I set myself SMART goals					
I visualise myself doing PA to help motivate me					
I weigh up the pros and cons of doing exercise when I don't feel like doing it.					
I think positively about doing physical activity					
I assess my capabilities and limitations and work within those					
I add variety to my physical activity if I get bored or plateau.					

4. If there are any techniques you do not feel confident in using, can you think of anything that might help increase your confidence? What do you think you need? Please write any comments in the box below as this will help us improve the way the intervention is delivered.

**Appendix O:**  
**Example Transcript of a 20-minute Segment  
of an Intervention Session (3<sup>rd</sup> Session)**



### **Transcript of a 3<sup>rd</sup> Intervention Session (Male)**

I: Okay, I missed you yesterday but I got your message so that's fine. I'm just ringing for the second call. Erm, I know it's been a week since we last spoke so I think last week you were still kind of keen on making headway with the goals we set the week before which was going to the gym at the weekend and doing a circuit at home, but obviously last week you were ill so it was kind of an off week. So how's things been this week?

P: well last week I did my back in

I; Oh right

P: I know, tell me about it. It's going to sound like I'm making excuses up but I'm not. Tell me about it. I've err, as vie said before I do supper with a bit of a bad back and I was getting into the car

I: right

P; and I had it twisted and trapped a nerve or vie done something but unfortunately vie not been able to anything other than walk the dogs really. It's still hurting now, so I've not been to the gym. I've not attempted anything at home (2) so a bit of a crap week really.

I: so it sounds, obviously, these things happen and it sounds like you've just got to let it rest and let it mend but at the same time, you know, you're walking. You're not active, you are active still.

P; oh no, I'm not active. I'm still going to work I've just. It lets me know when I'm at work. When I'm doing stuff. And when I'm walking as well. When I try to do a circuit of the local park it's about half way round I get a bit of sciatica down my legs and so it's a short cut, back to the car.

I; yeah

P: but yeah I've just got to take it easy

I: yeah

P: My body will let me know. Tells me to watch what I'm doing

I: it sounds like you're quite good at listening to your body and not pushing it too much

P: well I know. I'm not a fan of taking pain killers so (inaudible) although I'm prescribed quite strong pain killers for my back, I try not to take them because I don't want to mask the pain and do more damage.

I: Of course cos otherwise you could end up pushing yourself a bit more and that would cause more damage

P: it has like I say, it's better than what it was Saturday. I had all intentions of going to the gym today but I'm running late and I've got to give blood tonight and again I just don't want to push it just yet so I will give it a couple of days and hopefully get there on Friday and do a session but again if it starts twinging then obviously I'll have to stop and come out.

I: so I suppose it's a case of trial and error isn't it. It's just about having a bit of rest, not pushing it, seeing how things go and testing it and assessing things from there

P: yeah

I: erm okay so it sounds like what you're going to do there is sorted on the physical activity front.

P; yeah

I: so in terms of weight, last week you said weight was a main driver for your being active and I think it was at the end when you said 'oh and diet as well' you said you were eating a few more convenience foods and things and I said 'oh you know if you wanted to we could discuss that'

P; yeah

I: so how does that sound? Are you happy to go down that route and look at diet and food?

P: yeah definitely, I mean it's err, like I said (1) the business I'm in, If I'm not working in one place then I'm fine. I can prepare food and eat fruit, stay away from crisps and sandwiches but it's now always the case. I'm up and out of the house at five o'clock in the morning. you're on the road, trying to get to meetings. Coming back and I just grab

something, which is usually a sandwich or a meal deal although they're not ideal (inaudible) and that's over a thousand calories there so.

I; okay so what I'm hearing you say is that you have been making where possible to make conscious decisions, you eat fruit you take your own meals it's just when its unpredictable and you're out and about (1) erm and I suppose, I t sounds like that is the most problematic from what you're saying

P: yes

I; so what do you think you could do to kind of make sure that some of the times you make healthier options?

P; well I do a lot of the time, for instance coming back from ,London, I stop off at services and I get those pots of fruits

I: yeah

P; If vie nothing in the car, id have these pots of melon or grapes and ill have that and a pot of coffee something like that. I'll have a break. (1) I'm not one for making new year's resolutions, however, I want to try and cut bread out

I: right

P; vie done it before and lost. I suppose, Its err. When I cut the bread out there was noticeable weight loss from not eating bread

I: so that's something you've tried before

P; yeah yeah

I; okay erm (2) and it's something like that's a small chance but an effective change to do

P: yeah yeah

I; so how likely is it that you would be able to that?

P: from 1 to 10. Ten being highly likely, yeah, it's a ten

I; okay so do you foresee any barriers that get in the way of you being able to do that

P; no, because it's conscious. When I set my mind to something I'll do it. Like I said, no bread, and because you've said no bread, you're looking for an alternative.

I; yeah okay (1) so it sounds like you're really confident in doing that and you've done it before so you can do it again.

P; yeah

I; okay, so that sounds like a good idea. So when would you be starting to put that into motion?

P: After xmas.

I; after christmas, yeah. Get christmas out the way first

P; yeah I'm not that sadistic (both laugh)

I; okay vie got one other idea, which some people find helpful, just see what you think, erm sometime trying to keep a food diary just for a week can help identify what you do it and don't eat, the good things and the bad things

P; yeah vie done it before,

I; have you?

P: yeah it was more of a calorie counter. Erm when I went on the referral, I did it then. I started calorie counting. That probably helped with, not so much the weight loss, but the shape change. The going to the gym, you know, cutting the calorie intake down. I said to M (inaudible). I set myself a number of calories and I cut it down to limit to 2500. I was trying to keep it under 2000 and I did that and I understood the calorific value (inaudible). So yeah vie done it before

I: so how did you find it then, that calorie counting? How do I that fit in with you?

P: yeah it was alright. I mean I said before I'd pick a packet of crisps up and count the calories on it and thing, hang on, that's half an hour on the treadmill.

I: so it made you think a bit more about what you were eating.

P: It did yeah cos, and then setting a limit of 1500 calories or whatever, you know what you can eat and it does help.

I; so it sounds like you got a lot of benefits from it and you found it a helpful too It's: It's just getting back into the routine of doing it

I: yeah cos I was going to say, what changed from you doing it to not doing it?

P; erm (4) bad habit. I feel out of doing it. I didn't bother doing it whereas I should have done. I got lazy. Will power thing. Dunno

I; so over time your motivation started to

P; there's the word- motivation

I; what do you think contributed to that sort of drift?

P: erm (4) well I suppose when you achieve a goal erm and then obviously you think you need to do it anymore and then all of a sudden you're back where you started

I; okay so it sounds like then, you set yourself a goal. You did it and then achieve it and you were like great vie done it now.

P; yeah

I: rather than okay, so, and I suppose you needed another goal, and its law=most as if that was needed then, do you see what I mean?

P; yeah it was, and to be fair it's needed now.

I: okay, so how do you feel about setting some new goals around weight a food?

P; yeah, definitely

I; okay so what do you think is a realistic amount to lose- a target?

P; I need to get my starting point first (laughs) I don't know, I'd like to; It's normally on clothes anyway. That's how I judge it. So I would say. A stone and a half to start. And then set another goal.

I; okay so to set a realistic goal, a stone and a half,



P; I'm not going to set a large goal like 5 stone. It's got to be realistic

I; exactly, and it sounds like one of the ways you're monitoring that would be your clothes and that's a good way of noticing when you've achieved what you wanted to do.

P; yeah

I: so to set firmly in your mind then, what are the things that you have to do to achieve this?

P; well erm (2) it's the diet, what you're eating, and drinking as well. What you're drinking and erm, the exercise really, doing or not doing

I: so it's a bit of everything. Drink, diet and exercise.

P: yeah

I: so how confident are you that you could do this consistently over the next three months

P: very confidence, on a scale of 1-10?

I; yeah why not (laughs)

P: erm I would say an 8 or a 9

I: so quite high

P: yeah

I: so erm, again with the scales (laughs), you're fairly confident and it sounds like it comes from the fact that you've done it before so you've got that ability to do this. I'm just wondering, how committed are you on a scale of 0-10?

P: to achieving the goal?

I; yeah so to put this into motion and looking at changes in the diet

P; yeah again an 8 or a 9.

I: okay so how are you going to start this then?

P; well I want to get xmas out of the way and then I'll start calorie counting and then taking the diary with me, not just at home, take it with me, which is something that I didn't do. Writing it at work and keeping it going. The exercise (4) so not just a food diary, but also the alcohol intake. There a lot of calories in that lot. Plus, I'm not going to become a saint or a monk overnight (laughs) you know

I; you've got to be realistic

P; yeah that's why people don't achieve their goals

I; they set their goals too high, don't achieve it and wonder why.

P; yeah

I: so overall, I think you've got a lot of experience with this but what I'm hearing from you is that you've learnt from the process and you're saying vie done this before but what I didn't do is take it to work.

P; yeah

I; so you've got a good idea and let's get christmas out of the way. So what are we saying, the first of January?

P; let's say the 2<sup>nd</sup>. I'm back to work.

I; okay so 2<sup>nd</sup> of January, you've got a good plan. So see what happens on the exercise front, test the waters with the back and rest it. And in January, get cracking with the diet. Erm. How does it sound if you send me, do a week first, and then you send me a copy of the diary? But I think we'd probably speak before then

P: do you want a word document or excel sheet/

I; it's up to you; whatever you feel comfortable with (2) erm there is actually an app. Are you into your apps?

P; (laughs) yes

I; it's called my fitness pal.com and basically it's a database and you type in what you've had

P: oh right

I: it's got everything in their including home cooked stuffs. You can choose what you want to see- how much iron or fat you're having.

P: oh right yeah.

I; And it basically does it for you. You can set your weight goal and it will tell you exactly if you're on target

P; I've actually got something similar on my ozone come to think of it, but vie not actually activated it. If you can send me the link through me will do.

I: and if you do that you can print or save the document

P; yeah

I; so how does all that sound?

P; yeah it sounds good yeah.

I: okay so next time I contact you it will be on Tuesday in the new year- 8<sup>th</sup> or 9<sup>th</sup> of January.

P; yeah that would be good that

I: cool, have a good Christmas. Ill speaks to you in January, bye.