



Leptogenicity of the Food Environment and Food Choice Behaviour in Leisure Centres

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Leptogenicity of the Food Environment and Food Choice Behaviour
in Leisure Centres

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Abstract

Leisure centres offer a platform for physical activity. Previous research however suggests that leisure centre food environments may not be congruent with the leptogenic (lean promoting) physical activity offer. Despite this, there is a paucity of research evaluating the food environment and food consumer behaviour in UK leisure centres.

A situational analysis was carried out in leisure centres using the Analysis Grid for Environments Linked to Obesity (ANGELO), and the food offer was categorised using the Nutrient Profiling Model (NPM). Semi-structured interviews were used to explore leisure centre café users' (*n* 7), managers' (*n* 2) and catering managers' (*n* 2) perceptions of the leisure centre food environment and the perceived influences on behaviour. As a result of the findings, a 2-week long experiment was carried out to determine the impact of Calorie information on consumer intention to make healthy food choices and on purchase behaviour. Questionnaires, based on an adapted version of the Theory of Planned Behaviour (ATPB), were distributed to café users. Structural equation modelling (SEM) was used to examine the strength of the hypothesised pathways of the model. The impact of the experiment on the ATPB and energy (kcal) purchased were evaluated using independent samples t-tests. Additionally, consumers were profiled based on their responses to the ATPB using a hierarchical cluster analysis.

All stakeholders were supportive of increasing the healthiness of the food environment in leisure centres, however catering managers and managers had concerns over potential financial implications. During the experiment, Calorie information significantly increased consumer confidence and control, however there was no statistical increase in intention to make healthy choices or in the leptogenicity of purchase behaviour. SEM offered a novel approach to demonstrate the strength of the hypothesised pathways and confirmed that the strongest pathway to intention is via attitudes. Three consumer segments were identified; nutritionally motivated, nutritionally ambivalent and nutritionally disinterested. Future research should focus on increasing the availability and visibility of healthy choices, targeting influential people and challenging habit and preference.

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Abbreviations

AGFI	Adjusted Goodness of Fit Index
ANGCY	Alberta Nutrition Guidelines for Children and Youth
ANGELO	Analysis Grid for Environments Linked to Obesity
ATPB	Adapted Theory of Planned Behaviour
BP	Blood Pressure
CFA	Confirmatory Factor Analysis
CFI	Comparative Fit index
CHD	Coronary Heart Disease

EDNP	Energy Dense Nutrient Poor
EFA	Exploratory Factor Analysis
EU	European Union
GFI	Goodness of Fit Index
HFSS	High Fat, Salt and Sugar
HTAS	Health and Taste Attitude Scale
IFI	Incremental Fit Index
KMO	Kaiser-Meyer-Olkin
NDNS	National Diet and Nutrition Survey
NFI	Normed Fit Index
NNFI	Non-Normed Fit Index
NPM	Nutrient Profiling Model
PBC	Perceived Behavioural Control
PBCC	Perceived Behavioural Control and Confidence
RMSEA	Root Mean Square Error of Approximation
SEM	Structural Equation Modelling
SSB	Sugar-Sweetened Beverages
TLI	Tucker-Lewis Index
TLL	Traffic Light Labelling
TPB	Theory of Planned Behaviour
UK	United Kingdom

Chapter 1 Introduction

1.0 Purpose of the Chapter

Chapter 1 will introduce the research background, outline the structure of the thesis and identify the aims, objectives and research question for the present study.

1.1 Research background

Modern environments are considered unsupportive of healthy consumer behaviours (Townshend and Lake, 2009). The obesogenic environment, which promotes sedentary behaviour and less healthy food choice, is a recognised factor that could be contributing to increased obesity prevalence (Edwards *et al.*, 2010; Ferreira *et al.*, 2007). Within England, 64% of adults are classed as overweight or obese (Public Health England, 2014a). Obesity is associated with multiple co-morbidities, including type 2 diabetes, types of cancer and hypertension (National Institute for Health and Care Excellence, 2014; National Health Service, 2012), and on a global scale is responsible for around 2.8 million deaths per annum (World Health Organization, 2013). In addition to the negative health impact of obesity, annual economic impact is predicted to reach £49.9 billion by 2050 (Butland *et al.*, 2007). These figures illustrate the detrimental impact of obesity on both individual health and wider society, highlighting the need for a sustained research effort into obesity management leading to practical solutions. The obesogenic environment, which promotes sedentary behaviour and poor dietary choices, is a recognised factor that could be contributing to increased obesity prevalence (Edwards *et al.*, 2010; Ferreira *et al.*, 2007).

The physical activity environment offered by leisure centres suggests that they are an appropriate platform for communicating healthy food choices (Kelly *et al.*, 2010; Carter *et al.*, 2013). However, previous research in leisure centres has demonstrated that the food offer may not be congruent with the concept of a healthy lifestyle (Nowak, Jeanes and Reeves, 2012; Olstad, Raine and McCargar, 2012). There is a paucity of research (Nowak, Jeanes and Reeves, 2012) which has investigated the food environment in UK leisure centres, and an absence of insight into consumer food choice behaviour within UK based leisure centres. Furthermore, only one study reporting the impact of nutritional

information on food choice in leisure centres was identified, which took place in Canada (Olstad *et al.*, 2015b).

1.1.2 Leisure centres

UK leisure centres can be controlled by the local government, trusts or private businesses (Benson and Henderson, 2005). Increasing numbers of public leisure centres are run by trusts (30%) as opposed to local government (Mintel, 2017a). Media reports have demonstrated that trust run leisure centres can help to save councils money, partly because some of the trusts are charitable organisations, and that attendance at these sites is good (The Guardian, 2013). Research by Mintel (2017b) found that 23% of participants used a public leisure centre at least once a month compared to 17% of participants who used a private health club at least once a month. Furthermore, across a 12 month period, more females (34%) visited a leisure centre in comparison to males (29%), and a higher proportion of individuals under 45 years (37%) visited a leisure centre when compared to individuals over 45 years (26%) (Mintel, 2017a).

There are a range of motivations for why individuals engage with public leisure centres and private gyms. For example, Crossley (2006) observed that private gym users may have different motivations for joining a gym than for sustaining use once they have joined. Two primary motivations for joining included a desire to improve performance, namely where the gym user was an athlete, and a motivation to lose weight or increase fitness levels. In terms of continuing use, it was observed that gym attendance became part of a routine, so motivation was no longer required. Enjoyment and the social aspect of attending a gym also encouraged continued use. Furthermore, research carried out by Pridgeon and Grogan (2012), in a small gym without exercise classes, found that some individuals had ended their membership. This particular group needed to establish a routine in order to be able to enjoy attending and they would rely on a training partner to make the experience less intimidating and to motivate them. This cohort were also more likely to compare themselves to others in a way that would impact on their self esteem and stimulate concerns about their body image. In comparison, gym-users who had sustained their membership tended to be motivated by competition and by other gym users who they saw as role

models. Furthermore, similar to the results found by Crossley (2006), attendance was seen as habitual, hence motivation was not required. The research by Crossley (2006) and by Pridgeon and Grogan (2012) demonstrates that customers may have a variety of goals when using a gym and may be more suited to different environments.

Nelson and Henderson (2005) discussed the importance of considering market orientation within UK leisure centres, which included “customer orientation, competitor orientation and inter-functional co-ordination” (Nelson and Henderson, 2005, p.242). Demand for particular services can be dynamic in the leisure centre industry and with decreasing demand of some services, and increasing demand of alternative services, the leisure centre may experience changes in customer orientation and in their potential target market. Doyle (1992) argued that performance is dependent upon on the satisfaction of several stakeholders. In a leisure centre context, Nelson and Henderson (2005) identified the key stakeholders as customers, managers, employees and owners, where owners were defined as ‘elected members’ for local government controlled leisure centres. This demonstrates the need to involve several key stakeholders in the present study.

Mintel (2017a) suggested that the gap between the facilities available at private gyms and public leisure centres may be getting smaller, however that customers who engage with private gyms may be more likely to demonstrate demand for technology, such as virtual reality exercise classes, which may not align with the demands of the market users for public facilities. Customers may also be offered a variety of membership types, and the preferred type of membership may differ between private gyms and public leisure centres. For example, research carried out by Mintel (2017a) identified that a number of private gyms offer short-term contracts, with a monthly payment, that last around 3-6 months , however only 10% of public leisure centre users would be interested in this option. Furthermore 33% of participants reported that they would not be interested in joining a public leisure centre, perhaps instead using a ‘pay as you go’ option which involves a one-off fee for each visit.

In terms of the food environment, previous research carried out in London identified that 51% of the 67 venues audited had a café or restaurant on-site (Nowak, Jeanes and Reeves, 2012). The research identified that 78% of private venues and public venues reported promotion of healthy eating however evidence of promotion was only found in 9% of private venues and was not found in any public venues. Furthermore, despite nutritional labelling being mandatory on pre-packed foods, for non pre-packed food, including food prepared in a leisure centre café, there are only voluntary guidelines (Food Standards Agency, 2016). Therefore, nutrition labels do not need to be provided in leisure centres however they could prove useful to encourage healthy choices.

1.2 Structure of the thesis

The study was carried out in two stages. The first stage involved preliminary research which informed the development of a nudge strategy that was tested in the second stage of the study. The thesis was structured so that the method, results and discussion for the first stage precede the method, results and discussion sections for the second stage. A methodology section, which introduces the structure of the research in more depth, precedes the method for stage 1. The results of the second stage of the study were presented in three chapters, each followed by a separate discussion chapter. This structure was adopted because each of the results and discussion chapters informed the following results and discussion chapters. Table 1 summarises the chapters which correspond to each section of the research project. Figure 1 provides a flowchart of the chapters.

Table 1: Structure of the Thesis, by section

Section	Chapter
<i>Literature Review</i>	<ul style="list-style-type: none"> • Chapter 2
<i>Method and Methodology Chapters</i>	<ul style="list-style-type: none"> • Chapter 3 Philosophy and Methodology • Chapter 4 Method Stage 1 • Chapter 7 Method Stage 2
<i>Results Chapters</i>	<ul style="list-style-type: none"> • Chapter 5 Results 1 • Chapter 8 Results 2 • Chapter 10 Results 3 • Chapter 12 Results 4
<i>Discussion Chapters</i>	<ul style="list-style-type: none"> • Chapter 6 Discussion 1 • Chapter 9 Discussion 2 • Chapter 11 Discussion 3 • Chapter 13 Discussion 4
<i>Conclusion</i>	<ul style="list-style-type: none"> • Chapter 14

Chapter 2 Literature Review

Chapter 2 contains a review of previous research within the field. A further review was carried out after the results of the first stage of the study, which was integrated into Chapter 2 to demonstrate how all the research fits together to inform the present study.



Chapter 3 Philosophical Assumptions and Methodology

Chapter 3 presents an overview of the different philosophical perspectives and demonstrates the researcher's own assumptions which have informed the method and methodology. A rationale for the two stage, mixed method approach that was adopted has been provided.



Chapter 4 Method Stage 1: Situational Analysis and Semi-Structured Interviews

Chapter 4 outlines the methods adopted for stage 1 of the study. The sampling approach, study design and analytical procedures have been detailed and justified.



Chapter 5 Results 1: The Leisure Centre Food Environment

Chapter 5 outlines the results of the situational analysis and semi-structured interviews that formed the first stage of the study. The results of the situational analysis have been presented in the format of the ANGELO framework and the results of the semi-structured interviews have been presented in themes.



Chapter 6 Discussion 1: Strategies to Increase Leptogenic Food Choice

Chapter 6 discusses the results of the situational analysis and semi-structured interviews, and examines potential strategies to increase leptogenic food choice. Based on current literature and stage 1 findings, a tailored nudge strategy was designed.



Chapter 7 Method Stage 2: Quasi-experiment and Questionnaire

Chapter 7 outlines the methods adopted for stage 2 of the study. The sampling approach, study design and analytical procedures have been detailed and justified.



Chapter 8 Results 2: Theoretical Relationships between Constructs

Chapter 8 explores the underlying factor structure of the questionnaire data

using exploratory factor analysis. A confirmatory factor analysis was used to confirm the factor structure. This factor structure was adopted for all of the results sections for stage 2. Structural equation modelling (SEM) was used to confirm the acceptability of the hypothesised Adapted Theory of Planned Behaviour (ATPB) model.



Chapter 9 Discussion 2: Pathways to Modify Intention and Behaviour in Leisure Centres

Chapter 9 evaluates and discusses the relationships between Concern Disease, Concern Nutrients, Motive, Attitudes, Subjective Norms, Perceived Behavioural Control and Confidence (PBCC), Intention and Behaviour that underpin food choice in leisure centre cafés.



Chapter 10 Results 3: Impact of the Nudge Strategy

Chapter 10 determines the impact of the intervention, where Calorie information was displayed on menus in leisure centre cafés, on consumer Concern, Motives, Attitudes, Perceived Behavioural Control and Confidence (PBCC), Subjective Norms, Intention and Behaviour. Self-reported influences on behaviour have been presented in themes.



Chapter 11 Discussion 3: Evaluation of the impact of Calorie information on PBCC, Intention and Behaviour

Chapter 11 discusses the impact of the intervention and the self-reported influences on food choice which may have prevented increased leptogenic intention and behaviour whilst the intervention was in place.



Chapter 12 Results 4: Leisure Centre Consumer Segmentation

Chapter 12 profiles participants based on their Concern, Motives, Attitudes, PBCC, Subjective Norms and Intention. Comparisons were made between the results of each of the three clusters identified; Nutritionally motivated consumers, Nutritionally ambivalent consumers and Nutritionally disinterested consumers. Comparisons were also made between the purchase behaviour and self-reported influences on behaviour for each of the clusters.



Chapter 13 Discussion 4: Consumer Segments and Nutritional Motivation

Chapter 13 discusses the potential merits of tailoring different strategies to encourage leptogenic food choice in nutritionally motivated, nutritionally ambivalent and nutritionally disinterested consumers.



Chapter 14 Conclusions

Chapter 14 discusses the strengths and limitations of the present study, makes recommendations for future research and concludes the research study.

[Figure 1: Structure of the Thesis](#)

1.3 Aim and Objectives

Based on the design of the study, aims and objectives were developed for each stage. This was because the research direction for stage 2 was influenced and ultimately directed by the outcomes from stage 1. The research question was developed from the results of stage 1 (Chapter 5).

1.3.1 Aim and Objectives for Stage 1

1.3.1.1 Aim

To explicate how UK consumers interact with leisure centre food environments and to identify strategies to increase leptogenic food choice.

1.3.1.2 Objectives

1. Deconstruct and classify the obesogenicity of leisure centre food environments using the ANGELO framework and nutrient profiling model.
2. Determine stakeholder perceptions of the food environment in leisure centres using semi-structured interviews and identify strategies to encourage leptogenic food choice.

1.3.2 Aim and Objectives and Research Question for Stage 2

1.3.2.1 Research Question

Does Calorie information, designed to nudge consumers towards leptogenic food choice, impact on consumers' intention and behaviour in leisure centre cafés?

1.3.2.2 Aim

To determine the impact of Calorie information on the leptogenicity of consumer food choice intentions and behaviours in leisure centre cafés, using the Adapted Theory of Planned Behaviour (ATPB).

1.3.2.3 Objectives

1. Implement a nudge strategy, the provision of Calorie information, in leisure centre cafés and determine consumers' food choice intentions and behaviours using the ATPB.
2. Apply structural equation modelling to evaluate the relationships between factors, and evaluate the contribution of the ATPB to explain food choice in leisure centre cafés.

3. Segment consumers according to patterns in their mean scores for Concern, Motive, Attitudes, PBC, Confidence, Subjective Norms and Intention and compare their demographic characteristics, energy (kcal) intake, and nature of the influences on food choice behaviour.
4. Evaluate the success and impact of the selected strategy and issue specific recommendations for future work with the different consumer segments identified.

Chapter 2 Literature Review

2.0 Introduction

Chapter 2 will review previous research in the field. The chapter starts with a definition of the food environment, and more specifically what comprises an obesogenic or leptogenic environment. In line with the field of study, the focus will then be placed on the food environment in physical activity settings. Subsequent to this, food environment models have been evaluated in relation to the context of the present study. The chapter also introduces relevant theories such as exchange theory, rational choice theory, behaviour modification and nudge theory. Finally, consumer behaviour models have been evaluated in relation to the context of the present study.

2.1 Definition of the food environment

The term 'food environment' is abundant in the literature (Naylor *et al.*, 2010a; Olstad, Raine and McCargar, 2012; Olstad *et al.*, 2011a; Thomas *et al.*, 2012). It has been defined as a "complex social network impacted by social, economic and political factors at the neighbourhood, regional, national and international levels" (Brown and Brewster, 2015, p.202). More specifically, the food environment refers to the availability of energy and nutrients within a particular environment, and the factors that may influence consumers' accessibility to, or consumption of, particular products (Holsten, 2009). These influences are often governed by the aforementioned network of factors which may subsequently play a role in overweight and obesity prevalence (Sallis and Glanz, 2009). The present study is interested in the food environment in leisure centres, and aims to explicate how leisure centre users interact with the food environment in this setting. As per a previous study, 'food' was defined as "any food or non-alcoholic beverage and excluded food supplements, vitamins or sports supplements" (Carter *et al.*, 2012, p.1374).

The food environment is a platform which can potentially inform and influence consumer food choice, and as such there has been academic interest regarding its potential impact on public health (Lytle, 2009; McKinnon *et al.*, 2009). It has been suggested that modern food environments may be unsupportive of healthy

consumer behaviours (Townshend and Lake, 2009). As a result, the environment may be considered 'obesogenic'. An 'obesogenic environment' refers to "the sum of influences that the surroundings, opportunities, or conditions of life have on promoting obesity in individuals or populations" (Swinburn, Egger and Raza, 1999, p.564). The emphasis on 'surroundings' is essential for the present research which will focus on consumer interaction with the leisure centre food environment. Although obesity prevalence was a primary driver of the present research (Chapter 1), the study will focus on the obesogenicity of the food environment and will not consider the obesity levels of individuals. Interventions designed to facilitate the transition between obesogenic and leptogenic environments are considered pertinent to support public health policies, demonstrating a need for this research (Edwards *et al.*, 2010; Ferreira *et al.*, 2007; Hinde and Dixon, 2005). The following section (2.1.1) will consider the obesogenic environment in greater detail.

The present research focuses on the food environment in leisure centres. It is recognised that energy intake at a leisure centre may only contribute towards a small percentage of annual energy intake, when compared to other environments. However, World Health Organization (2012) identified that some interventions which target diet, physical activity and health could act as a 'lighthouse' to guide consumers, even though they may have a negligible effect on overall intake. Previous research has found that consumers estimate there to be less energy (kcal) in food that is purchased from a healthy restaurant, such as Subway, when compared to food that is purchased from an unhealthy restaurant, such as McDonald's, even if the actual energy (kcal) is exactly the same in both restaurants (Chandon and Wansink, 2007). This demonstrates a 'health halo' effect, where food is perceived to be healthier within a restaurant that is perceived to be healthy. Leisure centres offer a leptogenic physical activity environment which suggests that they purport a healthy image, which could create a health halo effect. However, previous research within leisure centres has suggested that the food environment may be incongruent with the concept of a healthy lifestyle (Nowak, Jeanes and Reeves, 2012; Olstad, Raine and McCargar, 2012). The food environment in physical activity settings will be discussed further in section 2.2.

2.1.1 Obesogenic/leptogenic food environment

It has been posited that individual choices are influenced by "the prevailing culture relating to food and physical activity which favours overconsumption and inactivity" (HM Government, 2011, p.19). As a result, obesity research has evolved beyond physiological and behavioural characteristics at the individual level, to consider the wider food environment that individuals are exposed to (Elinder and Jansson, 2009). Within the UK, this also helps the focus on health and wellbeing to transcend the NHS and place emphasis on the nature of the environment (Barton, 2009). Lifestyles strongly impact on the quality of public health (Bandura, 1998), so it is imperative that food environments are supportive of healthy consumer behaviours (Swinburn, Egger and Raza, 1999).

Poor dietary choices and sedentary behaviour are key risk factors for individuals becoming overweight and obese (Prentice and Jebb, 1995; World Health Organization, 2014). This is due to the resulting imbalance in energy intake and expenditure (Jones *et al.*, 2007), with a positive energy balance likely to evolve from energy dense, nutrient poor (EDNP) foods and low physical activity. Individual food choices and physical activity output can be influenced by environmental factors (Butland *et al.*, 2007), for example the paucity of healthy food choices are a key barrier to healthy behaviours (Scammon *et al.*, 2011). Furthermore, Cohen and Lesser (2016) suggested that sales of less healthy foods may be promoted more, as the food industry is primarily driven by profit as opposed to potential health consequences. Although the authors recognised that it was unlikely to be the intention of the food industry to create an unhealthy environment, the promotion of less healthy products means that consumers are often challenged at the point-of-purchase to either make purchases which align with long-term health goals or that could increase their risk of disease, such as cancer and hypertension. Whilst this makes the assumption that all consumers have long-term goals to stay healthy, it does demonstrate the decision that consumers have to make between healthy or less healthy food choices. It is proposed that the food environment could be manipulated to encourage healthier food choices (Lake and Townshend, 2006). This may reflect a transition from traditional marketing through to social marketing, which applies marketing principles for a social benefit (2.5.2).

In contrast to the concept of the obesogenic environment, Swinburn, Egger and Raza (1999) introduced the dichotomous term; 'leptogenic environment'. Leptogenic environments promote leanness through the encouragement and facilitation of physical activity and healthy food choice. In recent years, there has been increasing interest in leptogenic choices as consumers have become increasingly health conscious (Kemp and Bui, 2011; Falguera, Aliguer and Falguera, 2012). In line with the concept of leptogenic environments, the Town and Country Planning Association (2014) introduced the idea of creating 'healthy weight environments'. This represents an environment which is designed to support individuals to achieve or maintain a healthy weight. Consumer interest in improving dietary behaviours suggests that research into the leptogenicity of food environments is timely and essential.

2.1.1.1 Definition of healthiness

"To date, there is no universal definition of the healthfulness of a food" (Bucher *et al.*, 2016, p.95). Furthermore, the perceived healthiness of an environment, such as the food environment, can differ between individuals (Glanz *et al.*, 2005). Previous research has sought to investigate the concept of healthy eating through seventy-nine interviews (Falk *et al.*, 2001). Participant definitions of healthy eating were categorised into seven categories; "low fat", "eating natural/unprocessed foods", "balanced eating", "eating to prevent disease", "maintaining nutrient balance", "eating to manage existing disease" and "eating to control weight" (Falk *et al.*, 2001, p.428; p.430). The results established that individual's definitions of healthy eating had been shaped by experiences, for example past experiences, family and the environment, and by information from sources such as health professionals and food labels. In the same study, foods deemed as 'healthy' included foods that were 'fat free', 'organic', 'fresh', 'low calorie' and deemed to be 'real food'. It was also reported that participants referred to 'vegetables' when asked about healthy food. This was also found in research carried out in Greece by Tsiamparli, Tsakiridou and Mattas (2013) where the majority (61.6%) of the 793 participants strongly agreed that fresh fruit and vegetables are healthy. Furthermore, 45.5% of the participants agreed with the notion that healthy eating is 'balanced eating'. These results in

combination with the findings from the research carried out by Falk *et al.* (2001) demonstrate some variation in how consumers define 'healthy eating' which can impact on the success of attempts to promote healthy food choice (Tsiamparli, Tsakiridou and Mattas, 2013).

Individual perceptions of a healthy diet may also differ based on engagement with physical activity. Khan *et al.* (2017, p.2) stated that for "moderate physical activity, a healthy diet should prevent weight gain, help to maintain appropriate body composition, and prevent any adverse health issues". For athletes, the recommended composition of their diet changed, based on whether they were preparing to train for an event, were training for an event, or had completed an event. Therefore what may be seen as an optimum diet could change based on the stage of their training. Furthermore, research by Fox *et al.* (2011) found that male university athletes' perceptions of their protein requirements were much higher than the recommended level. In addition, their protein intake was significantly higher than the recommended amount. Despite recognition that protein requirements for athletes may be higher than the general population, it was proposed that excessive intakes significantly higher than the recommendations would not offer any additional benefit to performance, although athletes may perceive high protein to form part of an optimum diet.

Due to the differences in the definition of 'healthy' eating, it is essential to define the meaning of 'healthy' within this study. Nutrient profiling systems can be employed to help categorise the healthiness of a food offer. For example, the Nutrient Profiling Model can be used to determine overall healthiness, taking into account energy (KJ) intake alongside macronutrients and fruit, vegetable and nut intake (Department of Health, 2011). Furthermore, kilocalories, a measure of the amount of energy in a food or drink (NHS Choices, 2016a), can be used to determine the leptogenicity or obesogenicity of a product. This can be achieved through a comparison of the product's nutritional value and the recommendations for energy (kcal) intake. As a result, healthiness was defined in the present study as energy (kcal) purchased within the recommendations provided by Public Health England (2014b).

2.2 Food environment in physical activity settings

It has long been recognised that physical activity and adequate nutrition are both required for optimum health (Prentice and Jebb, 1995; Cramer, 2016), and to help prevent overweight and obesity (World Health Organization, 2014). As a result, there is a body of research which focuses on the food environment in physical activity settings. Research in this field takes place on an international platform, illustrating its global impact. The majority of research to date has taken place in Canada (Naylor *et al.*, 2010b; Olstad *et al.*, 2015b; Olstad *et al.*, 2015c; Olstad, Raine and McCargar, 2012; Olstad *et al.*, 2011a; Olstad *et al.*, 2011b; Thomas and Irwin, 2010; Danylchuk and MacIntosh, 2009; Naylor *et al.*, 2010b), and Australia and New Zealand (Kelly *et al.*, 2010; Carter *et al.*, 2013; Lloyd and Dumbrell, 2011; Dobbinson, Hayman and Livingston, 2006; Kelly *et al.*, 2008; Kelly, Bauman and Baur, 2014; Kelly *et al.*, 2012). Literature in this area has been published in recent years, demonstrating that this research addresses a contemporary issue (e.g. Olstad *et al.*, 2014; Kelly, Bauman and Baur, 2014; Kelly *et al.*, 2014; Olstad *et al.*, 2015a; Olstad *et al.*, 2015b; Olstad *et al.*, 2015c). However there is a paucity of research available in the UK (Nowak, Jeanes and Reeves, 2012), highlighting the pertinence of further research in the UK.

Research in this field has encompassed food sponsorship of sport (Carter *et al.*, 2013; Kelly *et al.*, 2012; Ireland and Watkins, 2010; Danylchuk and MacIntosh, 2009; Pettigrew *et al.*, 2012; McDaniel and Heald, 2000; Kelly *et al.*, 2011a; Kelly *et al.*, 2011b), the food environment in children's sports clubs (Kelly *et al.*, 2010; Kelly *et al.*, 2008; Thomas *et al.*, 2012), and the food environment in recreational centres, or leisure centres as they are recognised within the UK (Vander Wekken *et al.*, 2012; Naylor *et al.*, 2010a). Although the present study focussed on leisure centres specifically, the general area of interest for this research is the food environment in physical activity settings. Due to the paucity of research available in leisure centres, the following section will provide a broad overview of literature regarding the food environment in physical activity settings. This includes sports sponsorship and the food environment in children's sports clubs. The purpose of this is to provide insight into the relationship between the food environment and physical activity settings, in view

of the healthy image that physical activity settings can purport (section 2.1), prior to an in depth review of the research relating specifically to the food environment in leisure centres (section 2.2.2).

2.2.1 Food environment in sports clubs and sports sponsorship

A previous systematic review regarding the food environment in sports settings, excluding only schools or research where food enhanced sporting performance, concluded that research in this area was limited (Carter *et al.*, 2012). The review included studies published since 1985 that reported primary research based around the nature of food/ non-alcoholic beverages, sponsorship, views on the food environment and the association between sponsorship, marketing and availability in physical activity settings. In total, 14 documents were included in the review which mainly comprised of research carried out in Australia, and 1 document from each of the following countries; UK, US, New Zealand, Canada. The majority of research reviewed the physical environment, however further research was deemed required into the type of food available and the choices made by customers. Parents in Australia were supportive of suggested restrictions on food, drink and alcohol sponsorship of elite and children's sports (Kelly *et al.*, 2012). The vast majority of parents considered companies selling sporting goods (99%), or fruit and vegetables (98%) to be appropriate sponsors. In comparison, snack food companies (73%), fast food restaurants (72%) and chocolate/confectionery companies (64%) were deemed by parents to be less appropriate. This demonstrates a desire for healthier food messages in sports clubs. Furthermore, a telephone survey carried out in New South Wales (Australia) with 402 parents of children aged 5-17 identified that only 2% of parents perceived community swimming pools to offer predominantly healthy products (Kelly *et al.*, 2008). When combined, these two pieces of research demonstrate that there is a desire for the food environment in sports clubs to convey healthier messages.

Sports arenas are considered to be captive settings (Turley and Shannon, 2000), as customers are exposed to the environment for a prolonged period of time, providing a platform for exposure to food based stimuli. It has been argued

that organisations, such as McDonalds, recognised to offer more obesogenic, palatable, energy-dense foods, provide a contradictory message when sponsoring a sporting event which showcases a leptogenic physical activity environment (Carter *et al.*, 2013). Part of the concern raised by Carter *et al.* (2013) referred to the notion of image transfer through sponsorship. This concern is supported by Meenaghan and Shipley (1999) who explained that image values can transfer from a particular category, such as sport, onto the sponsor. They posited that alignment with sport can transfer a number of image values onto the sponsor, including the image that sport is healthy. In terms of food and non-alcoholic beverage sports sponsorship, Danylchuk and MacIntosh (2009) queried the level of social responsibility from the organisers' perspective, and the company perspective, suggesting that both stakeholders should consider whether their alliance is appropriate. For example, the alliance between food companies such as McDonalds, Cadbury and Coca-Cola with the 2012 London Olympic Games gained media interest (Malhotra, 2012) due to the perceived incongruence between the healthiness of the physical activity environment and the healthiness of the food environment. These concerns demonstrate an expectation for the food environment to be consistent with the perceived leptogenicity of the physical activity environment.

2.2.2. Food environment in leisure centres

2.2.2.1 Importance and overview

Leisure centres have an innate leptogenic physical activity environment in terms of the prevalence of activities and equipment that is available. Due to this focus, it is posited that a leptogenic food environment is most suitable to complement the healthy image purported by leisure centres (Carter *et al.*, 2013). As identified in section 2.1.1, consumers are becoming increasingly health conscious. It is therefore arguable that individuals may use physical activity venues as an outlet to improve or maintain their health. For example, Crossley (2006) found a range of motivations for using gyms, which included weight management, fitness, and improving sporting ability. However, given the results of prior research in the field (Nowak, Jeanes and Reeves, 2012; Olstad, Raine

and McCargar, 2012), it is arguable that the food environment within leisure centres may not support this endeavour.

Research in leisure centres has focussed around the nature of the food environment (Naylor *et al.*, 2010a; Nowak, Jeanes and Reeves, 2012), policies and nutrition guidelines which regulate, or could regulate, the food environment (Olstad and Raine, 2013; Naylor, Olstad and Therrien, 2015; Olstad, Raine and McCargar, 2012; Olstad *et al.*, 2011a), and interventions to try and increase healthy food choices (Olstad *et al.*, 2014; Lloyd and Dumbrell, 2011). More recently, research in Alberta, Canada has begun to evaluate the impact of nutritional labelling on food choice behaviour (Olstad *et al.*, 2015b). The following sections will discuss the literature within each of these key areas.

2.2.2.2 Nature of the food environment in leisure centres

Naylor *et al.* (2010a) carried out audits of the food environment in public leisure centres. Largely, the food environment was considered to be obesogenic, although the focus groups which were carried out alongside the facility audits demonstrated that stakeholders were interested in change. Stakeholders that were involved in the focus groups included Managers, members of the City Council, Food Service Staff, Health Authority Members, Team Managers and Concession Operators, however it was unclear which stakeholders, if not all, demonstrated a strong interest in change. The audits were carried out by staff within each facility which could have introduced some researcher bias. This was a particular concern because research by Vander Wekken *et al.* (2012) demonstrated that 56% of industry suppliers to leisure centres perceived their products to be predominantly healthy whereas only 19% perceived their products as predominantly unhealthy. Whilst it is recognised that there are some healthy options within leisure centre food environments, research has demonstrated that the food environment in leisure centres is largely obesogenic in nature (Naylor *et al.*, 2010a; Nowak, Jeanes and Reeves, 2012), suggesting a possible misconception from some of the leisure centre stakeholders in the research carried out by Vander Wekken *et al.* (2012).

Despite the potential for bias introduced by staff completing the audit in the study carried out by Naylor *et al.* (2010a), the volume of completed audits ($n = 77$) could be seen as a strength. The results demonstrated that the most frequently available side order was deep fried foods (38%) and the most frequently offered desserts were cakes, pies, squares and cookies (55%). In comparison, healthier options such as fruit and vegetables comprised 10% of all available side orders, and yoghurt comprised 2% of all available desserts. The vending machines offered mainly chocolate and chips (crisps) (68%) and contained primarily sugar-sweetened beverages (SSB) (57%) in comparison to healthier alternatives such as water (13%) and 100% fruit or vegetable juice (10%). Results from a UK based study, which observed the food environment available to children in 67 leisure centres in London, of which 44 were public venues, supported the notion that the food environment offered higher proportions of less healthy products (Nowak, Jeanes and Reeves, 2012). Results indicated that 90% of public leisure centres offered sugary soft drinks and nearly 70% offered crisps and branded chocolate, compared to just over 20% which offered fresh fruit. This was the only research study identified that reviews the food environment in UK leisure centres. Whilst the study provides insight into the general obesogenicity/ leptogenicity of the food offer available within UK-based leisure centres, the research focussed on the food environment offered to children. Furthermore, the research did not extend to consider food consumer behaviour within this context, which means that there is no way to assess whether the lack of healthy options resulted in unhealthy food choices. This reflects a gap in the literature for research regarding food consumer behaviour within UK based leisure centres.

As part of the UK based study carried out by Nowak Jeanes and Reeves (2012), it was assessed whether the products available in the leisure centre would meet the criteria set by the School Food Trust criteria for school canteens. The criteria adopted within the study was not clearly outlined, however the results were divided into the following categories; permitted, restricted, and not permitted. Based on the School Food Trust criteria, only 0.4% of snack options and 14% of drinks offered in the vending machines in public leisure facilities would be permitted in schools. In comparison, 21.9% of

snack options and 39.5% of drinks served in the café/restaurant in public leisure centres would be permitted in schools. Furthermore, 73.1% of meals offered would be permitted in schools. This demonstrates the availability of some healthier options, however they are largely in the on-site café/restaurant as opposed to the vending machines. This could provide an opportunity for promoting healthier options within UK based leisure centre cafés/restaurants, however it is worth recognising that less of the public facilities which were investigated by Nowak, Jeanes and Reeves (2012) had a café/restaurant on-site (35%) when compared to facilities that had vending machines (98%). Given the availability of some leptogenic options in leisure centre cafés, it is interesting that Thomas and Irwin (2010) found that 34.4% of leisure centre users in Canada did not engage with the on-site catering facilities due to a lack of healthy food choice. This demonstrates a potential discrepancy between perception of the food offer and the actual offer, which may stem from a lack of ability to identify healthier choices. Clear identification and signposting of healthier foods is therefore paramount to help create a more leptogenic environment and inform the consumer.

In addition to using the School Food Trust criteria, Nowak, Jeanes and Reeves (2012) also adopted the Nutrient Profiling Model (NPM) to categorise drinks, and pre-packed snacks from the vending machines, based on whether they were healthy. The percentage of healthy snacks from the vending machine that were categorised as healthy using the NPM mirrored the percentage of snacks permitted by the School Food Trust criteria (0.4%). However, more drinks were categorised by the NPM as healthy (58.3%) than were categorised as permitted (14%). The same pattern was observed for drinks offered in the café/restaurant; 58.2% categorised as healthy compared to 39.5% categorised as permitted. This demonstrates some discrepancy in the assessment of the obesogenicity/leptogenicity of the offer, based on the tool adopted. This could be partly explained by the School Food Trust criteria containing a 'restricted' category, and from the focus on children adopted by this particular tool.

It is useful to recognise that this discrepancy may not be present between all nutrient profiling tools. Olstad *et al.* (2015c) assessed three nutrition profiling systems and found that all determined that the majority of vending machine

items (60-69%), in 18 recreational facilities in Canada, were categorised as least healthy. The nutrient profiling systems adopted included government nutrition standards for food/beverages in recreational and sports settings in British Columbia, Alberta and Nova Scotia. It was concluded that the policy outcomes would be similar using any of the three systems, demonstrating some consistency in government guidelines. The following section discusses the adoption of policies in leisure centres.

2.2.2.3 Policies within the food environment in leisure centres

Olstad and Raine (2013) carried out research in Alberta, Canada, and identified that the adoption of voluntary nutrition guidelines in recreational facilities is limited, and proposed that mandatory policies should be implemented. They argued that the government should subsidise public leisure facilities to encourage healthy living. Policies are considered useful to influence behaviour (Priest *et al.*, 2005). Priest *et al.* (2005) carried out a systematic review of studies which identified policy implementation in sporting organisations. The focus was on studies which evaluated policies to increase healthy behaviour, or assessed changes to intentions, attitudes or knowledge. This included, but was not limited to, healthy food choices. No controlled studies were identified, however barriers to the implementation of policies included a requirement for training and support with the development and evaluation of policies.

Naylor, Olstad and Therrien (2015) carried out an intervention in Canada where they provided support, such as training and resources, to enable recreational centres to improve the healthiness of their food environment. As part of the training, a representative from each facility was trained on a Healthy Food and Beverage Sales model, provided with guidance on goal setting and policy development, offered support with developing marketing materials, and provided with examples of policies adopted in different communities. Electronic resources and technical support with implementing the action plan were also provided. The experimental facilities ($n = 21$) were given 8 months of support. The intervention led to a significant increase in healthy vending products and a significant decrease in unhealthy products available at experimental sites when

compared to control sites ($n = 23$). Furthermore, healthy policies were implemented in a number of the experimental sites following the 8 months support provided, increasing from 10% of facilities with a policy in place to 48%. In comparison, none of the control sites had implemented a policy by the follow up point. This demonstrates the need for training and technical support to implement policies and improve the leptogenicity of the food environment. Olstad *et al.* (2011b) concurred that support can enable recreational centres to implement policies. However, interviews with staff involved in the study carried out by Naylor, Olstad and Therrien (2015) demonstrated that creating a healthier food environment can be resource intensive and very time consuming; suggesting that the 8 months provided for the study was inadequate.

Despite the barriers, once implemented, policies can be beneficial to the healthiness of a food environment. For example, facilities which had adopted the Alberta Nutrition Guidelines for Children and Youth (ANGCY) were found to offer more products classified as 'choose more often' and had less average energy (kcal) available in their vending machines compared to facilities which had not adopted the ANGCY (Olstad, Raine and McCargar, 2012). Despite this, the food environment was still not classified as leptogenic, and the Manager of one facility which had adopted the ANGCY subjectively estimated that only 25% of products were healthy. Furthermore, a survey of 151 recreational centres carried out by Olstad *et al.* (2011a) identified that only 6% of the centres had implemented the guidelines. An explanation was that Managers were concerned that the implementation of policies could prove detrimental to the customer demand, and therefore detrimental to revenue. This concern resonates throughout the field, and is generally raised by leisure centre Managers and staff (Olstad *et al.*, 2015b; Olstad and Raine, 2013; Vander Wekken *et al.*, 2012). Furthermore, Olstad, Raine and McCargar (2012) found that facilities felt that sales of food and beverages had reduced as a result of the ANGCY being implemented. Interestingly however, Vander Wekken *et al.* (2012) suggested that consumers are becoming increasingly health orientated, and therefore businesses will need to adapt to suit this evolving demand. Despite this, the perceived barrier to changing the food offer demonstrates the

need to consider alternative methods to improve the healthiness of the food environment in leisure centre settings.

2.2.2.4 Modifying the food environment in leisure centres

As opposed to reducing the availability of less healthy options, studies have started to explore the impact of interventions to modify and 'nudge' consumers towards healthier choices using a variety of stimuli. Nudge theory has been explained in detail in section 2.5.3. Olstad *et al.* (2014) studied the impact of the addition of descriptive menu labels, taste-testing and price reductions. Two concessions were available on the same site. In one concession, 9.1% of products were classified as healthy using the ANGCY, and this food offer was unchanged. In the second concession, where the intervention took place, the menu was designed to consist of 44.4% healthy products. The signage intervention in this concession involved changes to the names of healthy products to make them more appealing to children, and doubling the size of advertisements for healthy products. After 8 days of the signage intervention, taste testing of healthy foods was also offered. Finally, a 30% discount was offered on healthy products for 8 days, in addition to the signage and taste-testing interventions. An 8 day pre-intervention period was implemented prior to the signage intervention, and an 8 day post-intervention period, which reverted back to the baseline offer, was implemented after all interventions were completed.

Overall sales of products and a sub-sample of consumer purchases were collected, which accounted for 40.7% of the products sold during the study and were collected across a 5 hour period for 2 days of each intervention phase. Characteristics including sex, weight status and age of the sub-sample were estimated by the researchers. Overall, sales of healthy items did not differ between the intervention periods, however in the sub-sample a significant increase in sales of healthy products was observed. The authors reported that the reason for the differences was unclear, however as the data from the sub-sample was always collected at the same time period it was proposed that

consumers attending at a different time of the day may have been less receptive to the interventions, perhaps because of different motivations.

In the overall sample, 40.8% of the products sold were healthy which was significantly less than the amount of unhealthy products sold. This could be partly explained by the characteristics of the consumers, as the results of the sub-sample demonstrated that significantly more healthy products (43.5%) were purchased by adults alone when compared to adults who were with children (39%), or children alone (35.8%). The results from the sub-sample also demonstrated that females were significantly more likely to be influenced by signage and taste-testing combined when compared to males who were more likely to be influenced by signage, taste-testing and price combined. Furthermore, 44.7% of participants who were categorised as 'non-overweight' made healthy choices when compared to 27.5% of consumers who were categorised as overweight/obese. However, the accuracy of these findings are limited as consumers' weight status was estimated by the researchers during the study, and the differences between the results from the overall sample and the sub-sample also suggest that the characteristics observed may not be representative. Despite these limitations, the results of the study indicate potential differences between consumers, based on their characteristics. It is therefore critical to understand better how different consumers interact with leisure centre food environments and react to nudges aimed at increasing healthy food choices.

Given that the menu was adapted to include more healthy products for the study carried out by Olstad *et al.* (2014), it is arguable that the availability of healthy options could also have enabled healthier choices to be made. However, Olstad *et al.* (2011b) assessed the impact of implementation of the ANGCY on the food environment in a recreational facility in Canada and observed that children continued to purchase similar products. This was despite the fact that the ANGCY was 75% implemented in the concession, leading to 27% of products being categorised as 'choose more often' or 'choose sometimes' with the remaining 73% categorised as 'choose less often'. It was proposed that a reduction in the availability of less healthy choices would need to be made concurrently to the increase in healthy products, however it was not

clear what impact this would have on overall sales and how managers would view this proposal. The study by Olstad *et al.* (2014) found that, despite the changes made to increase the healthiness of the food environment, significantly more average daily revenue and gross profit was obtained from unhealthy sales (65.9%) when compared to healthy sales (34.1%). This would suggest that reductions in the availability of unhealthy products could potentially impact on revenue.

Lloyd and Dumbrell (2011) evaluated a project which aimed to replace energy dense nutrient poor (EDNP) products available in a community swimming pool kiosk with a healthier menu. A variety of stakeholders were involved in the project including a Public Health Nutritionist, a Community Services Manager from the local Government and a 'Business Person' from the community pool kiosk. The initial aim was to introduce a '100% healthy' menu which excluded products labelled as 'red', based on Australian Dietary Guidelines, which were described as products that "lack adequate nutritional value and are high in saturated fat and/or sugar and/or salt" (Lloyd and Dumbrell, 2011, p23). It was later concluded by the 'Business Person' from the community pool kiosk that the aim was unsuitable for the venue, based on the need for consumer choice. The results from interviews carried out with the stakeholders further emphasised the importance of consumer sovereignty and the consumers' right to autonomy with regards to food choice. Although it was unclear if all stakeholders supported this point, it was apparent that the desire for freedom of choice presented a barrier to replacing the energy dense nutrient poor (EDNP) foods. This aligns with the libertarian approach promoted by nudge theory (section 2.5.3) (Thaler and Sunstein, 2009).

One way to improve the food environment, but to maintain autonomous food choice is through the provision of information. Traffic light labelling (TLL) has been found to significantly increase the purchase of healthier products highlighted green, and significantly decrease the purchase of less healthy products highlighted red in recreational sports centre cafés (Olstad *et al.*, 2015b). An avoidance of any loss of revenue during the TLL intervention was also reported. This is particularly interesting given the widespread concern that changes to the food offer would have financial implications (section 2.2.2.3).

This suggests that changes to the food environment, such as the provision of information, would be appropriate to increase leptogenicity but minimise concern about revenue. As part of the Canada based study, customers ≥ 14 years of age were asked to rank the following factors based on their importance; convenience, taste, price and nutrition. The majority of participants at baseline (61.9%) and during the intervention (65.1%) ranked convenience as the most important, followed by nutrition (29.5%; 26.7%) which was ranked above taste and price. However, previous research has placed health as less important than taste and price. For example, Carrillo *et al.* (2011) investigated factors underlying food choice using the Food Choice Questionnaire and found that 'tastes good' received the highest average score for importance (M 6.51) on a 7-point likert scale, whereas 'good value for money' (M 6.15) and 'keeps me healthy' (M 5.83) were the second and third most important factors. The result obtained by Olstad *et al.* (2015b), which demonstrates that nutrition is ranked as more important than taste and price, could have been influenced by the context, for example recreational centre users could be more nutrition conscious, or by social desirability given the emphasis on nutritional labels within the remaining parts of the questionnaire. Although the results of the study by Olstad *et al.* (2015b) suggest that nutrition was ranked as the second most important factor, after convenience, they did not demonstrate to what extent consumers are motivated to make healthy choices. It was also unclear whether the results were specific to purchases in a leisure centre café, or whether participants were answering the questions in terms of what influences their purchasing decisions more broadly. Further research is therefore required to specifically identify intention to purchase healthy choices in a leisure centre café.

Olstad *et al.* (2015b) also identified consumer use of nutritional labelling when making a purchase and their understanding of labels. Of the 38% who noticed the TLL, 84.8% understood it and 39.3% said that they used it, the majority of whom used it to buy 'green items'. This demonstrates a purpose for the nutritional information to help support healthy choices. Furthermore, the majority of participants, before the intervention (81.1%) and during the intervention (80.2%), stated that they usually/always use nutritional information when

making a food choice. As only 39.3% of consumers reported using the TLL, the results may demonstrate a lack of visibility of the nutritional information to consumers and also highlight the possibility that consumers who ‘usually’ use nutritional information did not in this instance. It is therefore necessary to identify any further influences on consumer food choice in leisure centres, from a consumer perspective.

2.3 Nutritional information

There is a paucity of literature surrounding the provision of nutritional information in leisure centre cafés (e.g. Olstad *et al.*, 2015b), and an absence of literature within the UK. The research carried out by Olstad *et al.* (2015b), evaluated in the section above (section 2.2.2.4), was the only study identified that investigated the impact of nutritional information in a leisure centre food environment. Given the absence of further research in leisure centres, the following section will review the impact of nutritional information on food choice more broadly and will also detail the legislation that is in place.

It has been suggested that food labelling could encourage more leptogenic food choices, which could lessen the prevalence of obesity (Sonnenberg *et al.*, 2013). Kiesel, McCluskey and Villas-Boas (2011) were in support that the impact of nutritional information on consumer food choice, and the value placed by consumers on access to nutritional information, are pertinent areas to consider due to the prevalence of obesity. Nutritional information can elevate levels of transparency between the producer and the consumer (Hodgkins *et al.*, 2015). With regards to transparency, legislation, which came into force on 13th December 2014 (Food Standards Agency, 2017) made it mandatory for food establishments, such as cafés and restaurants, to provide allergen information to customers. This demonstrates the evolving nature of food labelling legislation. The Department of Health (2013) provide technical guidance for nutrition-related requirements, such as food labelling, which explains the guidance under the EU food information for consumers’ (FIC) regulation (No. 1169/2011). Back-of-pack nutritional labelling on pre-packed food is mandatory, however voluntary guidelines are currently provided for non-

pre-packed foods, such as those prepared in a catering establishment (Food Standards Agency, 2016). Although the present study took place whilst this regulation is in place, it is important to recognise that the regulation could be affected by Britain leaving the EU. This may provide an opportunity for reviewing the regulations, making research regarding the impact of nutrition labelling timely and essential.

A number of studies have suggested that TLL may be beneficial to help consumer understanding and interpretation of nutrition labels (Sonnenberg *et al.*, 2013; Olstad *et al.*, 2015b). TLL is considered to be an 'informational short cut' to facilitate quick comparison between products (Food Standards Agency, 2010). A previous study found that UK consumers use food labelling more frequently relative to five other European countries (Grunert *et al.*, 2010). The study investigated consumer use of front-of-pack nutrition labels, through questionnaires, observations and interviews in major retailers. A total of 27.0% of UK-based participants reviewed the nutritional information. This was higher than the percentage from the remaining countries under observation, which ranged from 8.8% to 19.7%, with a total mean of 16.8%. This suggests that UK consumers refer to nutritional information more frequently and may therefore be likely to respond to an intervention involving nutritional information.

Previous research has also investigated the best format of nutritional information. Hodgkins *et al.* (2015) investigated the impact of different nutritional labelling formats on perceived healthiness of yoghurts, pizza and biscuits. The formats investigated included TLL, the provision of guideline daily amounts, a hybrid of the two aforementioned labels, and a healthy logo, all of which were compared to a basic label which contained just the numerical nutritional information. It was found that there was little effect of the alternative formats on consumer perceptions of healthiness when compared to the basic label. Although the study design, which specifically asked participants to read each food label, could have been influential, the results suggest that the provision of numerical information alone is sufficient.

2.4 Frameworks/models of the food environment

The paucity of research available in UK based leisure centres (e.g. Nowak, Jeanes and Reeves, 2012), warrants further research to categorise the healthiness of the food offer. Furthermore, the absence of consideration of consumer perceptions and behaviours within UK based studies further demonstrates the need for a preliminary study to inform the development of an intervention. To help manage the complexity of the food environment, a number of models/ frameworks have previously been created to allow the food environment to be explored.

There are a breadth of models and frameworks available to help frame the food environment (Sallis and Glanz, 2009; Glanz *et al.*, 2005; Swinburn, Egger and Raza, 1999; Booth *et al.*, 2001). Booth *et al.* (2001), for example, devised a framework which comprised of several layers of determinants of physical activity and food choice. The model is intended to support public health based interventions. Within the model, a number of lifestyle factors are considered, including; barriers/ enablers of change, cultural factors, social factors, and psychobiologic factors. Whilst the latter component included factors such as experiential learning and conditioned behaviours, it also included genetics and physiology. The present study was focussed on how the environment can influence behaviour, therefore it was determined that consideration of genetic and physiological factors would not be appropriate. As a result, further models were considered.

Glanz *et al.* (2005) developed the Model of Community Nutrition Environments to audit the nutrition environment. The model includes the following sections; 'policy variables', 'environmental variables', 'individual variables' and 'behaviour'. The 'policy variables' refer to the presence of government and industry policies. The 'environmental variables' aspect of the model is comprised of four different types of nutrition environment including; the Organizational Nutrition Environment, the Information Environment, the Community Nutrition Environment, and the Consumer Nutrition Environment. The Organizational Nutrition Environment is based on environments which are accessed by specific communities; for example schools and churches. Whilst leisure centres may be most likely to be accessed by the immediate community,

public leisure centres are available for any users hence this type of environment seems less pertinent. The Information Environment largely relates to the media and to advertising which could influence consumer interaction with the environment. The Community Nutrition Environment encompassed factors such as proximity and availability of food and beverage outlets, which has been the subject of a number of recent research studies (Day and Pearce, 2011; Buck *et al.*, 2013; Black and Day, 2012; Smith *et al.*, 2013). The availability of a food environment within the leisure centre is key for the present study. It is important to consider that there may be a food environment external to the leisure centre that could influence engagement with the internal food environment, however the external food environment was not directly investigated as part of the present study. The Consumer Nutrition Environment, referred more to the availability of leptogenic food options, economic factors, product placement and promotion, and nutritional factors. This is the most aligned with the aim of the first stage of the present study (section 1.3.1.1), which intended to determine how consumers interact with the food environment and what strategies could help to increase leptogenic food choice. The 'individual variables' aspect of the model includes 'psychosocial' variables which did not form a key focus of the present study, however 'behaviour' is important to consider based on the latter half of the aim of the first stage of the study which focussed on the development of strategies to increase leptogenic food choice. Although the Model of Community Nutrition Environments would have been suitable for this study, The Analysis Grid for Environments Linked to Obesity (ANGELO) (Table 2) was purposefully developed to help categorise the obesogenicity of the environment (Swinburn, Egger and Raza, 1999) and is therefore, at first glance, particularly well suited to the aim of this study.

2.4.1 The ANGELO framework

The ANGELO framework considers both the food environment and the physical activity environment, which is a critical aspect of the present study. Furthermore, the framework has also been employed within a wide array of public health based studies which act to classify obesogenic environments (Dean and Elliott, 2012; Simmons *et al.*, 2009; Lloyd and Dumbrell, 2011). The

ANGELO is a 2x4 grid which facilitates the categorisation of the environment by size; micro and macro, and by type; physical, economic, socio-cultural and political (Swinburn, Egger and Raza, 1999). These factors clearly reflect the definition of the food environment that was provided earlier (section 2.1) (Brown and Brewster, 2015; Sallis and Glanz, 2009).

[Table 2: The ANGELO framework \(Adapted from Swinburn, Egger and Raza, 1999, p.565\)](#)

Environment type	Environment size			
	Micro-environment		Macro-environment	
	Food	Physical activity	Food	Physical activity
<i>Physical</i>	“what is available”*			
<i>Economic</i>	“costs related to food and physical activity”*			
<i>Political</i>	“rules related to food and physical activity”*			
<i>Socio-cultural</i>	“a community's or society's attitudes, beliefs, and values related to food and physical activity”*			

*Please refer to Swinburn, Egger and Raza (1999) for examples

In order to be able to determine the healthiness of the offer, it is critical to be aware of what is available within the environment (Nowak, Jeanes and Reeves, 2012). This reflects the physical environment of the ANGELO (Swinburn, Egger and Raza, 1999). Once the physical environment is understood, socio-cultural factors including ‘attitudes, beliefs, and values related to food’ can be considered (Swinburn, Egger and Raza, 1999, p.566). These factors are valuable to identify potential strategies to encourage leptogenic behaviour which forms a key part of the aim for the first stage of the study. According to the ANGELO, economic factors termed the ‘costs relating to food’ need to be determined (Swinburn, Egger and Raza, 1999, p.566). The cost of food can therefore be a barrier to healthy eating, and previous research has demonstrated that some healthier options, such as those based on meat or

protein, are more expensive when compared to their less healthy counterparts (Rao et al., 2013). Therefore, it is pertinent to consider economic factors to understand if they play a role in consumer interaction with the leisure centre food environment. It is also vital to consider political factors, termed the 'rules related to food' including any 'laws, regulations, policies, and institutional rules' (Swinburn, Egger and Raza, 1999, p.566-567). As discussed in section 2.2.2.3, the presence of food policy could increase the abundance of healthy options within a food offer, which in turn may help to address wider societal issues such as obesity (Carter and Swinburn, 2004). It has also been posited that leisure centres require policies to restrict the prevalence of less healthy food choices (Olstad, Raine and McCargar, 2012), emphasising the importance of identifying the presence of any policies which could influence the food offer, and how consumers interact with the food environment.

It has been posited that leisure centres reflect more of a micro-environment (Swinburn, Egger and Raza, 1999), hence the emphasis was placed on this environment size. Furthermore, the presence of a largely leptogenic physical activity environment was assumed, therefore the food environment formed the key focus of the study. The ANGELO was adapted to suit this focus (Table 3). One previous study was identified where the ANGELO framework was applied within a leisure centre setting (Lloyd and Dumbrell, 2011). The ANGELO was considered useful during the design stage of an intervention, to help clarify appropriate objectives for the study (Lloyd and Dumbrell, 2011). In this instance, the ANGELO was employed as an analytical framework to report on the process evaluation for a project which originally intended to replace EDNP products with healthier products, in an on-site kiosk (section 2.2.2.4). The aforementioned study was carried out in Australia, suggesting that the use of the ANGELO would provide a novel application of the framework within UK leisure centres.

Table 3: Adapted ANGELO framework (Adapted from Swinburn, Egger and Raza, 1999, p.565)

Environment type	Environment size	Example
	Micro-environment	
	Food	
<i>Physical</i>	“what is available”	Availability of vending machines
<i>Economic</i>	“costs related to food”	Subsidies to encourage healthy food choices
<i>Political</i>	“rules related to food”	Healthy eating policy
<i>Socio-cultural</i>	“a community's or society's attitudes, beliefs, and values related to food”	Celebrity endorsement of products

2.5 Consumer food choice behaviour

Consumer behaviour was described by Solomon *et al.* (2013, p.150) as 'the process individuals or groups go through to select, purchase, use and dispose of goods, services, ideas or experiences to satisfy their needs and desires'. With regards to the food environment, the 'selection' aspect of consumer behaviour is particularly pertinent. The process of food choice is complex and it is often influenced by a multitude of factors (Shepherd, Sparks and Guthrie, 1995). For example, determinants of behaviour include (European Food Information Council, 2005);

- Biological determinants (e.g. hunger, appetite and taste)
- Economic determinants (e.g. cost, income and availability)
- Physical determinants (e.g. access, education, skills and time)
- Social determinants (e.g. culture, family, peers and meal patterns)
- Psychological determinants (e.g. mood, stress and guilt)
- Attitudes, beliefs and knowledge about food

Biological and physiological determinants, such as hunger, appetite and personal preference, were previously viewed as the primary motivator of food choice (Birkenhead and Slater, 2015). In relation to the present study, it is interesting that exercise may increase appetite however it may also suppress appetite (Birkenhead and Slater, 2015). Köster (2009) also categorised socio-demographic factors as biological and physiological determinants of food choice. In particular, it is recognised that age and gender may be influential (Chambers *et al.*, 2008). In relation to age, focus groups carried out by Chambers *et al.* (2008) identified that cost and time were barriers to eating healthy for 18-30 year olds, with lack of time also being a barrier for 31-59 year olds. In addition to this, a review of research regarding food choice in 18-24 year olds demonstrated that unhealthy food may be convenient to access, for example due to the general proximity of fast food outlets (Munt *et al.*, 2017). Health was mostly an influential factor for participants aged 60 and above, namely due to their personal experiences with disease. Interestingly health became more of a determinant of food choice for 18-30 year olds where they perceived that it would be beneficial for their appearance, for example where they were concerned about gaining weight.

Pearcey and Zhan (2018) carried out a survey, largely based on the Food Choice Questionnaire, with 661 college students from the US and China. They proposed that women may be more likely to be aware of the benefits of healthy choices in comparison to men, and they may also be more likely to demonstrate restraint eating behaviours. Furthermore, they found that women's food choice was significantly more motivated by weight when compared to men. This demonstrates that determinants of food choice may also differ by gender and also shows that health is only one aspect considered during the decision making process (Falk *et al.*, 2001). As previously stated (section 2.4.1), 'healthy' food choices may be more expensive than 'less healthy' food choices (Rao *et al.*, 2013), and cost could therefore act as a determinant of a healthy choice. Dammann and Smith (2009) carried out focus groups with mothers and female guardians on a low income. The majority of the participants felt that their limited income prevented them from being able to make healthy choices. Furthermore, the majority of these participants demonstrated varying knowledge of nutrition

and limited motivation to consume a healthy diet, for example due to a lack of understanding about the link between diet and disease and due to cultural factors.

Consumer attitudes towards products can be influenced by the alignment of the cultural associations of a product and the individuals' values (Allen *et al.*, 2006). Murcott (1982, p.203) explained that the “cultural significance of food and eating focuses on social values, meanings and beliefs rather than on dietary requirements and nutritional values”. Food can allow individuals to identify with a particular group and it can reinforce ethnic identity (Mintz and Du Bois, 2002). Pearcey and Zhan (2018) found that Chinese college students were significantly more likely to be motivated by the natural content of foods and by ethical concerns when compared to American college students. In comparison, American students were significantly more likely than Chinese students to be influenced by convenience and price. It was posited that these findings were due to cultural differences, for example China has endured a number of food safety scares, which could have led to concern about the content of food, and America has a strong fast food culture that is aligned with convenience. Individual food choice behaviour may be influenced by surrounding people as well. For example, research by Robinson and Higgs (2011) demonstrated that individuals may be more likely to select low energy density foods after having seen someone else select the same. This finding was particularly interesting as the participants did not know each other before the start of the study, demonstrating the impact that people, beyond family and peers, can have on food choice.

Köster *et al.* (2009) highlighted the role of extrinsic and intrinsic characteristics as determinants of food choice. Intrinsic characteristics are largely related to sensory properties. The importance of this determinant may be explained by the notion that food can be a hedonic pleasure for consumers (Chandon and Wansink, 2012). Furthermore, sensory aspects were also identified as a key motive that underlies food choice (Stephoe, Pollard and Wardle, 1995). Extrinsic characteristics can encompass a range of factors including packaging, nutrition claims and brands (Köster *et al.*, 2009). Furthermore, brands can be used as a determinant of factors in a food product, such as the quality, intrinsic

characteristics and healthiness (Chrysochou, 2010). This demonstrates the impact that marketing can have as a determinant of food choice, which can include product labelling (Leng *et al.*, 2017). Marketing theory is paramount to understanding consumer behaviour, and the modification of consumer behaviour. This includes the psychology of consumer behaviour, which will be discussed further in the following section.

2.5.1 Behaviour modification

Marsden and Littler (1998) classified the five main perspectives of human behaviour as; cognitive, behavioural, trait, interpretive and postmodern. Of particular interest within this study is the behavioural perspective which refers to behaviour modification and learning. Furthermore, the cognitive perspective, which will be discussed further alongside rational choice theory (section 2.5.4), refers to information processing in the decision-making process, which could be related to the processing of nutritional information.

Behaviour modification has evolved from the work of Skinner (1953), whose work was grounded in psychology theory (Nord and Peter, 1980). In particular, behaviour modification refers to how environmental factors may initiate behaviour (Nord and Peter, 1980; Marsden and Littler, 1998). Learning, for example, reflects a change in consumer behaviour which can result from a certain experience or from the provision of information (Solomon *et al.*, 2013).

Behavioural learning focuses on behaviour and behaviour modification, and encompasses both operant conditioning and classical conditioning (Nord and Peter, 1980; Jansson-Boyd, 2010). Jansson-Boyd (2010) identified that the primary difference between operant and classical conditioning is the order in which the response and stimulus occur. In classical conditioning the response occurs after the presentation of the stimulus. For example, in terms of the provision of nutritional information, Calorie information (stimulus) may be expected to cue, or support, more leptogenic food choice (response). However, the stimulus and response are vice versa in operant conditioning, where the stimulus acts to reinforce a desired response or to demonstrate a consequence (Jansson-Boyd, 2010). However, it was also identified that the response to

classical conditioning is often involuntary, compared to operant conditioning where the response is often deliberate, which is more aligned with the concept of rational choice (section 2.5.4).

An evaluative conditioning approach is similar to classical conditioning. Jones, Olson and Fazio (2010, p.207) defined evaluative conditioning as "attitude formation (or change) due to an object's pairing with positively or negatively valenced stimuli". In evaluative conditioning, an association is made with an item and a stimulus which has been introduced. An example of the use of evaluative conditioning to help encourage more leptogenic food choices is offered by Hollands, Prestwich and Marteau (2011) who carried out a study where energy-dense food products were paired with aversive images. It was identified that the aversive images stimulated negative attitudes towards the product, and participants who were within the experimental group were more likely to select snack items, such as fruit, in comparison to participants within the control group who were not presented with the adverse images. In contrast to this, in reference to the provision of nutritional information, Calorie information may stimulate positive attitudes towards lower energy (kcal) products for consumers who value healthy choices.

2.5.2 Social marketing theory

Given the public health aspect of the present study, it is pertinent to consider marketing principles from a social marketing perspective. Social marketing can be defined as "a strategic or planning process, or systematic application of techniques, used for the benefit of individuals or society rather than commercial gain" (Carins and Rundle-Thiele, 2014, p.1629). Kotler and Levy (1969) first introduced the idea of applying traditional marketing techniques to the marketing of social objectives. Kotler and Zaltman (1971) introduced the social marketing approach more formally, emphasising the opportunity to apply marketing logic to achieve social goals. The aim of social marketing is to influence the target audience to engage in one of four behaviours (Lee and Kotler, 2011); accepting a new behaviour, rejecting a behaviour which could be

viewed as undesirable, modifying behaviour, and abandoning a behaviour that was deemed undesirable.

As part of a social marketing approach, it is crucial to understand the target audience and how they interact with the specified environment (Grier and Bryant, 2005; Wang, Worsley and Hunter, 2012). Furthermore, it is essential to understand the costs and benefits of the behaviour, which relates to the process of exchange (National Social Marketing Centre, 2016). The notion of exchange is fundamental to traditional marketing techniques (Kotler and Zaltman, 1971; Solomon *et al.*, 2013). An exchange must comprise something that each of the parties involved value, and will benefit from in some way (Solomon *et al.*, 2013). Traditionally an exchange incurs a tangible benefit, for example the transfer of goods, services and/or money. However, it is recognised that the benefits acquired during an exchange could also be intangible. For example, in a leisure centre café, the value obtained by the café is likely to be tangible and monetary based however the value obtained by the customers could be tangible, for example the product purchased, and/or intangible, for example the perception that making 'healthy' food choices could help to reduce the individuals' risk of disease. However Rothschild (1999) recognised that such an exchange would be less certain in terms of the benefit that the consumer will acquire because, for example, poor nutrition is only one risk factor for disease (Gedrich, 2003). This emphasises that consumers must be motivated to make a change, in order to modify their behaviour (Bagozzi, 1975). This is particularly pertinent because health is only one factor that is considered valuable by consumers (Carrillo *et al.*, 2011). Therefore, based on the notion of exchange, it can be hypothesised that consumers who are motivated by / see value in healthy choices may be more likely engage in healthy food choices.

Whilst the study is underpinned by social marketing principles, such as exchange, further knowledge of consumer segments and potential barriers to making healthy choices in leisure centre cafés needs to be understood to enable a full social marketing approach to be adopted.

2.5.2.1 Exchange matrix

French (2011, p.159) proposed an exchange matrix which comprises of four marketing based approaches to behaviour change (Figure 2).

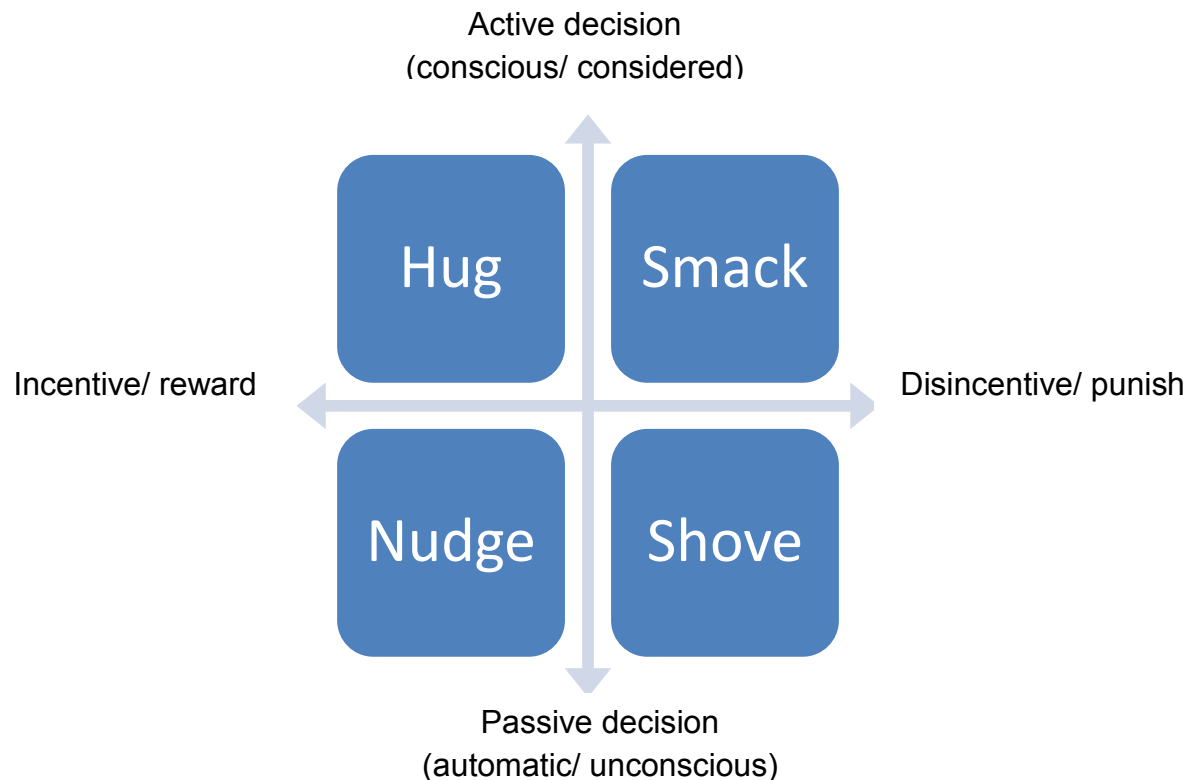


Figure 2: Exchange Matrix (Adapted from French, 2011, p.159)

The Local Government Association (2013) provided clear examples of how the four types of exchange, or intervention techniques, could be applied to encourage behaviour to improve public health. 'Smacks' and 'shoves' reflected disincentives. Smacks generally referred to the removal of choice, for example via banning particular goods or services. Shoves also referred to the restriction of choice, and included financial disincentives such as taxation. In the context of the present study, a smack would involve the removal of unhealthy products, as seen in the study by Lloyd and Dumbrell (2011), described in section 2.2.2.4. Interestingly however, the 'Business Person' involved in the study reported that the removal of all unhealthy products was not suitable for the facility. This was because changes to the food offer needed to be driven by consumer demand and consumers expected freedom of choice to select EDNP foods if they desired. Furthermore, it was found that stakeholders in the evaluation carried

out by Lloyd and Dumbrell (2011) considered freedom of choice to be particularly important for leisure centre café users. This would make a shove more desirable, as it relies on the restriction of choice as opposed to the removal of unhealthy products. Whilst previous research, described in section 2.2.2.4, demonstrated some merit in the concept of reducing the availability of less healthy products alongside increasing the availability of healthy products (Olstad *et al.*, 2011b), the overriding message was that of concern from staff working in leisure centres that changes to the food offer would have a negative impact on revenue (Olstad and Raine, 2013; Lloyd and Dumbrell, 2011; Vander Wekken *et al.*, 2012).

As a result, incentives such as ‘Hugs’ and ‘Nudges’ were considered more appropriate. Hugs predominantly referred to financial incentives, such as vouchers exchanged for engagement with a desirable behaviour (Local Government Association, 2013). In the context of the present study, this could include a discount on healthy products or vouchers for healthy products. A previous study by Olstad *et al.* (2014), which was reviewed in section 2.2.2.4, offered a 30% discount on healthy products. Although a significant increase was observed from the amount of healthy products sold at baseline to the amount of healthy products sold during the signage and taste-testing intervention, this increase was only maintained during the price intervention and no further increase in healthy sales were observed. As a result, Olstad *et al.* (2014) concluded that price reductions did not have an impact in recreational sports settings. This suggests that a hug may not be the best approach for a leisure centre. Olstad *et al.* (2014) categorised their research as a nudge approach, so it was interesting that the signage and taste-testing significantly increased sales of healthy products.

2.5.3 Nudge theory

Thaler and Sunstein (2009) introduced ‘nudge theory’ which has been applied previously in leisure centres to try and promote leptogenic food choice (Olstad *et al.*, 2014) (section 2.2.2.4). It has been defined as “an environmental approach to behaviour change grounded in principles of libertarian paternalism,

that alters social and physical environments to shift behaviours in self-interested directions” (Olstad *et al.*, 2014, p2). Thaler and Sunstein (2009) coined the term ‘choice architect’ to explain the role of an individual, or of multiple individuals, who are responsible for “organising the context in which people make decisions” (Thaler and Sunstein, 2009, p.3). A number of studies have adopted nudge techniques broadly encompassing the placement of products (van Kleef, Otten and van Trijp, 2012; Rozin *et al.*, 2011; Chapman and Ogden, 2012), descriptive menu labels, order of menu-items and nutritional information (Olstad *et al.*, 2014; Wansink, Painter and van Ittersum, 2001; Dayan and Bar-Hillel, 2011; Skov *et al.*, 2013; Downs, Loewenstein and Wisdom, 2009), serving utensil and plate size (Rozin *et al.*, 2011; Skov *et al.*, 2013), and taste-testing provision (Wadhera and Capaldi-Phillips, 2014; Olstad *et al.*, 2014). Despite this, there are different views about what constitutes a nudge and if the provision of information can be categorised as a nudge strategy.

Research carried out by Thorndike *et al.* (2014) in a hospital café addresses the implementation of nutritional information and choice architecture as separate approaches, suggesting that the provision of information may be seen as separate to a nudge approach. The authors referred to nutritional information as the provision of knowledge however they argued that this information requires interpretation. In contrast, choice architecture approaches were viewed as automatic processes. Choice architecture was used to increase the visibility and convenience of products categorised as ‘green’ by the traffic-light labelling system, and to reduce the visibility of products categorised ‘red’. The intervention was effective in improving healthy nutritional choices of hospital employees, which was sustained for 2 years. Although the choice architecture intervention was implemented 3 months after the provision of traffic-light labelling information, the authors were unable to isolate whether the nutritional information or the choice architecture had more of an impact because the data from the employees was only measured at baseline, 12 months and 24 months. Further research studies have classified a nudge strategy as changing accessibility, for example in relation to the proximity of products (Rozin *et al.*, 2011), and as changing the accessibility and availability of healthy snack choices (van Kleef, Otten and van Trijp, 2012). The results of these choice

architecture based approaches were mixed, for example van Kleef, Otten and van Trijp (2012) found no difference in consumer behaviour in comparison to Rozin *et al.* (2011) who reported positive changes in consumer behaviour.

There are also research studies that have classified the provision of nutritional information as a choice architecture approach. Bucher *et al.* (2016b) categorised the provision of information as a type of choice architecture alongside changes to the environment, which included the placement of products. Furthermore, Arno and Thomas (2016) carried out a systematic review and meta-analysis with the intention to determine the impact of nudge strategies on the dietary choices of 18-65 year olds. They categorised nudges as interventions involving changes to the environment, perception, availability of food, which included convenience, and knowledge-based change, which included labelling. The Local Government Association (2013) and Cohen (2013) also categorised the provision of information, such as Calorie information, as a nudge approach. Thaler and Sunstein (2009, p.6) defined a nudge as “any aspect of the choice architecture that alters people’s behaviour in a predictable way without forbidding any options or significantly changing their economic incentives”. Furthermore, they asserted that the “intervention must be easy and cheap to avoid” and that “nudges are not mandates”. This is because nudge theory is considered to be ‘libertarian paternalistic’ in approach because freedom of choice is preserved, however the consumer is guided towards a particular choice (Olstad *et al.*, 2014). The provision of nutritional information could alter consumer food choice behaviour without restricting options, and therefore it satisfies the criteria for a nudge. This type of intervention is desirable given the results from a study by Lloyd and Dumbrell (2011) demonstrating that the right to autonomy of food choice is essential in a leisure centre setting (section 2.2.2.4). A nudge approach is also in line with the proposition made by HM Government (2011), that consumers should be encouraged to engage in healthy food choices, however that freedom of choice should be sustained.

In terms of the provision of nutritional information, a natural experiment carried out by Downs, Loewenstein and Wisdom (2009) found that Calorie information significantly reduced energy intake in a hamburger restaurant in Brooklyn, New

York, however the Calorie information did not have an impact on energy intake in a restaurant, that is part of the same chain, in Manhattan, or in a Manhattan coffee shop. Data was collected at lunchtime in all locations. The points of comparison were prior to the implementation of mandatory provision of Calorie information in New York catering establishments that provided standardised portions, and post implementation of the Calorie information. Despite the discrepancy in the results, there is evidence that Calorie information on menus can be effective. Further to this, the results of a study by Olstad *et al.* (2015b) (section 2.2.2.4) found that TLL significantly increased the purchase of healthy products and significantly decreased the purchase of less healthy products in recreational centres in Canada. Although this research was not presented as a nudge approach, it does demonstrate the potential for nutritional information to significantly increase the leptogenicity of consumer purchase behaviour in a leisure centre setting.

From the research reviewed, it is arguable that the provision of information can be categorised as a nudge strategy that intends to instigate knowledge based change. Contrary to Figure 2 (section 2.5.2.1), a nudge approach using nutritional information may be more conscious than automatic, in comparison to other nudge approaches. This is supported by Cohen (2013) who categorised the provision of Calorie information as a nudge approach however also recognised that this type of nudge is rational by nature. Therefore, it is important to consider rational choice theory and rational choice models.

2.5.4 Rational choice and Rational Choice Theory

Prior to acting on a behaviour, it is assumed that consumers carry out a conscious or sub-conscious cost-benefit analysis (National Social Marketing Centre, 2016). Although consumer behaviour was traditionally considered to be rational, potential irrationalities in behaviour are now recognised (Marsden and Littler, 1998). Thaler and Sunstein (2009) who developed nudge theory grounded it in the area of behavioural economics. This combines economics and theories of psychology, which has supported the notion that there may be irrationalities in consumer behaviour. It was posited by French (2011) that an

exchange can either be passive or active in nature. The former requires little cognitive input, whereas the latter reflects a more conscious, cognitive decision making process. Within the framework proposed by French (2011) (Figure 2), nudge theory is assumed to be more passive in nature. Furthermore, previous research which has applied nudge theory has posited that nudge based approaches are non-cognitive in nature (Olstad *et al.*, 2014). Whilst this may be true for a number of choice architecture based nudge approaches, the provision of information has also been identified as a nudge strategy (section 2.5.3) (Local Government Association, 2013; Cohen, 2013).

Felsen, Castelo and Reiner (2013) investigated public attitudes towards overt (conscious) and covert (subconscious) manipulations in the US and Canada. An example of an eating scenario presented as covert in the study involved unhealthy products being made less accessible in a café. In comparison, the overt eating scenario involved the provision of nutritional information in a café. The study found that the overt nudge was considered more autonomous and was favoured by the public, especially where consumers felt that they did not require support with their choice. It is possible that some nutritional information based interventions could stimulate a less conscious response, for example, traffic light labels have been presented as an informational short-cut (Food Standards Agency, 2010). However the use of numeric Calorie information could demand more attention and lead to a more conscious decision.

Homans' (1961) Rational Choice Theory assumes that individuals calculate the potential costs and benefits of their actions and then behave accordingly. When discussing social behaviour, Homans (1961, p.2) stated that "when a person acts in a certain way he is at least rewarded or punished by the behaviour of another person, though he may also be rewarded or punished by the non-human environment". Work surrounding reward and punishment is largely grounded in psychology theory, with early studies involving animal research. However, Homans (1961) believed that the theory from these animal studies required extrapolating to suit social behaviour research within human beings. It was proposed that the gap between the social behaviour observed in animals is "quite a distance" (Homans, 1961, p.12), thereby limiting the potential for the transfer of this theory to human beings. As a result, the present study has

drawn on a number of theories to underpin this research, which include, but are not limited to, behavioural psychology theory which originated in the social behaviour of animals.

In Social Cognitive Theory, previously known as Social Learning Theory, self-regulation is a pivotal factor acting to motivate human behaviours (Bandura, 1991). This theory is aligned with rational choice theory, as it relies on the notion that behaviours are purposeful and deliberative. It is argued that individuals may have pre-determined behaviours based on the most desirable outcome, or the perceived benefit of acting a certain way. Interestingly, Bandura (1991) states that consumers will act based on what they perceive is 'likely' to help them to obtain a particular benefit. With regards to the process of selecting leptogenic food choices, consumers may opt to make a leptogenic choice because they anticipate a benefit from that decision. However, it is possible that consumers may not be able to accurately identify healthy choices. It is therefore pertinent that the environment contains information, such as Calorie information, to help consumers to make an accurate, and informed leptogenic food choice.

The cognitive school of thought relates to how consumers learn (Jansson-Boyd, 2010). The approach assumes that consumers act in a rational way, acting upon information and knowledge that they have been exposed to previously. They operate within their own bounded rationality, whereby their food choice will be based on the information available to them. Consumer behaviour models can help to identify the key factors involved in the food choice process.

2.6 Consumer behaviour models

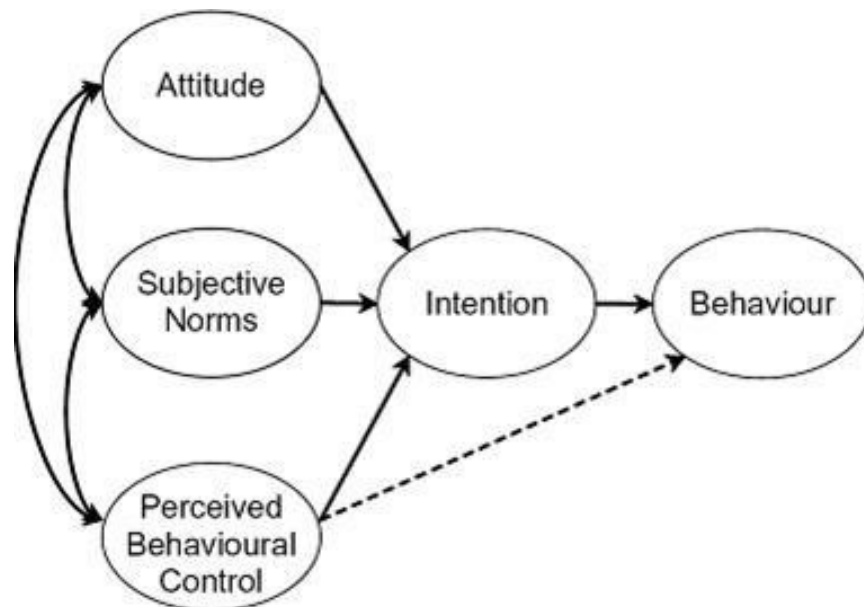
The Health Belief Model (HBM) is a widely recognised model in the field of health behaviour for behaviour change at an individual level (Green and Murphy, 2014). Since its creation it has been adapted to include a self-efficacy construct to help create interventions which encourage behaviour modification (Rosenstock, Strecher and Becker, 1988). The HBM considers positives and negatives of engaging in a behaviour (Green and Murphy, 2014), which links to the underpinning nature of this study which considers costs and benefits.

Furthermore, the model has previously been applied in interventions, for example to understand mothers' compliance with an intervention to improve their child's diet (Becker *et al.*, 1977) or to increase adolescent consumption of folate rich foods (Labrosse and Albrecht, 2013), which suggests that it is applicable to the present study. Champion and Skinner (2008) outlined the key aspects of each construct within the HBM. The constructs were designed for research based on a specific illness or condition, considering aspects such as the perceived susceptibility to a specified condition, and the perceived severity of the condition itself. Therefore the HBM may be most suited to research that focuses on a population segment with a particular illness/condition. As a result, further models of consumer behaviour were considered.

The Theory of Planned Behaviour (TPB) (Figure 3) comprises a number of constructs which inform intention, and which are hypothesised to predict behaviour (Conner and Armitage, 1998). The model is classified as an 'expectancy value' model, which assumes that individuals expect particular costs/ benefits to accompany a behaviour and act based on what it is that they value. It is considered to be a useful tool to understand the complex factors that can influence consumer behaviour (Shepherd, Sparks and Guthrie, 1995). As a result, the TPB has been widely applied to predict consumer behaviour (Conner and Armitage, 1998) and has been applied in previous research regarding food choice (Fila and Smith, 2006; Alam and Sayuti, 2011; Arvola *et al.*, 2008).

The TPB model posits that the following four constructs are predictors of behaviour; Attitudes, Subjective Norms, Perceived Behavioural Control (PBC) and Intention. The model was developed from the original Theory of Reasoned Action (TRA) (Ajzen and Fishbein, 1980), and was extended to include PBC as an additional construct. The TRA is considered to be a model based on rational consumer behaviour. However PBC, the additional construct in the TPB, recognises the possibility of non-volitional responses (Shepherd, Sparks and Guthrie, 1995), where the individual may not have full control over their behaviour. Nudge approaches should preserve freedom of choice and they may increase free will (Thaler and Sunstein, 2009). Therefore, PBC would be important to consider alongside a nudge approach to evaluate the impact of the approach on feelings of control. Despite the addition of the PBC construct,

Bagozzi, Gürhan-Canli and Priester (2002), and Conner and Armitage (1998) identified that the TPB is a deliberative model designed to reflect a conscious decision-making process, and therefore appropriate to identify rational consumer decisions.



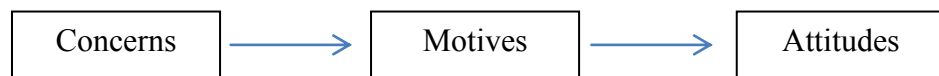
[Figure 3: The Theory of Planned Behaviour \(Ajzen, 1991, p.182\)](#)

2.6.1 Theory of Planned Behaviour constructs

2.6.1.1 Attitudes

Attitudes are defined as the “individuals global positive or negative evaluations of performing a particular behaviour” (Armitage and Conner, 2001, p.474). Attitudes are categorised as behavioural beliefs (Ajzen, 1991) and can be comprised of instrumental attitudes and affective attitudes (Rhodes and Courneya, 2003). Affective attitudes refer to the emotions produced from the thought of engaging in a particular behaviour and instrumental attitudes refer to cognitive evaluation about the result of performing a particular behaviour, and whether the result would be beneficial (French *et al.*, 2005). Based on the TPB, more positive evaluations of engaging with a behaviour inform positive behavioural intention (Ajzen, 1991). This can be explained by the fact that individuals will have more positive attitudes towards engaging with a behaviour

that they believe will involve favourable consequences. Sun (2008) proposed a theoretical model which suggests that health concerns and food motives can inform healthy eating attitudes (Figure 4).



[Figure 4: Theoretical model proposing antecedents of attitudes \(Sun, 2008\)](#)

Motives have previously been considered in research in this field. For example, Vyth *et al.* (2010) investigated the use of a front-of-pack nutrition logo in supermarkets and found that ‘weight control’ and ‘product information’ had a positive relationship with behaviour. Furthermore, motivation encourages consumers to use nutrition labels, which can then support decision making (Grunert *et al.*, 2010). Further to this, it is proposed that concern about health can lead to differences in Motives (Sun, 2008). This is because greater Concern can prompt more effort to engage in healthy behaviour. Lau, Hartman and Ware (1986) identified that health concerns such as disease may lead to the individual putting a greater value on health, and perhaps therefore seeing a greater value in making healthy choices. As a result of the model proposed by Sun (2008) (Figure 4), and the role that concerns and motives may play in consumers decision making. Concern and Motives were added to the TPB model as predictors of Attitudes (2.6.2).

2.6.1.2 Subjective norms

Subjective norms refer to “a person’s beliefs about whether significant others think he or she should engage in the behaviour” (Conner and Armitage, 1998, p.1431). Therefore, subjective norms essentially act to assess the level of social pressure on the individual to engage in a certain behaviour, which is hypothesised to influence their intention to perform that behaviour. Subjective norms are categorised as normative beliefs (Ajzen, 1991) and can be comprised of injunctive norms and descriptive norms (Rhodes and Courneya, 2003). Injunctive norms assess whether significant others believe that an

individual should engage in a particular behaviour and descriptive norms assess whether significant others engage in that behaviour themselves. Armitage and Conner (2001) carried out a meta-analytic review which suggested that subjective norms may be an inadequate pre-determinant of intentions. This is contradictory to the design of the model, which suggests that this factor is a direct predictor of intentions, which can subsequently inform behaviour. However, it was proposed that the poor performance of subjective norms in previous research could be attributed to the use of a single item measure. Furthermore, eating occasions and food can be a focal point of social interaction, hence the influence of significant others' on intention is still pertinent to consider within the present context (Steptoe, Pollard and Wardle, 1995).

2.6.1.3 Perceived behavioural control

PBC is based on the perceived ease or difficulty of engaging with a specific behaviour (Conner and Armitage, 1998), and is categorised as control beliefs (Ajzen, 1991). Based on the TPB, PBC is expected to inform Intention. It was suggested that PBC could be synonymous with the concept of self-efficacy (Conner and Armitage, 1998; Ajzen, 1991; Ajzen, 2002) however this is doubted by some researchers who have found self-efficacy to be a better predictor of Intention and PBC to be a better predictor of behaviour (Povey *et al.*, 2000). Self-efficacy has been defined as "people's beliefs about their capabilities to exercise control over their own level of functioning and other events that affect their lives" (Bandura, 1991, p.257) and as "beliefs in one's capabilities to organize and execute the courses of action required to produce given levels of attainments" (Bandura, 1998, p.624). According to Rhodes and Courneya (2003) self-efficacy is a subcomponent of PBC, alongside controllability, whereby self-efficacy measures perceived ease or difficulty of engaging with a behaviour and controllability measures the extent to which the individual has control over performing that behaviour (Ajzen, 2002). The fact that PBC was an additional construct, added to the TRA to create the TPB, and that self-efficacy was added to the HBM (Rosenstock, Strecher and Becker, 1988), highlights the importance of the consideration of control and self-efficacy within expectancy-

value research. This further reinforces the application of the TPB in the present study, as opposed to the TRA.

2.6.1.4 Confidence in interpreting nutritional information

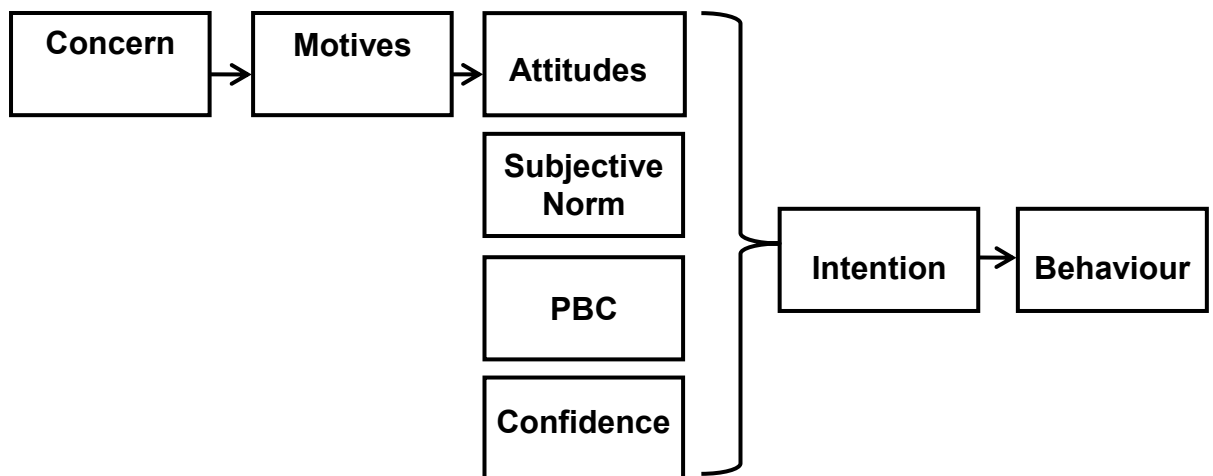
With regards to nutritional information on food labels, Grunert *et al.* (2007, p.388) posited that “knowledge about nutrition issues can be expected to have effects especially on understanding and use”. Petrovici *et al.* (2012) found a positive relationship between consumer knowledge of nutritional information in the UK and use of nutritional information. However all participants within the study achieved a relatively high score for consumer knowledge, which was based on the number of answers to questions such as good sources of fibre, demonstrating confidence in nutritional knowledge. Further to this, Cowburn and Stockley (2005) carried out a systematic review of European studies, which included a focus on consumer understanding of nutrition labels. They found that the term ‘calories’ was largely understood, however there was confusion about the relationship between certain terms, such as ‘calories’ and ‘energy’. Given the mixed results, consumer confidence in interpreting nutritional information is important to consider. Confidence was added into the TPB model as an antecedent of Intention (2.6.2).

2.6.1.5 Intention and Behaviour

Intention reflects “a person’s motivation in the sense of her or his conscious plan or decision to exert effort to enact the behaviour” (Conner and Armitage, 1998, p.1430). Based on the TPB model, Intention is an antecedent of Behaviour. Although a previous research study has found no association between Intention and Behaviour (Fila and Smith, 2006), the TPB was predictive of factors that could affect healthy eating intention and behaviour independently. This could be because it is recognised that some intentions are abandoned or revised (Ajzen, 1985). As a result, it may be beneficial to measure purchase Behaviour as well as Intention, to ensure that Intention is not fully relied on as a proxy measurement for Behaviour.

2.6.2 Adapted Theory of Planned Behaviour

The Theory of Planned Behaviour was adapted for the purpose of the present study (Figure 5). As mentioned in section 2.6.1.1, Concern and Motives were proposed to inform Attitudes (Sun, 2008), hence their position in the model (Figure 5). Confidence was added as an additional construct due to its relevance for the present study (section 2.6.1.4). In the model, it was added as an antecedent of Intention, alongside Attitudes, Subjective Norm and PBC. Knowledge can increase use of nutritional information (Grunert *et al*, 2007; Petrovici *et al.*, 2012) which could reflect intention to use the information in order to make a healthy food choice.



[Figure 5: Adapted Theory of Planned Behaviour \(ATPB\)](#)

2.7 Summary

Sedentary behaviour and poor dietary choices contribute towards an obesogenic environment. The food environment in leisure centres is considered to be obesogenic. This conflicts with the leptogenic physical activity environment that is offered by leisure centres and conveys a healthy image. In the UK, there is a paucity of research currently available and an absence of understanding of consumer food choice behaviour within leisure centres. There is a need for further insight into the food environment in UK leisure centres and to understand consumer food choice behaviour. The food environment is governed by a number of factors so a model such as the ANGELO framework,

which considers physical, economic, political and socio-cultural environments, would be useful to help manage the complexity of food choice.

Previous research based around the nature of the food environment in leisure centres has demonstrated that the vending offer is predominantly obesogenic, however the café offer may provide more leptogenic options. The implementation of healthy eating policies in the food environment has shown to increase healthy purchase behaviour, however concern from managers and leisure centre staff, regarding the potential negative impact that changing the food offer could have on demand, continues to be seen as a barrier to implementation. Modifications to the food environment using methods such as signage, taste-testing, price interventions and TLL have been met with mixed results. A combination of signage and taste-testing increased sales of healthy products in a leisure centre, however price interventions only sustained this change and did not lead to a further increase in healthy purchases. Potential differences based on characteristics, such as sex, have been found to influence the impact of interventions. TLL has been found to increase healthy choices and decrease less healthy choices in a leisure centre setting, demonstrating the potential for nutritional information to encourage healthy purchase behaviour in this context.

Behaviour modification has evolved from psychology theory, so the concept of providing nutritional information could be framed as a stimulus to prompt leptogenic food choice (response). In line with social marketing theory, it is recognised that the exchange must involve something that the leisure centre users value, so it is expected that each individual will make a rational choice that considers the costs and benefits of the end behaviour. Four types of exchange were considered, and it was determined that the use of nutritional information would constitute a nudge approach. The TPB could be used to help manage the complexity of food choice. The model posits that Attitudes, Subjective Norms and PBC inform Intention, which subsequently predicts Behaviour. In addition to this, it was proposed that Confidence will inform Intention, and that Concern and Motives are antecedents of Attitudes. The literature review led to the development of three hypotheses.

2.8 Hypotheses

Null hypothesis 1 (H_0): No relationship will be observed between Concern, Motives, Attitudes and Intention, between Confidence and Intention, between Subjective Norms and Intention, or between PBC and Intention. No relationship will be observed between Intention and Behaviour.

Alternative hypothesis 1 (H_1): Concern and Motives will inform Attitudes which can predict Intention, alongside Confidence, Subjective Norms and PBC which will also inform Intention. Intention will predict Behaviour.

Hypothesis 1 will be investigated using a structural equation model to test the hypothesised pathways between Concern, Motives, Attitudes, Confidence, Subjective Norms, PBC, Intention and Behaviour. The results and discussion relating to this hypothesis can be found in chapters 8 and 9, respectively.

Null hypothesis 2 (H_0): There will be no increase in PBC or in leptogenic food choice Intention and Behaviour as a result of the provision of Calorie information

Alternative hypothesis 2 (H_2): Calorie information will increase PBC and leptogenic food choice Intention and Behaviour

Hypothesis 2 will be investigated using a quasi-experiment to test the impact of an intervention where Calorie information is provided in a leisure centre café. The results and discussion relating to this hypothesis can be found in chapters 10 and 11, respectively.

Null hypothesis 3 (H_0): Leisure centre users will demonstrate homogenous motivations for making healthy choices in the leisure centre café.

Alternative hypothesis 3 (H_3): Leisure centre café users will demonstrate a range of motivations for using the leisure centre café and some segments of the population will be more concerned about making healthy choices.

Hypothesis 3 will be investigated using cluster analysis to identify different segments of the population and their level of interest in making healthy choices. The results and discussion relating to this hypothesis can be found in chapters 12 and 13, respectively.

The following Chapter (3) will detail the philosophical assumptions and the methodology adopted for the present research.

Chapter 3 Philosophical Assumptions and Methodology

3.0 Introduction to the Chapter

The first section of this chapter will discuss the philosophical assumptions of the research. The ontological, axiological and epistemological assumptions for positivist and interpretivist approaches will be identified. Each assumption will then be discussed in relation to the present study followed by a discussion of the pragmatic approach adopted. The second section of this chapter will introduce the methodology and present a rationale for the two-stage, mixed-method approach that was adopted. The specific study design for the methods in stage one and stage two of the research will be presented in Chapter 4 and Chapter 7 respectively.

3.1 Philosophical assumptions

“There are many alternative ways of constructing and justifying knowledge in the social sciences” (Anderson, 1986, p.158). Hudson and Ozanne (1988) concurred with this statement affirming that, in customer based research, knowledge can be obtained through a wide variety of methods. Positivist and interpretivist approaches are considered to be the most predominant in social science (Hudson and Ozanne, 1988). Table 4 provides a summary of the assumptions related to these two schools of thought (Hudson and Ozanne, 1988, p.509), which have been discussed in relation to the present research below.

[Table 4: A summary of positivist and interpretive approaches, adapted from \(Hudson and Ozanne, 1988, p.509\)](#)

Assumptions	Positivist	Interpretive
<i>Ontological</i>		
Nature of reality	Objective, tangible Single Fragmentable Divisible	Socially constructed Multiple Holistic Contextual
Nature of social beings	Deterministic Reactive	Voluntaristic Proactive

Assumptions	Positivist	Interpretive
<i>Axiological</i> Overriding goal	“Explanation” via assumption under general laws, prediction	“Understanding” based on Verstehen
<i>Epistemological</i> Knowledge generated	Nomothetic Time-free Context – independent	Idiographic Time-bound Context Dependent
View of causality	Real causes exist	Multiple, simultaneous shaping
Research relationship	Dualism, separation	Interactive, cooperative

3.1.1 Ontological assumptions

Positivists adopt a realist ontology (Hudson and Ozanne, 1988) which assumes that an objective reality exists independently of the human mind (Johnson and Duberley, 2000). In contrast to this, interpretivists assume that reality is perceived, and is a direct projection of the mind (Hudson and Ozanne, 1988; Johnson and Duberley, 2000). In the first stage of the present study, the first objective related to classifying the obesogenicity of the food environment using the ANGELO framework and the NPM. To be able to classify the environment assumes a single reality, however a number of macro-environmental factors, such as food supply, are recognised, hence it is possible for that reality to change over time. In consumer research, studies traditionally sought a single reality (Hunt, 1991), however more recently, it is recognised that consumers have their own knowledge, reality and values (Tressider and Hirst, 2012). Individual reality can be built and moulded in accordance with surroundings, for example reality can be informed by cultural influences, social factors, historical factors, economic factors and the external environment (Tressider and Hirst, 2012; Anderson, 1986). This is aligned with the present study, which considers a variety of influences on consumer behaviour including, but not limited to, socio-cultural influences and economic factors. Interpretivists also assume that “multiple realities can exist because of individual and group perspectives” (Hudson and Ozanne, 1988, p.509). The third objective in the second stage of

the present research involves the segmentation of consumers based on their characteristics, energy (kcal) intake, and influences on their behaviour. This recognises the potential for group perspectives, which would indicate the presence of multiple realities.

Positivists assume that behaviour is deterministic, when compared to the assumption made by interpretivists that behaviour is voluntaristic (Hudson and Ozanne, 1988). However, positivists do recognise that human behaviour may also be reactive, for example individuals may react to behavioural conditioning. This relates to the first objective for the second stage of the present study, where Calorie information will be provided on a menu in leisure centres to act as a stimulus to encourage a response; in this instance, a lower energy (kcal) purchase.

3.1.2 Axiological assumptions

Axiological assumptions relate to fundamental goals. Positivists strive to achieve an explanation and to be able to predict behaviour (Hudson and Ozanne, 1988). This relates to the second objective for the second stage of the present study. Structural equation modelling will be used to explain and confirm the factor structure of the questionnaire data. The model will also demonstrate the strongest predictor(s) of intention and behaviour. Interpretivists also aim to understand behaviour. Additional influences on behaviour will be explored during the second stage of the study to help contextualise why consumers may or may not have made a leptogenic choice, and to further understand consumer behaviour in a leisure centre setting.

3.1.3 Epistemological assumptions

Morgan and Smircich (1980, p.493) stated that "as we pass from assumption to assumption along the subjective-objective continuum, the nature of what constitutes adequate knowledge changes". An objective, positivistic epistemology assumes that the research area can be observed and measured with neutrality (Johnson and Duberley, 2000). The knowledge generated is time

and context free, and the aim is to make causal links regarding influences on behaviour (Hudson and Ozanne, 1988). In contrast to this, a subjective, interpretivist stance assumes that knowledge cannot be obtained from a neutral position (Johnson and Duberley, 2000). The knowledge generated relates to a particular time and context and the purpose is to “seek to determine motives, meanings, reasons, and other subjective experiences that are time - and context – bound” (Hudson and Ozanne, 1988, p.511). As previously mentioned, it assumed that the food environment is to some extent time bound, as the food offer may evolve. Furthermore, the research intends to identify stakeholder perceptions of the food environment, particularly with regards to objective two for the first stage of the study which involves semi-structured interviews with stakeholders to determine a suitable intervention strategy. In terms of the research relationship, this also relates to a more interpretivist assumption, as it is assumed that the population themselves need to be involved in creating the research if the reality is based on their perceptions (Hudson and Ozanne, 1988). In contrast to this, the positivist researcher is more independent and detached. The concept of identifying causal links, as identified earlier, relates to the use of the ATPB model in the second stage of the present study, and again to the use of SEM, which intends to identify antecedents of intention and behaviour.

3.1.4 Pragmatism

As identified in sections 3.1.1, 3.1.2 and 3.1.3, the approach that I adopted aligned with some positivistic assumptions and some interpretivistic assumptions, despite these two schools of thought being at opposite ends of the continuum. As I developed my understanding of how my research related to positivist and interpretivist assumptions, I came to the realisation that my research was most aligned with a pragmatic approach. A pragmatic approach can draw on both quantitative and qualitative assumptions (Creswell, 2009) and has no single philosophy or reality (Creswell, 2007; Creswell, 2009),

According to Johnson and Duberley (2000), a pragmatic approach has a subjective ontology and an objective epistemology. Despite the proposition that classifying the food environment assumed a single reality (section 3.1.1), and was therefore more aligned with an objective ontology, I did recognise a number

of factors that could cause that reality to change over time, perhaps making it more subjective. A pragmatic approach has also been described as one that identifies the truth for a particular moment in time (Creswell, 2007), which is reflective of the approach that was adopted. Furthermore, the interview phase within my research recognised the possibility of multiple realities. In particular, this was important to me in order to be able to recognise different stakeholder points of view. Pragmatic approaches also have an emphasis on the role of social construction. It was stated by Johnson and Duberley (2000, p.157) that “our social constructions are bounded by the tolerance of an external reality which exists independently of our cognitive processes”. This could reflect the present study, where social construction may be bound by the food choice available within the food environment at that particular point in time.

I selected methods that were most suitable for the research study, as per a pragmatic approach (Creswell, 2009). This was essential for my research study as the aim of the first stage of the research was to determine the obesogenicity/leptogenicity of the environment and to identify influences on consumer behaviour in order to identify a suitable intervention to increase healthy food choice. The very nature of the research was that it was problem-centred, and that the research design needed to be based on what was best suited to the study. The purpose of the first stage meant that some exploratory research was required, which was largely qualitative in nature, and the use of an intervention for the second stage meant that the method adopted was largely quantitative in nature. This resulted in a two-stage mixed method study, an approach that is aligned with pragmatism (Creswell, 2007).

3.2 Methodology

Following on from the philosophical assumptions of the study, a rationale will now be provided for the method that was adopted.

3.2.1 Stages to the research study

The research was carried out in two stages. The first stage aimed to determine the obesogenicity/leptogenicity of the leisure centre food environment, and identify potential influences on consumer food choice behaviour. The second stage, which was informed by the results of the first, involved a quasi-experiment, an experimental design without random assignment, which aimed to test the impact of a nudge strategy designed to encourage leptogenic food choices. Questionnaires were also employed during the second stage to identify influences on food choice intention and behaviour. Table 5 summarises the methods adopted and the corresponding stage of the study.

Table 5: Selected methods and corresponding stage of the study

Stage	Method	
Stage 1	<u>Situational analysis</u>	<u>Semi-structured interviews</u>
	<ul style="list-style-type: none"> • <i>Physical environment:</i> Including availability and contents of vending machines; Café food offer and frequently purchased products • <i>Economic environment:</i> Cost of the food offer (café and vending); special offers/deals • <i>Political environment:</i> Government healthy eating guidance/restrictions on own food 	<ul style="list-style-type: none"> • <i>Stakeholders:</i> Managers, Catering Managers, Leisure Centre Café Users • <i>Themes for interviews:</i> Background/facility, Food offer, Food environment (focus on the Physical, Economic, Political and Socio-cultural environments)
Stage 2	<u>Quasi-experiment</u>	
	<ul style="list-style-type: none"> • <i>Design:</i> Pre-intervention (week 1) and Intervention (week 2) • <i>Centres:</i> Intervention centre (Calorie information displayed in week 2) and Control centre (No Calorie information) 	
	<u>Questionnaire</u>	
	<ul style="list-style-type: none"> • <i>Factors:</i> Participant characteristics, Concern, Motives, Attitudes, Subjective Norms, PBC, Confidence, Intention, Influences and Behaviour 	

3.2.2 Research Design

3.2.2.1 Research design and rationale

A mixed method multi-stage approach was adopted with both concurrent and sequential components. The following sections will discuss the research design in further detail.

3.2.2.2 Mixed-method approach

For the first stage of the present study, a quantitative situational analysis was carried out concurrent to qualitative semi-structured interviews. Quantitative and qualitative techniques have been applied collectively in previous research within the field of study (Naylor *et al.*, 2010a; Olstad, Raine and McCargar, 2012). For example, Naylor *et al.* (2010a) employed facility audits to assess factors such as policy and the food offer, whereas focus groups were used to assess aspects such as issues related to change. Qualitative research allows for the exploration of meaning that individuals may attribute to a particular issue. Furthermore the process is considered as inductive (Creswell, 2009; Neuman, 2014), and therefore it is appropriate for the creation of new knowledge. This is particularly important for the present study as knowledge needs to be created to understand how environments can be designed to support individuals to achieve, or maintain, a healthy weight (Town and Country Planning Association, 2014). Qualitative techniques have been increasingly adopted in public health based research (Neuman, 2011; Pilnick and Swift, 2011). Faltermaier (1997) explained that qualitative research became of particular interest in public health studies because of its ability to address new questions. Furthermore, there is a need for effective strategies to improve public health, which requires background knowledge. The qualitative element was essential in the present research as the literature demonstrated a gap in the knowledge available within the UK regarding influences on food choice behaviour in leisure centres. In addition to this, preliminary research is crucial in order to obtain stakeholder insight and understanding of consumer interaction with the environment prior to designing an intervention (French, 2011; Lake and Townshend, 2006).

The results of the first stage of the study collectively informed a quasi-experiment and quantitative questionnaire. In comparison to qualitative research, quantitative research relies on testing theory and measuring the relationships between variables (Creswell, 2009). This was pertinent to determine the effect of the nudge strategy on consumer food choice intention and behaviour. Through a mixed-method approach, multiple measures of the research question can be achieved (Curtis and Drennan, 2013). Questionnaires alone have been considered inadequate (Faltermaier, 1997) and are considered best when combined with a qualitative based method (Saks and Allsop, 2007).

3.2.2.3 Reliability and validity

In terms of the qualitative data, validity was defined as ensuring that the analysis captured an accurate view of the data (Gibbs, 2008). In the present study, direct quotes from the interviews were embedded throughout the narrative of the results to provide evidence of the raw data. Furthermore, the interviews used for the present study were carried out and transcribed by a single researcher, which facilitated familiarisation with the data. Additional interviews, which were not used for the present study, were carried out with leisure centre cafe users (*n* 4), catering managers (*n* 3) and managers (*n* 4) in separate leisure centres by two students studying MSc Nutrition and Public Health Management. Although the interviews carried out by the Masters students were not included in the present research, the key themes within each data set were discussed. Triangulation across researchers can help to increase the authenticity, accuracy, dependability and trustworthiness of the results (Creswell, 2007; Gibbs, 2008; Wallendorf and Belk, 1989).

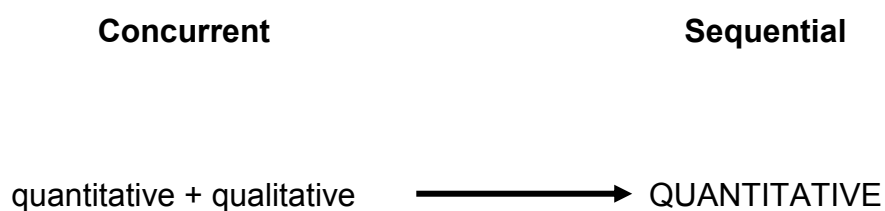
The questionnaire items adopted in the second stage of the study were adapted from validated scales. Furthermore, the cronbach's alpha for each construct was established to ensure internal reliability. The quasi-experimental design adopted meant that participants were not randomly assigned to the intervention or the control centre. This can create concerns around internal reliability as additional variables, such as demographic information, could have an influence (Curtis and Drennan, 2013). However, a strength that quasi-experiments have is that they take place in a real-life setting as opposed to in a laboratory. The control centre was used in the present study to control for external factors which

could influence food choice, such as the weather. In each stage of the study, the two leisure centres were also under the remit of the same council.

The overall research project included multiple methods. The triangulation of methods, can help to increase the validity of the results (Pilnick and Swift, 2011). In particular, the situational analysis was carried out concurrently to the interviews for the first stage of the study which contributed towards answering the aim of the first stage of the study, and helped to improve the validity and trustworthiness of the results.

3.2.2.4 Multi-stage approach and implementation sequence

In mixed-methods research, qualitative and quantitative methods can be applied sequentially or concurrently (Andrew and Halcomb, 2009). For the present research, the first stage involved the application of quantitative and qualitative methods concurrently. This stage subsequently informed the quantitative second stage of the study, which is then reflective of a sequential design. Overall, this reflects a multi-phase design whereby both designs are employed collectively within the overall research study (Creswell and Plano Clark, 2011). The research is explanatory on the basis that qualitative data was used to inform the design of an intervention, which was assessed mostly with the use of a quantitative tool. Andrew and Halcomb (2009) demonstrated the priority level for each phase using upper case letters to reflect a high priority and lower case letters to reflect a lower priority within the implementation sequence. The diagram below demonstrates the implementation sequence and priority levels for this study, indicating that the second stage is considered the more dominant method.



3.2.2.5 Study location

The rationale for this study is underpinned by the concept of obesogenic environments, and the notion that the food environment in physical activity settings needs to be more supportive of healthy food choice behaviours (Chapter 2, section 2.1). 59.9% of the Sheffield population is overweight or obese, below the national average of 64% (Public Health England, 2014a; Public Health England, 2014c). In addition, the percentage of adults residing in Sheffield who were classified as obese (24.9%) is above the average for England (23%) (Public Health England, 2014c). Sports England (2014b) identified gym-work and swimming as the top sports for Sheffield. Both sports are generally available in leisure centres, and formed part of the inclusion criteria for the present study. It has also been identified that 24.4% of Sheffield-based adults reported participation in gym-work or swimming at least once a month, a higher participation rate compared to regional participation (21.5%) and national participation (22.4%) (Sports England, 2014a). This suggests that the Sheffield population is relatively more likely to be engaging with leisure centres and demonstrates that Sheffield would be a useful area to target.

To develop an in-depth understanding of the food environment in UK leisure centres, and influences on consumer food choice intention and behaviour, the present research employed a case study approach. This reflects a previous approach taken in research with the field, external to the UK (Naylor *et al.*, 2011). However previous research in the UK has focussed on gaining a broad understanding of the food environment (Nowak, Jeanes and Reeves, 2012), demonstrating that the present study adopted a novel approach for the UK. The first stage was carried out in two leisure centres based in Sheffield and the second stage was carried out in two leisure centres based in Derbyshire. The area bordered Sheffield and selecting the leisure centres in Derbyshire ensured that two leisure centres would be available to participate in the study simultaneously. In Derbyshire, 68.3% of adults are overweight and obese, which is above the national average (Derbyshire County Council, 2017), demonstrating that Derbyshire was a useful area to target. The two leisure centres involved in each stage were under the remit of the same council.

3.2.2.5.1 Public versus Private centres

Sports England (2014a) stated that around 21% of the English population are members of a sports club, excluding non-members who opt to 'pay as you go'. Individuals are likely to demonstrate a range of motivations for engaging with a sports centre, and customers who use public leisure facilities may demonstrate different motivations when compared to customers who use private leisure facilities.

Public leisure centres are generally perceived to be more convenient and good value (Davies, 2015) and can also be seen as an affordable platform to engage with physical activity (Olstad, Raine and McCargar, 2012). In comparison, sports clubs are seen as more expensive (Davies, 2015). This suggests that public leisure centres may be more widely accessible for the general population. The food offer available may also differ between types of facility. For example, Nowak, Jeanes and Reeves (2012) found that only 24% of UK based public facilities offered fresh fruit in comparison to 74% of UK based private facilities. Furthermore, healthy snack and beverage options were more prevalent in private centres when compared to public centres. This suggests that UK based, public leisure centre food environments may be more obesogenic when compared to private leisure centre food environments, which indicates a need for a more leptogenic environment in public leisure centres. As a result, the present research focussed on public leisure centres.

3.2.2.6 Sampling approach

For both stages of the study, a purposive sampling approach was used to identify the leisure centres, followed by a convenience sampling approach to recruit leisure centre café users as participants. The sample size required varies depending on the classification of the approach (Creswell and Plano Clark, 2011; Teddlie and Yu, 2007). A smaller sample size was required for the qualitative preliminary study in comparison to the quantitative questionnaire used in stage 2. Further details of the approach to selecting and recruiting leisure centres, and participants, for stage one and stage two of the study has been addressed in Chapters 4 and 7 respectively.

The leisure centres that participated in the first stage of the study were both Sheffield based. Both of the leisure centres had a swimming pool, a café and offered an activity schedule. The café in LC1 was part of a franchise, whereas the café in LC2 was run in-house. The two leisure centres were in adjacent wards within Sheffield, which could lead to some crossover in visitors. The population average is higher for LC2 with over 27,000 residents (Sheffield City Council, 2017), in comparison to LC1, with just over 19,000 residents (Sheffield City Council, 2013). LC2 is based within an area that has higher levels of deprivation when compared to the area where LC1 is based. The majority of the population in both wards, who were potentially using the leisure centres, were aged 24-64. Further detail on the environment within the two centres was identified during the situational analysis (Chapter 5).

The leisure centres that participated in the second stage of the study were both Derbyshire based. As per stage one, both of the leisure centres had a swimming pool, a café and offered an activity schedule. The intervention site was run in-house whereas the control site was part of a franchise. The menu was provided on the wall in each leisure centre; in the intervention site the menu was adjacent to the counter whereas in the control site the menu was behind the counter. Both of the cafés offered hot food, which could be ordered from the menu, and had items on the counter which included cakes, biscuits, chocolate, crisps and fruit. The population average for the ward where the intervention site was based was around 7,500 residents, compared to the ward where the control site was based which had just under 5,000 residents (Derbyshire Observatory, 2011). The majority of the population in both wards were aged 25-64 and the majority were recorded to be in good general health. Furthermore, both of the leisure centres were under the remit of the same council.

3.2.3 Summary

Some sections of the present study are aligned with positivistic assumptions and some sections are aligned with interpretivistic assumptions. The approach adopted was a pragmatic approach. The research was carried out in two-stages

and a mixed-method approach was adopted. A quantitative situational analysis was carried out concurrently with qualitative semi-structured interviews during the first stage of the study. The second stage of the study, which was sequential to the first stage, involved a quasi-experiment and a questionnaire. A purposive sampling approach was carried out to identify two leisure centres in Sheffield for the first stage of the study and two leisure centres in Derbyshire for the second stage of the study. Convenience sampling was adopted to recruit leisure centre café users in the facilities. The following Chapter (4) will detail the sampling approach, study design and analytical procedures adopted for the first stage of the study.

Chapter 4 Method Stage 1: Situational Analysis and Semi-Structured Interviews

4.0 Introduction to the Chapter

The first stage of the research study involved a concurrent mixed-methods study design, which took place in two leisure centres in Sheffield. The first method involved a situational analysis to audit the food environment, which was informed by the ANGELO framework. The second method involved semi-structured interviews with three types of stakeholders; leisure centre café users, leisure centre managers, and catering managers. The following section will detail the sampling approach taken for this stage of the research study, followed by the study design, and analytical procedures.

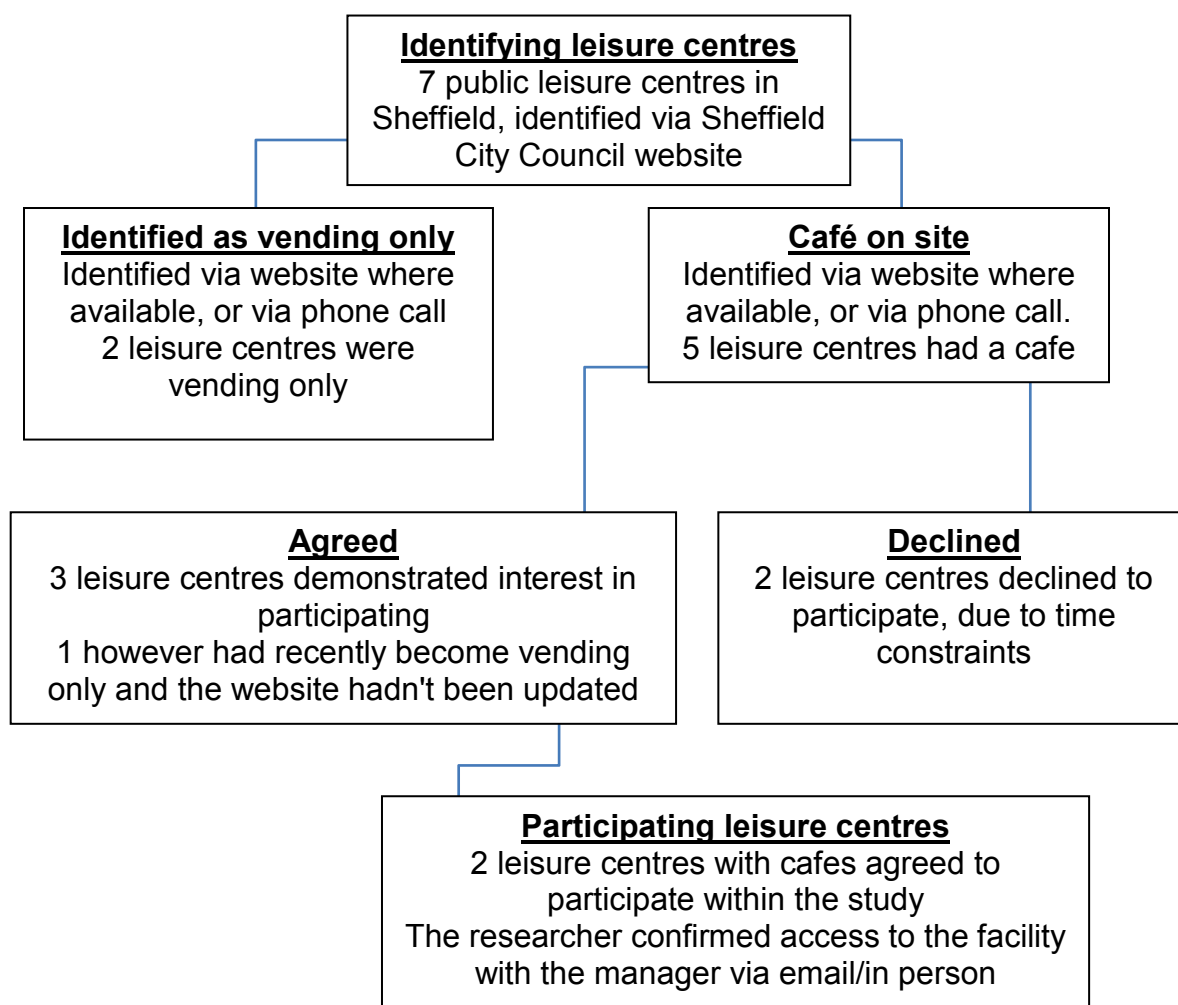
4.1 Sampling approach

4.1.1 Leisure centres and situational analysis

The first step was to determine the criteria for the purposive sample and then to identify and recruit leisure centres. Purposeful sampling has been described as a process whereby "researchers intentionally select (or recruit) participants who have experienced the central phenomenon or the key concept being explored in the study" (Creswell and Plano Clark, 2011, p.173), and can provide insight into the area of interest (Guarte and Barrios, 2006). For the first stage of the study, leisure centre stakeholders were recruited due to their experiences, demonstrating evidence of a broadly purposeful sampling technique which aimed to recruit a 'critical case sample' (Marshall, 1996). Whilst leisure centre café users were the target audience, managers and catering managers are key stakeholders who can provide insight into the food environment and consumer behaviour. It was particularly pertinent to discuss the views of managers and catering managers because of previously cited concern regarding the potential impact of changes to the food offer on revenue (Chapter 2, section 2.2.2.3) and on freedom of choice (Chapter 2, section 2.5.2.1).

As previously identified, public leisure centres, with both a swimming pool and a gym, in Sheffield were selected for the first stage of the study (Chapter 3,

section 3.2.2.5). Due to the focus on the food environment, it was imperative that all participating centres had an on-site café. Following a comprehensive internet search, 7 public leisure centres were identified in Sheffield using the Sheffield City Council website (2014) of which five appeared to have a café on site (Figure 6) and were contacted by the researcher. Two of the leisure centres declined due to time constraints. Three agreed to participate however one had recently become vending only and was excluded. The two participating leisure centres (LC1 and LC2) fell under the remit of the same council. Both centres had a gym and swimming pool as well as a café. One of the cafés was managed internally, however the other formed part of a franchise. Further details on the nature of the leisure centres can be found in Chapter 5, which details the results of the situational analysis.



[Figure 6: Schematic representation of the approach to leisure centre recruitment](#)

4.1.2 Interviews

As identified in Chapter 3, section 3.2.2.2, it was essential to capture the perceptions of all the key stakeholders involved in the leisure centre café. This included leisure centre café users, catering managers and leisure centre managers. The interview themes were informed by the ANGELO framework which includes a focus on the physical, economic, political and socio-cultural environments (Swinburn, Egger and Raza, 1999) (Chapter 2, section 2.4.1). It was assumed that catering managers and managers may have greater knowledge of the political environment when compared to leisure centre café users, demonstrating a need to include these stakeholders in the research.

The manager and catering manager for each of the two leisure centres agreed to be interviewed. Leisure centre café users were recruited using a convenience sample. This meant that participants were easily accessible, helping to reduce resource, time, and monetary costs (Marshall, 1996; Teddlie and Yu, 2007). Participation was on a voluntary basis, and no incentive was offered for participation in the study. As a result, convenience was of the utmost importance to facilitate recruitment. It has also been accepted that most qualitative studies involve some degree of convenience sampling within the design (Marshall, 1996). Following permission from the manager to approach leisure centre café users, recruitment took place in the café. This ensured that participants had been customers of the café and would be able to share their views on the food environment. Once approached, they were provided with a brief overview of the study and handed an A5 poster (Appendix 1), summarising the study and the contact details of the researcher. Those who demonstrated an interest were also provided with a participant information sheet (Appendix 2/Appendix 3) for further information. Customers who volunteered to participate were invited to complete the interview at that moment, where appropriate, or to arrange a convenient time within the study period.

4.2 Ethical approval

Ethical approval was obtained from Sheffield Business School Faculty Research Ethics Committee (SBSREC1314/24), prior to the pilot study for this stage of the research (Appendix 4).

No children or vulnerable people were asked to participate in the study, and participation was voluntary. Permission to invite the catering manager and leisure centre café users to an interview, was obtained from the leisure centre manager. Written informed consent was obtained from all participants (Appendix 5).

4.3 Study design

Four days of access to each leisure centre was negotiated so that the situational analysis could be carried out and leisure centre users could be recruited for the interviews. Additional access required to complete the interviews was negotiated with the leisure centre manager, who acted as gate keeper to the facility.

4.3.1 Pilot study

4.3.1.1 Situational Analysis

The situational analysis observation sheet was tested during a pilot in a separate leisure centre facility (Appendix 6). Following the pilot, some of the factors that formed the situational analysis were removed or combined to help with clarity and to prevent repetition (Table 6). Some of the sections were also supplemented with further guidance to enable a systematic and consistent approach. The variety of factors which comprised the final situational analysis, and the corresponding ANGELO environment type, have been included in Table 7.

Table 6: Changes to the observation tool and rationale

Included in pilot study	More detail added, Removed, or Combined	Rationale
What facilities are available?	More detail added; What facilities are available? <i>Inc. Seating areas/viewing areas.</i>	Added to consider the seating area that was available outside of the café. This was important to understand if the café provided space for consumers to spend time, possibly whilst waiting for a family member/friend to complete an activity.
Equipment – what is available? <ul style="list-style-type: none"> • Sportswear/ swimwear for sale • Equipment provided for classes 	Removed	On reflection, this was deemed irrelevant to the present study, which primarily focussed on the food environment.
Opening times	More detail added; Opening times (<i>gym and café</i>)	The pilot identified that the café had shorter opening hours to the leisure centre gym, which meant that the leisure centre food environment would be vending only at times when the café was not open.
Ability to consume own food within the establishment <u>AND</u> <ul style="list-style-type: none"> • Till point/menu - this food does not contain...etc. • Culturally appropriate food provided, e.g. halal? 	Combined	Whilst identifying restrictions on consumption of own food within the café it made sense to consider the availability of culturally appropriate options and options for consumers with dietary preferences.

Included in pilot study	More detail added, Removed, or Combined	Rationale
Personal training <ul style="list-style-type: none"> <i>Is it available/who is it available for?</i> <i>Who delivers the training? - Qualifications?</i> 	Removed	On reflection, this was deemed irrelevant to the present study based on the study's focus on the food environment.
Free water access?	More detail added; Free water access? <i>(check in gym and in studio)</i>	The pilot demonstrated that water fountains may not be available in the café, however may be available elsewhere in the centre, such as within the gym.
Is taste testing available?	Removed	This was deemed unnecessary as an individual question. If taste testing was available, it would be documented within the 'what food is available' section.
Marketing <ul style="list-style-type: none"> What's visible - draw on diagram at the end of the booklet Vending machines/leaflets/posters/celebrity endorsement Offers/promotions - food/PA 	More detail added; Marketing <ul style="list-style-type: none"> What's visible - draw on diagram at the end of the booklet Vending machines/leaflets/posters/celebrity endorsement Offers/promotions - food/PA <i>Weight management programme/nutritional education</i> 	The pilot identified that leisure centres may offer weight management workshops/nutritional education workshops on-site, and may also advertise where customers can access workshops and information elsewhere.

Included in pilot study	More detail added, Removed, or Combined	Rationale
<p>Words used to describe products</p> <ul style="list-style-type: none"> • Menu/till point/vending machine/marketing material • How often does the word appear • In what context does a word appear <p><u>AND</u></p> <p>Nutritional information</p> <ul style="list-style-type: none"> • Available/descriptive/calories presented? • Menus/labels on products/till point area? 	Combined	<p>Whilst reviewing the menu for any comments on the words used to describe products, it made sense to identify if any nutritional information was displayed and if any products were labelled on the counter/at the till point.</p>

4.3.1.2 Interviews

The semi-structured interviews were piloted with one male and one female. Although the pilot interview did not lead to any amendments to the interview schedule, it was beneficial to help develop the researchers interviewing approach, such as further probing questions to help elicit more detailed information from the participant.

4.3.2 Situational Analysis

The first stage of the methodology involved a situational analysis in order to determine and classify the objective environment. A similar approach to that used by Nowak, Jeanes and Reeves (2012) was applied. The situational analysis was designed based on the ANGELO framework (Swinburn, Egger and Raza, 1999) (Chapter 2, section 2.4.1). The application of the framework helped to categorise the obesogenicity of the food environment.

4.3.2.1 Application of the ANGELO framework

Leisure facilities are classified as 'micro-environmental settings' which are locations "where groups of people gather for specific purposes which typically involve food, physical activity, or, frequently, both" (Swinburn, Egger and Raza, 1999, p.565). Despite the micro-environmental focus, it was anticipated that some macro-environmental factors may exert an influence over the food environment available, for example, food supply and seasonality. Furthermore, the weather could influence consumer food choice behaviour. Whilst these potential influences were appreciated, the focus of the situational analysis was on the objective leisure centre food environment presented during the research period.

The factors associated with the food environment for each of the four environment types defined within the ANGELO; physical, economic, political, and socio-cultural, were identified through a comprehensive literature review and used to create an observation sheet which was employed for the situational analysis (Appendix 7) (Table 7). The main focus was on the physical and economic sections of the ANGELO grid, as these aspects are primarily observable. Observable political factors were also considered. Socio-cultural factors however could not be observed and were explored through the interviews (section 4.3.3).

Table 7: Factors for the situational analysis by ANGELO environment type

ANGELO environment type	Factors to consider
<i>Physical</i>	<ul style="list-style-type: none">• What facilities are available?• What activities are available? (who for/classes?)• Swimming pool - number of lanes?• Opening times (gym and café)• Café layout (drawn)• What food is available in the café? (menu)• Are there any specials/deals in the cafe?• Ask Catering Manager for the best sellers (statistics or perception)• Vending machine numbers/contents• Availability of free water• Advertising related to food/ physical activity

ANGELO environment type	Factors to consider
<i>Economic</i>	<ul style="list-style-type: none"> • Cost of the café items • Cost of the vending items
<i>Political</i>	<ul style="list-style-type: none"> • Restrictions on consumption of own food? • Food allergy/intolerance information • Evidence of advertising related to policies? E.g. government schemes?

4.3.3 Semi-Structured Interviews

Qualitative, semi-structured interviews were carried out with leisure centre café users, managers and catering managers. Interviews can provide more in-depth understanding of consumer attitudes and behaviour within leisure centre cafes (Neuman, 2011; George, Kruger and Tennant, 2012; Kvale and Brinkmann, 2009) which was essential to satisfy the socio-cultural element of the ANGELO framework. Furthermore, the interviews with catering managers and managers enabled the exploration of policies which govern the food environment. All of the stakeholder interviews were used to explore perceptions of the physical and economic environment and any potential facilitators or barriers to behaviour change.

The ANGELO framework has previously been applied to questionnaire design (Carter and Swinburn, 2004), however to the researcher's knowledge the ANGELO has not been employed as a semi-structured interview framework. To ensure that the interview flowed freely, it was constructed around three main themes; background/facility, food offer, food environment (Table 8). This was to avoid repetition as some topics were appropriate in multiple categories of the ANGELO.

Prior to concluding that semi-structured interviews were the best approach, alternative methods and different interview structures were considered. Naylor *et al.* (2010a) adopted a similar approach to the situational analysis within the present study by carrying out facility audits in leisure centre food environments. In addition, they carried out focus groups. Focus groups can help to stimulate

conversation, compared to interviews which require participants who are happy to share their views (Creswell, 2007). It was anticipated that a semi-structured interview design would help to overcome this, as the interviewer is able to prompt discussion and encourage interaction from the participant (Kvale and Brinkmann, 2009; DiCicco-Bloom and Crabtree, 2006). By way of comparison, an unstructured interview would involve the participant discussing a phenomenon more freely. Given the application of the ANGELO framework to the present study, it was essential that key points related to each environment type were discussed. Hence unstructured interviews would have been unsuitable. The exploratory design of the first stage of the study also meant that structured interviews were unsuitable, as they are generally used to quantify patterns. A potential disadvantage of semi-structured interviews is the prerequisite for the interviewer to possess good quality interviewing skills (Kvale and Brinkmann, 2009; Matthews and Ross, 2010). To help overcome this, two pilot interviews were carried out so that the interview approach could be practised and adapted if required.

Table 8: Semi-structured interview schedule

	ANGELO environment type	Leisure centre user guidance	Manager guidance	Catering Manager guidance
Background / facility	N/A	Use of the facility?	Your role?	Your role?
		Member?	Time at the centre?	
		Purpose of visit?	Information about the centre (users/ demand)	
		Use of the café?		
Food offer	<i>Physical</i>	Thoughts on food/ vending offer?	Thoughts on food/ vending offer?	Thoughts on food/ vending offer?
		Calories/ Nutritional information?	Calories/Nutritional information?	Changes in the offer?
				Availability of healthy options?
				Frequently purchased items?
				Calories/Nutritional information?
	<i>Economic</i>	Thoughts on the vending prices/food prices?	Rationale behind/thoughts on the vending prices/food prices?	Rationale behind/thoughts on the vending prices/food prices?
	<i>Political</i>	Bringing own food/ drink?	Influential people? Policies guiding the food offer?	Influential people? Policies guiding the food offer?

	ANGELO environment type	Leisure centre user guidance	Manager guidance	Catering Manager guidance
Food environment	<i>Socio-cultural</i>	Thoughts on food offer? Interest in healthy options/ nutritional information? Desire for healthy eating/ nutritional advice/ what format? Influential people?	Thoughts on food offer? Attitude to nutritional information? Customer interest in healthy options?	Thoughts on food offer? Attitude to nutritional information? Customer interest in healthy options?
	<i>Physical</i>	Visibility and choice? Advertising/ healthy eating messages?	Advertising/ healthy eating messages?	Visibility and consumer choice? Advertising/ healthy eating messages?
	<i>Economic</i>		External environment?	External environment?
	<i>Political</i>		Staff training?	
	<i>Socio-cultural</i>		Staff training?	

4.3.3.1 Study population

Once the pilot study was completed; 11 interviews were carried out for the first stage of the study including interviews with leisure centre cafe users (*n* 7; 4 in

LC1 and 3 in LC2, all female), managers (*n* 2, 1 male in LC1, 1 female in LC2), and catering managers (*n* 2, 1 in each LC, both male).

4.4 Analytical procedures

4.4.1 Situational analysis

An overview of the facilities available in each leisure centre was provided. The vending options and frequently purchased café options were analysed using the Nutrient Profiling Model (NPM) to determine the obesogenicity/leptogenicity of the food offer.

4.4.1.1 Nutrient Profiling Model

The NPM was developed by the Food Standards Agency and was used to classify the healthiness of the food offer. Although the NPM was designed a decade ago, the technical guidance used was released in 2011 (Department of Health, 2011) and has been employed in more recent studies for a similar purpose (Nowak, Jeanes and Reeves, 2012). Alternative scales considered included the SSAg/1 scoring system (Rayner, Scarborough and Stockley, 2004), however this focussed on the main risk nutrients and did not extend to consider components such as fruit, vegetable and nut content. To determine the least healthy and most healthy products, it was deemed most appropriate to consider the balance of nutrients at this stage.

Using the NPM, a food is defined as healthy or less healthy (Department of Health, 2011). For each product, the amount of energy, saturated fat, sugar, sodium, fibre, protein, and the percentage of fruit, vegetables and nuts was calculated per 100g/100ml. To determine the overall score for each product, total 'A' points and total 'C' points needed to be calculated. The procedure is as follows;

Stage 1: Work out total 'A' points; (Energy) + (Saturated fat) + (Sugars) + (Sodium)

'A' points are awarded for energy, saturated fat, sugars and sodium (Table 9). The higher the quantity of each nutrient per 100g/100ml of a product, the higher the score awarded.

[Table 9: Nutrient Profiling Model 'A' points \(Department of Health, 2011, p. 5\)](#)

Points	Energy (kJ)	Sat Fat (g)	Total Sugar (g)	Sodium (mg)
0	≤335	≤1	≤4.5	≤90
1	>335	>1	>4.5	>90
2	>670	>2	>9	>180
3	>1005	>3	>13.5	>270
4	>1340	>4	>18	>360
5	>1675	>5	>22.5	>450
6	>2010	>6	>27	>540
7	>2345	>7	>31	>630
8	>2680	>8	>36	>720
9	>3015	>9	>40	>810
10	>3350	>10	>45	>900

Stage 2: Work out total 'C' points; (Fruit, vegetables and nuts) + (Fibre) + (Protein)

'C' points were allocated for the percentage of fruit, vegetables and nuts within a product, fibre and protein (Table 10). Again, the higher the quantity of each nutrient per 100g/100ml of a product, the higher the score awarded.

[Table 10: Nutrient Profiling Model 'C' points \(Department of Health, 2011, p. 5\)](#)

Points	Fruit, Veg & Nuts (%)	NSP Fibre	Or AOAC Fibre (g)	Protein (g)
0	≤40	≤0.7	≤0.9	≤1.6
1	>40	>0.7	>0.9	>1.6
2	>60	>1.4	>1.9	>3.2
3	-	>2.1	>2.8	>4.8
4	-	>2.8	>3.7	>6.4
5	>80	>3.5	>4.7	>8.0

Stage 3: Calculate the overall score

Total 'C' points were subtracted from total 'A' points to create an overall score, using the criteria in Table 11.

Table 11: Options to calculate the overall NPM score

Option and criteria	Calculation
Option 1: <i>If a food scores < 11 'A' points</i> OR <i>If a food scores ≥ 11 'A' points but scores 5 points for fruit, vegetables and nuts within the 'C' points</i>	Total 'A' points (energy + saturated fat + sugars + sodium) Minus Total 'C' points (fruit, veg and nuts + fibre + protein)
Option 2: <i>If a food scores ≥ 11 'A' points, and less than 5 points for fruit, vegetables and nuts</i>	Total 'A' points (energy + saturated fat + sugars + sodium) Minus Total 'C' points, excluding protein (fruit, veg and nuts + fibre) <i>(not allowed to score for protein)</i>

Stage 4: Classification of healthy or less healthy

A food was classified as less healthy if it was awarded ≥ 4 points, and a drink was classified as less healthy if it was awarded ≥ 1 point. Food and drink items scoring below this criteria were considered to be more healthy.

4.4.1.2 Vending options

Packaging and/or the manufacturers' website were used to obtain the macronutrient, energy, fruit, vegetable and nut content required for the NPM.

4.4.1.3 Analysis of the frequently purchased items

Frequently purchased products were identified using sales data (LC1), or were confirmed by the Catering Manager (LC2). Macronutrient, energy, fruit,

vegetable and nut content, as required for the NPM, was determined using Nutritics dietary analysis software (version 3.74; Nutritics, Dublin, Ireland) following a weighed nutritional analysis of each component which comprised the product.

4.4.2 Semi-structured interview

4.4.2.1 Thematic analysis

The interviews were analysed thematically, allowing common themes to be identified (Matthews and Ross, 2010). Braun and Clarke (2006, p.79) described thematic analysis as a “method for identifying, analysing and reporting patterns (themes) within data”. Thematic analysis has been employed previously to determine consumer food purchasing behaviours (Maubach, Hoek and McCreanor, 2009; McLean and Hoek, 2014). Furthermore, as this stage acted as preliminary research it was helpful that thematic analysis is a relatively straightforward approach to qualitative analysis (Braun and Clarke, 2006), whilst still providing a detailed overview.

The first phase of the thematic analysis involved familiarisation with the data (Braun and Clarke, 2006). The researcher personally transcribed the data, which started the process of familiarisation, and then re-read the data multiple times to continue this process. NVivo (version 10, QSR International software) was used to help identify codes and categorise them into themes. It is recognised that software packages can be useful to facilitate the process and generate themes (Smith and Firth, 2011). The key themes were discussed with two researchers (see section 3.2.2.3). Coding was data-driven as it was based on the information from the interviews (Braun and Clarke, 2006). To provide evidence of the themes and to contribute to the overall story, verbatim extracts of the interviews were included in the final report.

4.5 Summary

The first stage of the study involved a situational analysis which investigated the economic, political and physical environments, including the vending offer and

frequently consumed café products. Products were categorised as healthy or less healthy using the NPM. Semi-structured interviews were carried out with leisure centre users, managers and catering managers and were analysed using thematic analysis. The results of the situational analysis and semi-structured interviews are presented in Chapter 5. The method for the second stage of the study which was developed from the results of the first stage is presented in Chapter 7, following the results and discussion sections for stage 1.

Chapter 5 Results 1: The Leisure Centre Food Environment

5.0 Introduction to the Chapter

Chapter 5 outlines the results of the first stage of the study. The situational analysis is presented in the format of the ANGELO, considering the physical, economic, and political factors. The omission of the socio-cultural factor at this stage was justified in section 4.3.2.1. The results from the semi-structured interviews are presented in themes derived during thematic analysis. The themes for each stakeholder category have been combined to ensure the future direction for the research combined all stakeholder points of view.

5.1 Situational Analysis

5.1.1 Physical environment

5.1.1.1 Facilities, activities and opening times

Both leisure centres provided a swimming pool, gym, activity schedule, vending machines, and a café. LC2 also offered weight management and healthy eating workshops, an ICT area and a small library. The activity schedules at both leisure centres included classes which were available for children of different ages as well as sessions for adults. LC1 provided a separate leisure pool, with two slides, and a pool for lane swimming. A seating area (n ~ 80) overlooking the pool for the lane swimming was provided, however the café where the research took place was also situated at the pool side. The pool for LC2 was in a separate area to the café. Additional seating areas were available, including in the library. LC2 had 9 tables within the café, each seating between 2-4 people with spare chairs available, whereas LC1 had 12 tables, each seating between 3-6 people.

The café opening hours varied between weekdays and weekends (Table 12). Furthermore, the café opening hours did not match the leisure centre opening hours. Therefore there were times where leisure centre users could only access the vending machines.

Table 12: Leisure centre café opening times

Facility	Weekday opening times	Weekend opening times
LC1	11.00-19.30	10.00-16.00
LC2	10.00-15.00	closed

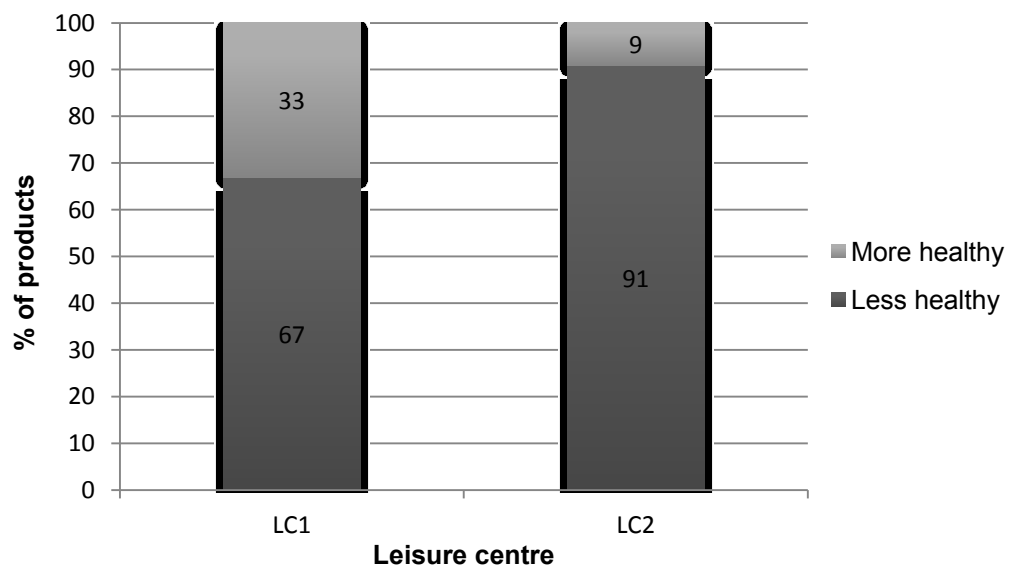
5.1.1.2 Food offer and advertising

Both cafés offered a variety of hot and cold beverages, sandwiches, Panini's, items on toast (e.g beans), jacket potatoes and a variety of 'snacks' such as biscuits, cakes, crisps and fruit. LC1 also offered a full English breakfast in the morning, burgers, chips and sausage rolls. LC2 also offered wraps, quiches, omelettes and yogurts. LC2 provided half size meals for children upon request, whereas LC1 provided 'kids meals' which included sausages, burgers, chicken dippers or Panini pizza, each served with chips. Frequently purchased food products were also identified (section 5.1.1.4). Water fountains were present in both facilities. LC1 provided water fountains in the gym and in the café, however LC2 only provided one in the gym. No nutritional information was visible in either café.

In terms of food advertising, LC1 promoted a Panini of the month and a sandwich of the month. At the time, they were also providing a 'World Cup Offer' where consumers got a free Brazil 2014 key ring with purchases of two Coke products. Coke, Sprite, Diet Coke, Fanta and water were included in the offer. LC2 promoted a sandwich meal, however details of what was included were not provided on the advertisement. A small sign stating 'healthy choices award' was visible on the fridge in the café, however it was unclear when this was awarded. The food hygiene rating of 5 was visible and posters based on government healthy eating advice were displayed (section 5.1.3.1). In comparison to the relatively small amount of food advertising, a number of notice boards and stands in both facilities provided information and leaflets regarding the physical activity offer. This included details on the classes available, workshops and membership offers. Some leaflets for local events and services, such as charity work and places to play golf, were also provided.

5.1.1.3 Healthiness of the vending offer

LC1 had the most vending machines ($n = 7$) when compared to LC2 ($n = 1$) and therefore offered a wider variety of items (LC1, $n = 82$; LC2, $n = 23$). The majority of the vending offer was classified as less healthy by the NPM in both leisure centres, however the proportion of more healthy items was higher in LC1 (Figure 7). This was partly due to the availability of a vending machine which offered protein products, such as flavoured whey protein, flavoured protein milks, protein gels and bars. Protein scored positively using the NPM, helping to create a more leptogenic score for LC1. However, even with removal of the protein products from the analysis, the proportion of more healthy products (22%) would have remained higher than in LC2.



[Figure 7: Availability of more healthy and less healthy vending products](#)

5.1.1.4 Frequently purchased products

LC1 provided sales data for the month of the study to allow the most frequently purchased products to be identified (Table 13). Only non pre-packed food products were included. Sales data was not available from LC2, so the Catering Manager identified the best sellers at the time of the study. In this instance five different categories of products were listed; 'jacket potato', 'omelette', 'sandwiches', 'Panini's' and 'items on toast'. Within these categories, a number of different fillings were identified hence a total of nine products were considered overall. Table 13 provides the product name and the NPM score,

cost and category of healthiness for each product. A food which scored ≥ 4 points was classified as 'less healthy' (Chapter 4).

[Table 13: Healthiness and cost of the frequently consumed products](#)

Location and Healthiness	Product Name (% weighting of each component)	'A' points (energy (KJ), saturated fat, sugar, sodium) – 'C' points (fruit, veg & nuts, NSP fibre, protein)	Overall NPM Score	Product Cost
LC1				
<i>More healthy</i>	<u>Fruit</u> (100% banana)	2 - 5	-3	£0.70
	<u>Kids chicken dipper meal</u> (72% chips, 28% chicken dippers)	7 - 6	1	£2.90
	<u>Jacket with cheese and beans</u> (56% potato, 29% beans, 15% cheese)	8 - 7	1	£3.95
	<u>Chips</u> (100% chips)	6 - 4	2	£1.25
	<u>BBQ chicken Panini</u> (55% chicken, 42% panini, 3% BBQ sauce)	9 - 5	4	£2.55
LC2				
<i>More healthy</i>	<u>Beans on toast</u> (78% beans, 22% toast)	8 - 10	-2	£2.00
	<u>Jacket with cheese, beans and butter</u> (47% potato, 35% beans, 14% cheese, 4% butter)	9 - 7	2	£3.40

Location and Healthiness	Product Name <i>(% weighting of each component)</i>	‘A’ points (energy (KJ), saturated fat, sugar, sodium) – ‘C’ points (fruit, veg & nuts, NSP fibre, protein)	Overall NPM Score	Product Cost
<i>Less Healthy</i>	<u>Cheese omelette</u>			
	<i>(51% omelette, 49% cheese)</i>	22 - 0*	22	£3.15
	<u>Cheese on toast</u>			
	<i>(59% cheese, 41% toast)</i>	20 - 2*	18	£2.00
	<u>Toast and butter</u>			
	<i>(73% toast, 27% butter)</i>	22 - 4*	18	£0.90
	<u>Cheese salad sandwich with butter</u>			
	<i>(32% cheese, 31% bread roll, 29% salad, 8% butter)</i>	18 - 2*	16	£2.70
	<u>Tuna mayonnaise and mozzarella Panini</u>			
	<i>(53% tuna mayonnaise, 34% panini, 13% mozzarella)</i>	11 - 0*	11	£3.20
	<u>Tuna mayonnaise salad sandwich</u>			
	<i>(37% tuna mayonnaise, 28% bread roll, 27% salad, 8% butter)</i>	11 - 1*	10	£2.80
	<u>Turkey salad sandwich with butter</u>			
	<i>(35% bread roll, 34% salad, 21% turkey, 10% butter)</i>	11 - 2*	9	£2.80

* Product could not score for protein because the ‘A’ points were ≥ 11 and the product did not score 5 points for fruit, vegetables and nuts

According to the NPM, the frequently purchased products were predominantly more healthy in LC1 (80%) and predominantly less healthy in LC2 (78%) (Table 13). Scores ranged from -3 to 4 in LC1 and -2 to 22 in LC2. In LC1, the most healthy product was the banana and the least healthy product was the BBQ chicken Panini. Although the kids chicken dipper meal and chips were categorised as more healthy, the energy (KJ) content for these meals were the highest in LC1; 1023KJ p/100g and 1001KJ p/100g respectively. In comparison, energy (KJ) content for the BBQ chicken Panini was 885KJ p/100g. However, the Panini and BBQ sauce scored highly for sodium and lower for NSP fibre in comparison to chips and to the kids chicken dipper meal. It is important to recognise that the calculations were based on the components provided by each facility and did not extend to include condiments, drinks or side orders that a consumer might choose to consume alongside a product. For example, consumers may choose to add salt or sauce to chips which would have increased the sodium and energy content of the meal, and may have led to a change in the classification of the product. Furthermore, the product healthiness was calculated p/100g using the NPM, so the portion size for the whole meal was not considered.

In LC2, the most healthy product was the beans on toast and the least healthy product was the cheese omelette. For the cheese omelette, nearly half of the meal was comprised of cheese which led to a high score for saturated fat and sodium. Further to this, the meal did not provide any fibre or fruit, vegetables and nuts. Alongside the cheese omelette, the majority of products at LC2 were categorised as less healthy. This can also be partly explained by the proportion of cheese and butter in a number of the products which led to a particularly high score for saturated fat, and in some instances sodium, which produced a high score for 'A' points. Based on the NPM, this often meant that protein points were excluded from the analysis resulting in a higher NPM score.

5.1.2 Economic environment

5.1.2.1 Food and beverage prices

5.1.2.1.1 Frequently consumed products

The price of each frequently consumed product was identified in Table 13, however some of the products may not be comparable by price as they could be a snack-item, meal, or a meal specifically designed for children. Within LC1 there were two frequently consumed standard-sized meals (not aimed at children). The less healthy option, BBQ chicken Panini (£2.55), was cheaper than the jacket with cheese and beans (£3.95) which was classified as the more healthy option. By way of comparison, LC2 offered relatively similar prices for comparable products. For example it was the same price for beans on toast (£2.00), categorised as more healthy, as for cheese on toast (£2.00), categorised as less healthy.

5.1.2.1.2 Vending machine products

Table 14: Food and beverage prices for the vending machines* alongside cost of fruit

Location	Confectionery	Crisps	Soft Drinks	Fruit**
LC1	£0.70 - £0.90	£0.70 - £1.00	£0.90 - £2.00	£0.70
LC2	£0.45 - £0.65	£0.50 - £0.70	£0.75	£0.45

* A full breakdown of the cost of vending machine products can be found in Appendix 8

**Prices are for fruit sold in the café

Both centres provided a range of crisps, confectionery and soft drinks within the vending machines. The opening and closing cost of confectionery, crisps, and drinks was lower in LC2 than in LC1 (Table 14). The nature of the products available could reflect some of these differences, particularly for drinks. For example, 500ml drinks bottles were available in LC1, whereas only cans (330ml) were available within LC2. As a result a normalised price was determined for drinks. In LC1, drinks ranged between £0.22 - £0.45 per 100ml, compared to £0.23 per 100ml in LC2.

Although fruit was not available within the vending machines, the cost of fruit from the café was included as a point of comparison. Fruit was available for £0.70 and £0.45 within LC1 and LC2 respectively. Both figures mirror the cost of the lowest priced items within the vending machines for the respective leisure centre. In addition to the aforementioned categories, protein based products, such as those as described earlier (section 5.1.1.3), were available within LC1 and ranged in price between £1.20 and £2.40.

5.1.2.2 Food and beverage offers

At the time of the study, LC1 offered a regular hot drink and a flapjack for £2.50. Consumers were also able to 'upgrade' a salad box to a larger portion for an additional £0.20.

In LC2, there was only one deal advertised; a 'sandwich takeaway meal deal' for £3.00. It was not specified on the advertisement what the meal deal comprised of, consumers were only invited to discuss the contents with the catering staff.

5.1.3 Political environment

5.1.3.1 Food restrictions and Government advertising

There were restrictions in place in both leisure centres to prevent customers from bringing their own food and drink to consume in the café. Signs were visible in both leisure centres to remind customers of this policy.

LC2 displayed posters of Government recommendations for healthy eating. Posters were based on advice from Change for Life, the NHS, and the Food Standards Agency (Figure 8). At the time of the situational analysis, no adverts relating to Government healthy eating advice were visible within LC1.



[Figure 8: Example Food Standards Agency and Change for Life posters](#)

5.2 Semi-structured interviews

To provide context to the interview themes which will follow, section 5.2.1 will briefly discuss the profile of the participants and their engagement with their respective leisure centre. Participant characteristics can be found within Chapter 4.

5.2.1 Engagement with the leisure centre

All of the participants visited the leisure centre at least once a week to personally engage with an exercise class or to accompany a child. It was proposed that frequency of engagement with the leisure centre may increase for some customers during school holidays. The majority of participants had engaged with the leisure centre for several years or more, with the full range spanning from 7 months to 14 years. Only one participant reported holding a membership with their respective facility. Lack of membership was due to a multitude of factors including; cost of membership, work commitments, frequency of visits, and the potential for weather to prevent engagement at times. A number of participants identified 'exercise' as central to their visit, alongside 'fun' and the 'social' aspect of visiting a leisure centre. Leisure centre café users, for example, reported having used the café after exercise, or whilst their child/grandchild was participating in exercise;

“We meet and we have coffee when we’ve had the exercise we sit and have coffee and a biscuit and err a chat” (LC2P2)

“Yeh, I’d, I’d use it (café), [daughter] uses it (café) when she comes swimming, she you know gets a drink and maybe has a snack or something. And errr when we come for lessons I might have a drink” (LC1P1)

Furthermore, the manager in LC1 felt that the leisure centre had started to attract leisure centre users for day trips, meaning that consumption of food or drink was likely;

"Errrm, I think as we’re getting more now a bit more of a destination venue rather than just a local swimming pool, people will come for the day and they might come for a swim, they’ll swim in the morning then they might have something to eat, they might swim in the afternoon, or they might do one activity in the morning have something to eat and swim in the afternoon" (LC1M)

5.2.2 Themes

Leisure centre café user interviews were analysed separately to the catering manager and manager interviews, however the results are presented together and have been categorised into the same themes (Table 15). This ensured that the future direction of the study combined all stakeholder points of view.

Table 15: Themes and subthemes derived from the interviews

Main theme	Subtheme
Obesogenicity/leptogenicity of the food offer	Variety of the food offer
	Dichotomy of the food offer
Cost of food and external food offer	Cost of food and demand
	Alternative food outlets
Barriers and enablers of leptogenic choices	Visibility of the food offer
	Education on healthy eating

5.2.2.1 Theme 1: Obesogenicity/ leptogenicity of the food offer

5.2.2.1.1 Variety of the food offer

This subtheme focuses on the perception of the food offer, from all stakeholder perspectives, and summarises what is available. Insight into the reasons behind the food offer is obtained from the managers and catering managers.

In terms of the café, some participants reported a varied food offer. A number of leisure centre café users felt that the food offer looked ‘nice’ and offered some healthy products. Specifically, they commented on the availability of salad and fruit, such as apples and bananas, however the replenishment of the fruit was considered inadequate at times;

“I’ve seen salad n stuff. I have seen salady things. And as I say they’ve always got fruit on the....counter... Errrm, sometimes it gets a bit low, I must admit and at one point there was only apples and I know a lot of kids devour bananas so maybe it’s cos they’ve run out” (LC1P2)

"I've seen some nice salads and stuff, quite healthy food I would say so...then I think there's obviously cakes and things for...the not so health conscious but no it's looked alright but as I say at the moment" (LC2P3)

Despite the perception that the food offer is somewhat varied, the manager for LC2 desired more healthy options;

"...for me the food offering is ok, it's not fantastic, it's not what I would wish to offer, I would want to offer a greater range of foods, have more information about healthy foods and more imaginative healthy meals" (LC2M)

The catering manager for LC1, explained that they offered products that are deemed 'child orientated', such as 'burgers' and 'chips', alongside options that were perceived to satisfy parents;

"So there is the food that the kids crave, as well as the food that the parents want them to have, so there are both options" (LC1CM)

Relative to the café offer, leisure centre café users were more negative about the vending offer and perceived it to be 'typical'. The vending machines were said to offer 'chocolate', 'crisps', and 'drinks'.

"When you've seen one, you've seen them all I think"(LC2P1)

"To be honest I don't think a lot about vending machines, I think that they're pretty rubbish" (LC2P3)

The manager for LC1 also referred to the vending offer as 'standard', however demonstrated that a variety of options were still available in the vending machines;

"We have the general crisps and chocolate and confectionery and stuff, but we also have alternatives to fizzy drinks such as water. We also sell errm nutrition bars, healthier options in direct competition to chocolate and things such as that. We also sell mineral water, mineral water or nutrition mineral water as well" (LC1M)

The vending offer was governed or had previously been governed by a contract in both leisure centres. LC2 previously had NHS funding which regulated their

vending offer, and prevented the availability of some unhealthy options. LC1 however held a contract with a confectionery company who regulated their vending offer. Where allowances were made, stipulations were still in place to ensure that the products for the machines were accessed through the company's suppliers.

"Yeah, yeh. Basically up until last year, we had the vending machine but we used to be funded by the NHS so whatever our opinions were there were things that we couldn't stock in the vending machine because the NHS would have stopped our funding" (LC2M)

"But we can like I say take certain bits out and put other things in that aren't specifically Nestlé. We're allowed to put in things like Mars because we recognise that they're a higher seller. People buy those, things like Mars, Twix's, Snickers are some of the biggest selling items of confectionery nationwide and if we stood by the Nestlé contracts then they wouldn't allow those in but they do, they say you buy them through our supplier and we'll let you put em in our vendors. So there is a little bit of lee-way within the design" (LC1CM)

Once the NHS funding stopped from LC2 the vending offer could no longer be supported and became less healthy. The catering manager referred to a lack of demand for the healthy vending products, and felt that it was within their remit to ensure that the products available reflected the demand.

"we haven't got the NHS funding now..times are getting hard for us financially so the machines gone a little more adrift" (LC2M)

"I'm going back years to when we first got them we had them just stocked with things like the cereal bars and things like that and to be honest people just weren't interested....Cos people aren't interested so I think then you can say to yourself well what do I do ere? Errm, as it's quite obvious that people don't want this, don't want these, that the machines not getting used, we're not making no money as a company and then you could say well we'll put some other things in" (LC2CM)

5.2.2.1.2 Dichotomy of the food offer

This subtheme focuses on the expectation from some leisure centre café users that leisure centres would provide a more healthy food offer. It also draws on the managers' concerns about the interaction between the physical activity side of the business and the food side.

Fitness and wellbeing was considered important within the leisure centres. A greater emphasis on health was expected within the food offer. Despite the previous subtheme demonstrating that some leisure centre café users perceived the food offer to be varied, some participants also expressed surprise at the food offer;

"Erm it surprises me that in a leisure centre that they would offer some things that they offer. Well, it's you know it's somewhere that you presume that they're kind of promoting health and fitness and wellbeing..."(LC1P3)

[Is healthiness important to offer?] "Well I think so in a place like this, yeah yeah...Well within, cos you come for fitness basically don't you" (LC2P3)

The manager at LC2 also expressed concern that public health is only really considered from the point of view of physical activity. Although the food offer was considered when the NHS funding was in place, once the funding ceased the conversations about the food offer halted;

"One of the issues I think for a centre like us is, and probably for others, that tends to come through culture directorate which is like the leisure world, and that's a little..whilst in theory public health is now integrated into that in reality it's not within the council, it's not integrated that well" (LC2M)

Completion of activity was found to motivate food purchase in some instances. For example, hunger following exercise led to the purchase of snack-items. One example given included fruit, suggesting that hunger after exercise could involve eating behaviours which could be perceived to be more healthy. However the manager for LC1 also raised concern that customers using the

gym feel that they have earned a 'treat', and that the energy consumed may be much greater than the energy expended;

"So sometimes when she [daughter] comes out the pool she's starving so I buy her a banana or an apple or something" (LC1P2)

"...I hear people saying oh I've been in the gym for half an hour I'm going to treat myself and go to errrm the fast food chicken place or the burger place or what have you when the education behind it is realistically you've burnt 250 calories there and you're just gonna take on 1000 and it's not really the right way of doing things..." (LC1M)

5.2.2.2 Theme 2: Cost of food and the external food offer

5.2.2.2.1 Cost of food and demand

This subtheme encompasses leisure centre users' perceptions of the cost of the food offer alongside manager and catering manager perceptions of consumer demand based on the cost associated with particular behaviours.

The majority of leisure centre café users considered the cost of food in the café to be 'reasonable' and 'good value for money', with only one participant perceiving the café offer to be 'expensive'. Contrary to this, vending machines were largely perceived as more expensive and were referred to as 'overpriced' and 'money-grabbing';

"I mean they're [vending machines] a bit more overpriced but then you expect that from things like this, you're not going to be able to get chocolate bars for 30, 40p they're gonna be double that but you do expect that wherever you go..." (LC1P1)

The catering manager for LC1 felt that healthy choices were more expensive, and the manager at LC2 highlighted the issue of affordability for the clients who engage with the centre;

"There's a premium for eating healthily. If that was a lot cheaper then maybe it would be a call for changing people's lifestyles, it's gotta be a choice ant it?" (LC1CM)

"...the clientele we get are not particularly affluent so you, we're always constrained by the sort of financial side of it" (LC2M)

For example, one parent reported that they allow their children to make their own food choice as it would be a 'waste of money' if they didn't want to eat it;

"They [participant's children] do decide what they eat, I don't ever force them to eat something they don't like or you know I wouldn't buy them anything I knew they wouldn't like because they wouldn't eat it, it would just be a waste of money" (LC1P1)

Further to this, the manager at LC1 expected that the financial climate at the time of the study would have encouraged a trip to the leisure centre to be seen as a treat, so children would be allowed to select their own food choices;

"...sometimes when parents take kids out, especially in this climate because I don't think kids are getting out and about as much as they used to due to being in a bit more of a difficult financial climate, errrm so I do think parents are more inclined to treat their kids and generally a treat is considered they've done some exercise, they've gone swimming or whatever so their treat is that the kids get to pick whatever they want from the menu board" (LC1M)

Both leisure centres have considered changes to make the food offer healthier. However, concerns about the demand for healthy products and about the potential impact on revenue were barriers to changing the food offer. LC1 had considered removing chips from the menu which was welcomed by fitness staff at the facility, who are required to hold a qualification which includes fundamental nutrition knowledge. However, the catering manager stated that '60% or 70%' of sales 'go through the fryer' which led to concerns about loss of income. LC2 also demonstrated financial concerns which led to a need for the income from the vending machine, and to the changes to the food offer within the vending machine. They also reported constraints on resources, such as staff numbers. As a result, initiatives such as 'calorie counted portions' disappeared;

"Cakes....we do do cakes. In an ideal world I would probably have less cakes, more choice of desserts and if we do have cakes we have tried

really hard to do things like Calorie counted portions so it's a treat it's a hundred Calories. It's, you know, the cakes that are lower sugar, lower fat – trying that. At the minute that's all gone a bit because we've really got staffing problems at this point in time..." (LC2M)

5.2.2.2.2 Alternative food outlets

This subtheme focuses on managers' and catering managers' thoughts and concerns about the food environment that is external to the leisure centre alongside leisure centre café users perceptions of the external food environment, and their engagement with it.

In LC1, the catering manager demonstrated concern that changes to the leisure centre food offer would cause consumers to go elsewhere. As a result, freedom of choice was considered to be essential. Furthermore, the catering manager expressed a belief that changes to the leisure centre food offer would not deter an unhealthy food choice, it would just delay the food choice;

"You've gotta serve to everyone you can't just force your ideals on someone within a leisure centre. They've gotta make the choices themselves. And if you give 'em the options and they still choose the chips, that's their choice and they have a freedom of choice, it's their money they can spend it on what they want you can't stop them" (LC1CM)

"If someone craves a Mars bar, they will go and buy a Mars bar if it means from us or they walk 100 yards down the road or they pick one up from the petrol station. Everything's so easily accessible now, by me not having 'em in here won't make me change their lifestyle or their life choices. It would just it would just stop it for 3/4 minutes longer that's all" (LC1CM)

In LC2 however, the catering manager was not concerned about the external food outlet. The food offer was not perceived to be comparable with the leisure centre's offer, so it was not considered as a competitor;

“...people think oh will they take all your business etc etc and it’s like, it’s never been like that I mean lady who wanted it [the café outside of the leisure centre] she’s alright and end of day they’ve got their market, and this centre and this cafe’s got their market...” (LC2CM)

In contrast to this, LC1 was surrounded by ‘six or seven fast food outlets’ including KFC, McDonalds and Burger King. The manager recognised that consumers may choose to consume fast food, however posited that these choices would be better made in a leisure centre environment;

"So we offer the full range errr only errrm you find that there is a need for the stuff that maybe isn’t the healthiest, errrm but as we’re surrounded by a number of fast food outlets, if individuals want to make that choice then they’ll make it. Errrm, and we’d rather them make that choice in an environment where we can offer them the advice and the feedback than maybe in a different environment where that’s not available" (LC1M)

Despite this, some of the leisure centre café users that were interviewed in LC1, reported visiting fast food outlets or chain restaurants following a leisure centre visit;

"Cos, often, or on a few occasions we’ve left here... we nipped to McDonalds or KFC or something on the way home just if we’ve got something else on" (LC1P1)

"I think if we come swimming as a family and we’re going to have some tea or a meal afterwards we would just go somewhere else, we wouldn’t think to just stay here and have some tea...Probably one of the, there’s quite a few kind of...chain restaurants nearby so it might be one of those..." (LC1P3)

Food from home was not permitted in either leisure centre, so leisure centre users choosing to eat whilst they were out would need to purchase food from the leisure centre café or elsewhere. It was found that a number of participants abided by the rules completely, and others only brought their own drinks with them.

It was evident from the catering manager and manager interviews that they were concerned about changing the food offer due to the external food offer and/or due to perceived demand. As a result, alternative methods to increase healthy choices, such as education and support, are pertinent to consider.

5.2.2.3 Theme 3: Barriers and enablers of leptogenic choices

5.2.2.3.1 Visibility of the food offer

This sub-theme relates to the thought process behind the visibility of vending machines and the products which are visible on the café counter. Leisure centre café user perceptions of the position of vending machines are also considered.

In LC1 the catering manager had considered the best place to position the vending machines to ensure maximum visibility;

"Entrances and exits the building. Where we can bottleneck people for the maximum amount of exposure." (LC1CM)

However, this did not go unnoticed by leisure centre café users who considered vending machines to be 'in your face' and highlighted the position of some vending machines by the poolside and highly visible to children;

"Cos it's there by the pool side, they're out [children] they're hungry oh I'm gunna have a chocolate bar, that sort of thing. That's what, that's how kids think. I don't know if other parents have noticed that but I noticed that the other day I thought why have they put vending machines right at the side of the pool?" (LC1P2)

The notion of children selecting choices that are visible to them was also discussed in terms of the café counter. The catering manager at LC1 however said that choices made by children were sometimes overridden by parents or grandparents;

"...the toddlers may come up and see things in the counter and say I want that and the parent will say no you're having, i.e. they may say a piece of fruit or something like that you know like a slice of toast or and then you can have i.e. a banana or something like that with it" (LC2CM)

One parent however suggested that some of the options such as fruit and biscuits could be separated, which would avoid having a less healthy option next to the fruit;

“I think if they had more on the display front. Cos like I say they have the fruit by the till which is immediately obvious, but at the same time they’ve then got a stack of biscuits next to that so separate it or...I don’t know” (LC1P2)

The catering manager at LC1 did reflect on whether it was right to be encouraging unhealthy choices;

“It makes me sound really bad you know when I think about the things that I’ve done and why they’re in the places they’re in. You think, you really do, you’re doing it because you’re trying to make people buy things that you know that you really shouldn’t; chocolate and crisps. It’s really strange when you sit and think you’re trying to make people buy these things and I don’t know....hey ho” (LC1CM)

Although the visibility of unhealthy products may act as a barrier to healthy choices, visibility of healthy options could result in more purchases. This was evidenced by the catering manager for LC1 who reported issues with their front of house refrigerator during the time of the study, which had previously housed products including salads and fruit;

"The [lack of] visuals of having salads in there and fruit boxes and all the other bits and pieces that go in there has made a massive difference we’re about £700, £800 down on those sales" (LC1CM)

The manager for LC1 however did try to explain that only some products could be placed in the most visible places, which was referred to as ‘position A1’;

“Unfortunately we can’t position everything in position A1 as it were so we have a range of products that are advertised and displayed throughout the venue and people make their choices” (LC1M)

The manager at LC2 also demonstrated regret towards some of the decisions that were made, such as preventing the visibility of free water near the café, however this particular decision was deemed necessary for financial reasons;

"... in my ideal world there would be water fountains available where everybody can get a drink of water when they want one...And there it is. However, we do that in the gym and we do it upstairs.... So it's not great, but it's where we are" (LC2M)

A water fountain was provided in the café area in LC1. Despite concerns about the hygiene of the fountains design, it was largely considered as positive. The process of using a water fountain was also considered to be a 'novelty' and appealing to children as it's something to 'play' with, which could therefore encourage consumption of water.

Due to the limited availability of space for displaying healthy and unhealthy options, and the financial concern associated with providing some of the healthy options, further methods which encouraged consumers to select the healthy choices were essential.

5.2.2.3.2 Education on healthy eating

This subtheme encompasses leisure centre users' awareness of healthy eating, and thoughts about the best method for communicating information about healthy eating. Stakeholder perceptions of Calorie information on menus are also considered.

The catering manager for LC1 highlighted that consumers have a choice about what to purchase and that it will be based on their education about healthy eating;

"I am in this business to make more money for the centre, to keep the centre open, to keep people coming in. The people who come in have a choice, they either buy it or they don't and it's about their education of whether they eat four or five chocolate bars a day or whether they eat one every two days but they still exercise and that" (LC1CM)

Generally, leisure centre café users were confident in their knowledge of healthy eating. Some had developed their knowledge via weight management groups such as Slimming World or Weight Watchers. Some parents also said that children gained knowledge at school. In LC2, cookery and wellbeing

courses were offered and some participants had received advice within the leisure centre;

"Someone did come [to the leisure centre], come in and chat to us and give us all the details on what healthy food we should eat and how much we should eat and what fruit and veg, you know that sort of thing"(LC2P2)

However, it was posited that workshops about nutrition would only attract individuals with an interest in healthy eating. As a result it was suggested that information is provided instead;

"I think it has to be something you're interested in too, beforehand to think about going to a class, whereas if you're just here and you happen to notice something and you read it then I think you're gonna catch more people in that respect, people that wouldn't normally think about nutrition"(LC1P3)

Leisure centre café users suggested approaches such as leaflets to communicate information about healthy eating. Discounted healthy meals, suggestions for cooking healthy meals at home and nutritional information were also suggested. Nutritional information was also of interest to managers and catering managers. Both leisure centres had either considered, or implemented, a form of nutritional information previously. In the past, LC2 provided 'calorie counted' portions of cakes however these were stopped due to reductions in staff and were not present during the data collection period. LC1 had only discussed the implementation of nutritional information previously. Concerns around the standardisation of product size and the best format for the information were considered barriers to action. Examples of potential formats included the Slimming World or Weight Watchers approach to labelling, and the traffic light labelling system. The lack of a clear approach prevented progression of the concept;

"And the final one [type of nutritional labelling considered] was about actually having something calorifically counted...which is fine if you are using...we use specs but they are open to interpretation... So they just

decided it was a bit of a land...a bit of a mine field and stayed away"
(LC1CM)

Although neither of the leisure centres provided any nutritional information at the time of the study, the results of the interviews have demonstrated that both centres were interested in providing this information. Furthermore, a number of leisure centre café users actually expected to see nutritional information in modern day food outlets;

"...you would never think to ask or you'd never wonder a few years ago but now everybody wants to know what's in it and how many calories cos they might be on a diet or something might they?" (LC1P4)

The notion of nutritional information being expected was furthered by a comment that supermarkets provide it. Nutritional information was largely considered 'interesting' by leisure centre café users with a minority reporting that they felt equipped to make the decision already. Only one participant reported a dislike for nutritional information on the basis that it would deter them from their desired choice;

"I don't like it [calorie information]. Makes me feel like I'm eating something that I shouldn't be eating. You know if you go out for a meal and then you see something and it tells you it's got 1500 calories in the meal, immediately that puts me off"(LC1P2)

In this instance however, the information would still be achieving its purpose from an education standpoint. It may be particularly pertinent to provide this information within a leisure centre, as one of the participants indicated that their visits to the facility actually prompted their interest in nutritional information;

"I mean I do...since I've been coming here (the leisure centre) ... I am inclined to think ooh what's that got in it, you know. Whereas up to being, up to not dieting and coming to the gym I were not bothered"(LC2P3)

This links back to the second subtheme in theme 1, regarding the dichotomy of the food environment. It's evident that the physical activity environment and food environment are entwined, demonstrating the platform to encourage healthy food choice behaviour within leisure centre settings.

5.3 Summary

The situational analysis demonstrated that the leisure centre vending machine offer was predominantly less healthy. Although mixed results were obtained regarding the frequently consumed products in the café, some healthy products were available in both centres. Evaluation of the economic environment suggested that the price of fruit in the café may be comparable to some of the items in the vending machines. In some instances however, purchases of more healthy products in the café would incur a higher cost. In support of the situational analysis, the interviews demonstrated a greater variety of products in the café when compared to the vending machines, with some healthy options available. Some of the leisure centre café users highlighted the dichotomy of the food environment and the physical environment within the leisure centre, and expected to see healthier options. It was however evident that managers and catering managers were concerned that changes to the food offer would lead to a loss in revenue. Furthermore, catering managers felt that their purpose was to bring money into the leisure centre, which meant that the food offer needed to reflect the demand. This concern was exacerbated in LC1 by the availability of multiple fast food outlets immediately external to the leisure centre. The visibility of healthy products could help to increase sales of these options, however the visibility of less healthy products and vending machines acts as a barrier to healthy choices. Leisure centre café users were largely interested in information to support them in making healthy choices. In particular, there was interest across all stakeholder groups in the provision of nutritional information. The following Chapter (6) will evaluate the results of the situational analysis and the key themes from the interviews, to determine the best strategy to adopt for stage two of the research.

Chapter 6 Discussion 1: Strategies to Increase Leptogenic Food Choice

6.0 Introduction to the chapter

This chapter will discuss the results of the situational analysis and semi-structured interviews in the context of previous research in this field. The aim of the first stage of the study was to classify the food environment, determine how leisure centre café users interact with the food environment and identify strategies to increase leptogenic food choice. The discussion will also draw on how the learning from this stage of the research was used to inform the development of a nudge strategy for the second stage of the study.

6.1 Obesogenicity of the leisure centre food environment

6.1.1 Obesogenicity of the vending offer

The vending offer in both leisure centres was categorised as predominantly obesogenic. Only 9% of the vending offer was categorised as healthy in LC2, and only 33% was categorised as healthy in LC1. This is consistent with previous research carried out in UK leisure centres, where only a minority of the vending offer was found to be healthy (0.4%) (Nowak, Jeanes and Reeves, 2012). However, the proportion of healthy products was lower than in the present study. This can be explained in part by the inclusion of drinks in the calculations for the present study, in comparison to the study by Nowak, Jeanes and Reeves (2012) which only considered snacks.

The vending offer was referred to as 'standard' by the manager from LC1, and was generally viewed as 'typical' by leisure centre café users. Although it was recognised that the offer included less healthy options such as crisps and chocolate, the manager at LC1 also reported that some healthy alternatives, namely water and nutrition bars, were available. Strategies could be implemented to encourage visibility and purchase of these healthier alternatives. For example, 'choice architecture', which is categorised as a nudge approach, has been used in previous research to guide consumers towards a healthier choice by making changes to the design of an environment (Olstad *et al.*, 2014). For example, van Kleef, Otten and van Trijp (2012) arranged healthier products on the top shelf of a shelving unit to enhance visibility and

accessibility, however this did not lead to an increase in the healthiness of purchases. Despite this, consumers were found to have greater freedom of choice. Furthermore, Wong *et al.* (2015) predicted, based on a simulation, that placing non-SSB beverages in optimal positions could nudge adolescents towards making a healthier beverage choice. This approach could be effective in a vending machine to nudge the purchase of non-SSB beverages instead of SSB. The availability of an optimal position was recognised by the manager in LC1, who referred to it as 'position A1'. Due to the limited availability of optimal positions, staff may be concerned about a choice architecture approach if they feel that there is a lack of demand for healthy choices, and they may wish to place the products with a high demand or with a high profit margin in these positions. Such an approach would also rely on the availability of adequate leptogenic options which, although available, were limited. Therefore, the availability of leptogenic options would need to be increased or alternative strategies need to be considered.

6.1.2 Obesogenicity of the café offer

There were conflicting results between the two leisure centres regarding the leptogenicity of the frequently consumed café products. The majority of products (78%) in LC2 were categorised as less healthy however the majority of products (80%) in LC1 were categorised as more healthy. In support of this, previous research in public, UK-based leisure centres found that 73.1% of meal options for children would meet the standards, based on the School Food Trust criteria (Nowak, Jeanes and Reeves, 2012). The finding that some leptogenic options are available in leisure centre cafés is important for the second stage of the present study as it suggests that methods to increase healthy purchasing behaviours can be considered, without initially making changes to the actual food offer. It is however worth noting that only non-packaged food items were included in the frequently purchased products. This excludes any pre-packed snacks such as crisps and biscuits which is a limitation of this research. Furthermore, the healthiness of the products was determined per 100g, as per the NPM, therefore the results do not take portion size consumed into account. Previous research in the US has demonstrated an increase in the availability of large portion sizes since the 1960's (Young and Nestle, 2012), although

increases in portion sizes may be less great in the UK when compared to the US (Wrieden, Gregor and Barton, 2008). Despite this, portion size may contribute to the obesogenicity of the food environment so the omission of this in the nutritional analysis presents a limitation of the research.

The conflicting results for the two leisure centres in the present study can be partly explained by the proportions of cheese, butter, and fillings mixed with mayonnaise in the meals from LC2. This resulted in high scores for saturated fat and sodium, in particular. Saturated fat should not exceed 11% of daily energy intake from food, however the results of the National Diet and Nutrition Survey (NDNS) demonstrated that all age groups exceeded this recommendation (Public Health England, 2014d). For example, individuals aged 19-64 years obtained 12.6% of daily food energy intake from saturated fat. One of the main sources of saturated fat was milk and milk products, with most age groups obtaining 22-25% of their saturated fat intake from these sources. In addition, 8-11% of sodium intake was obtained from these products for the majority of age groups. As in the present study, it was recognised in the NDNS (Public Health England, 2014d) that consumers may also add additional salt to products prior to consumption, which would increase the sodium consumption from that eating occasion. One way to encourage lower saturated fat and lower sodium choices would be the use of default options, where a pre-selected option is provided to the consumer unless an alternative is requested. For example a low salt, low fat cheese could be given to consumers unless an alternative cheese is requested. Default options have been successfully employed previously to encourage a particular portion size (Giesen *et al.*, 2013) and can be used to encourage healthy choices (Downs, Loewenstein and Wisdom, 2009). The online study by Giesen *et al.* (2013) found that participants selected the default option more frequently even though they were made aware that an alternative portion size was available.

6.2 Barriers to changing the food offer

6.2.1 Perceived demand and financial constraints

Both of the leisure centres in the present study had resource constraints which were discussed during the interview. A key barrier to changing the nature of the

food offer was concerns around a lack of demand for healthier products and potential loss of revenue. As described in the literature review, this concern is reflected throughout the field (Olstad *et al.*, 2015b; Olstad and Raine, 2013; Vander Wekken *et al.*, 2012). In support of this concern, Olstad *et al.* (2014) found that average daily gross profits in recreational centres were significantly higher for unhealthy (65.9%) products when compared to healthy products (34.1%). However, this can be partly explained by the fact that significantly more of the products sold were unhealthy (59.2%).

Lloyd and Dumbrell (2011) carried out an evaluation of a project which initially intended to replace all EDNP products at a community swimming pool with healthier alternatives. The 'business person' from the swimming pool, who was involved in the project, emphasised that the consumers should drive changes to the food environment. It is interesting therefore that consumers are becoming increasingly health conscious which could mean that businesses need to adapt to suit this demand (Vander Wekken *et al.*, 2012). Concerns about the project encompassed the feasibility of the removal of all EDNP products, the space required to store and display new products and the potential increase in food waste. Ultimately, following feedback from customers and the council, the project was adapted to facilitate more choice. It was recognised during the evaluation that there were resource implications of adapting the food offer, in terms of time and profits, which need to be recognised during the design for the second stage of the present study. This would also suggest that changes to the food offer, such as default options, may not be the most suitable method to adopt.

Despite concerns from leisure centre staff about the lack of demand for healthy products, the present study demonstrated that some leisure centre café users expected the food offer to be more leptogenic, due to the physical activity setting. This is contradictory to the expectation that stakeholders would resist changes to the food offer and demonstrates that the concern from staff about a lack of demand for healthy products may not be upheld. Despite this, LC1 had decided against removing chips from the menu previously because the catering manager had confirmed that '60% or 70%' of sales 'go through the fryer'. Furthermore, LC2 had tried including cereal bars in the vending machine,

however felt that consumers were not interested in this option. These examples suggest that, although consumers may expect to see healthy food choices in a leisure centre, actual behaviour may be skewed towards potentially less healthy choices. This was supported by the Food Standards Agency (2014) strategy for 2015-2020, where it was observed that consumer behaviour is opposite to their values. For example, consumers may value fresh products but purchase processed products. Consumers were aware that they created the demand for less healthy products by purchasing them, however they felt that marketing, pricing and packaging encouraged their behaviour. A review by Chandon and Wansink (2012), which included literature from marketing and consumer research, affirmed that marketing can influence consumption volume and may have an obesogenic effect. A wide range of influences were cited, including price, promotion, branding, health claims, serving size and access. This suggests that the food environment would benefit from some leptogenic information/stimuli to encourage healthier options.

6.2.2 Financial cost of engaging with healthy products

From a leisure centre café user perspective, the café food offer was generally perceived to be reasonably priced and good value for money, compared to the vending offer which was perceived to be expensive. The catering manager for LC1 however considered healthy products to be 'premium' and more expensive. This could act as a deterrent to making changes to the food offer, in particular where there are concerns about the affluence of the audience, as reported in LC2. LC2 also reported a change in the vending offer after NHS funding had been removed. The catering manager adapted the food offer to meet the demand for more, less healthy products, which demonstrated a potential lack of demand for healthy products and posits that financial support may be required to maintain a healthier offer. In support of the comment made by the catering manager for LC1, Morris *et al.* (2014) observed a positive association between the cost of food and the healthiness of dietary choices. This observation was based on a women's cohort study in the UK, where dietary choices were assessed for healthiness based on the Eatwell plate. Interestingly, the Eatwell plate recently changed to the Eatwell guide (Public Health England, 2016a), creating some differences which could potentially impact on the classification of

these results. For example, the size of the food group segments have been adjusted in line with current government guidance and the segment names have been adapted to emphasise sustainable foods (Public Health England, 2016b). High fat, salt and sugar foods have been removed from the main image, to demonstrate that they should be consumed less frequently. This further demonstrates the concern around the food offer available in the vending machines, and around the need to promote the leptogenic café items over the obesogenic items. Fruit juice has also been removed from the main image, however a hydration message has been added which provides advice on drinks. Energy requirements for men and women have also been added to the guide as a reminder that all foods and drink consumed contribute to daily energy intake.

The present study found that discounted healthy meals could prove beneficial to encourage healthy choices. Despite the notion that healthy foods may be more expensive, previous research in a leisure centre setting found a 30% discount on healthy options to be ineffectual (Olstad *et al.*, 2014). However, males (50.3%) made significantly healthier choices, whilst the signage, taste-testing and price reductions were in place, when compared to females (38%). This was particularly interesting, given that females (50.6%) made significantly healthier purchases, when just the signage and the taste-testing were in place, when compared to males (33.6%). This suggests that price reductions may have more of an impact on males. Alternative financial incentives such as prepaid cards could prompt healthy purchases. Just *et al.* (2008) found that prepaid cards, which could only be used for healthy purchases, increased the healthiness of choices in College students. Whilst prepaid cards are often used in Colleges and Universities, the concept could be extrapolated to venues, such as leisure centres, where people habitually attend the same facility. This method reflects a form of financial incentive, which echoes the purpose of a 'hug' (Local Government Association, 2013) within the exchange framework portrayed by French (2011).

6.2.3 External food environment

In the present study, LC2 felt that their market was clearly defined, and were therefore not concerned about the external food offer. In comparison, LC1 reported around 6 or 7 nearby fast food outlets, which motivated concern about changes to the food offer within the facility. This concern was validated by some leisure centre café users who reported using the fast food outlets and takeaways after the leisure centre. Previous research has been carried out into the proximity of food outlets surrounding schools (Day and Pearce, 2011; Buck *et al.*, 2013; Black and Day, 2012; Smith *et al.*, 2013) which could be extrapolated to the food environment surrounding leisure centres. However, a systematic review which included a number of the aforementioned studies (Williams *et al.*, 2014) identified that the external food environment had little impact on purchase and consumption. It was proposed that these results could be partly explained by the reliance on observations, as opposed to considering individual response to the food environment.

Analysing the external food environment was outside of the remit of the present study, however it is important to recognise, as it contributes to the concern raised by leisure centre staff about changing the food offer. For example, the manager at LC1 believed that changes to the food offer would not prevent a less healthy behaviour, it would just delay the behaviour whilst the customer went elsewhere. The manager also felt that the customer would be better off making the unhealthy choice in the leisure centre as they are more able to provide 'advice' and 'feedback', however it was unclear how this would be achieved. The notion of leisure centres being able to offer advice is particularly pertinent given the recent Catering Competency Framework (Public Health England, 2015a). Two prominent dimensions of the framework are; 'Fundamentals of Nutrition', which includes healthy eating guidelines and understanding of portion sizes, alongside 'Improving Health and Wellbeing' which incorporates knowledge of health risks and menu planning. It was evident from the present study that LC1 employees working in fitness were required to have a qualification which included fundamental nutrition, however nutrition knowledge may need to be more extensive, in line with the dimensions of the Catering Competency Framework. Furthermore, the Catering Competency Framework encourages catering staff, who are in a better position to provide

information during the food choice process, to hold this knowledge as well. Previous research has demonstrated that leisure centre workers expressed desire for adequate education on healthy choices so that they could disseminate the information to the public (Naylor *et al.*, 2010), demonstrating that staff training could be well received.

6.2.4 Importance of freedom of choice

The catering manager for LC1 felt that consumers needed to “make the choices themselves” and that “you can’t force your ideas on someone”. The importance of freedom of choice was supported by Lloyd and Dumbrell (2011) who carried out an evaluation of a project in a community swimming pool. Various parties involved in the project, although it was not clear who, made claims regarding “the autonomous right of customers” to select EDNP products (Lloyd and Dumbrell, 2011, p.24). Further to this, it was reported that some products, such as chips, were considered to be symbolic in the context. A total of 47 customers were asked about their attitudes towards restricting EDNP products for children and adults. Although there was some acceptance of restricting EDNP products for children, freedom of choice regarding the purchase of EDNP products was greatly valued. This validates the concerns in the present study that autonomous choice must be preserved.

It was interesting that in the present study, both leisure centres had consciously designed elements of the food environment to encourage sales. For example, the manager at LC2 reported that they would like to provide a water fountain in the café area, however they avoided this as they needed the income from the café. Furthermore, the catering manager in LC1 had strategically placed the vending machines where customers tend to “bottleneck” to enhance exposure. Although consumers still have the freedom to choose whether or not to make a purchase, the environment may promote particular behaviours. This approach could be adapted to promote healthy choices and is aligned with nudge theory, which adopts a libertarian paternalistic approach (Thaler and Sunstein, 2009). Previous campaigns have encouraged healthy choice without compromising freedom of choice. For example, Change4Life encourage families to make ‘sugar swaps’ (Public Health England, 2015b). Families are provided with

guidance on reducing the amount of sugar that children consume. They are given four 'sugar occasions' to choose from; breakfast, drinks, after-school snack and dessert, and are encouraged to make one or more swap from a higher sugar choice to a lower sugar choice. This strategy encourages healthier choices, however individuals still have the freedom to decide whether to engage, and to decide how many sugar swaps they make per day and what these will be. Such advice may be particularly pertinent where parents/guardians may allow children a treat following exercise. As 'treats' appears to form part of the culture of a leisure centre, it seems appropriate to enable freedom of choice, however to provide support and guidance where possible to encourage more leptogenic choices.

6.3 Ability to make healthy choices

6.3.1 Knowledge of nutrition

Knowledge of nutrition has already been discussed in terms of leisure centre staff (section 6.2.3). Leisure centre café users generally believed that they had sufficient knowledge of nutrition. However, previous research has demonstrated that consumers may have gaps in their knowledge of nutrition (Dickson-Spillmann, Siegrist and Keller, 2011; Grunert, Wills and Fernández-Celemin, 2010). For example Dickson-Spillmann, Siegrist and Keller (2011) found that Swiss consumers were aware of vitamins and minerals in fruits and vegetables, however they were less aware of the carbohydrate, fibre and water content. Further to this, a lack of understanding about the differences in the types of fat in meat and in oily fish was demonstrated. This was also found in research by Grunert, Wills and Fernández-Celemin (2010) who found that only 25% of consumers could correctly identify recommendations for polyunsaturated and mono-unsaturated fats, out of consume 'more', 'about the same', 'less' or 'try to avoid', compared to over 66% of consumers who could correctly identify this for nutritional information such as energy (kcal). This is interesting because polyunsaturated and mono-unsaturated fats can be provided voluntarily on the back-of-pack of food products, however energy (kcal) is amongst the mandatory information (Department of Health, 2013). This also demonstrates that consumers may have some knowledge of nutrition, however there may be gaps in their knowledge as well. Further to this, is the concern that consumer

perceptions of healthy products may differ from actual healthiness. For example Feinberg (2011) observed a significant difference between perceived energy (kcal) in beverages in a university café and actual energy (kcal), which demonstrates the potential difference between perceived healthiness and actual healthiness.

The nutritional knowledge obtained by leisure centre café users came from a variety of sources, including weight management groups, and one parent said that their child learns about healthy eating at school. One of the participants from LC2 had accessed nutrition advice at the point of their referral to the leisure centre, based on a recent disease, however, one of the participants from LC1 suggested that people would only be likely to engage with workshops if they have a vested interest. The variety of sources of nutritional information is interesting as although health professionals may provide facts about nutrition, media sources may present information in a manner which distorts the message (Chew, Palmer and Kim, 1995). Previous research has demonstrated that the quality of dietary advice provided in newspapers is predominantly below the requirements (Cooper *et al.*, 2012). Previous research also shows that society is saturated with media messages and children may spend up to 6.5 hours per day exposed to various media sources such as television, radio and magazines (Roberts, Foehr and Rideout, 2005; Freisling, Haas and Eimadfa, 2010). The recent changes to regulations on high fat, salt and sugar product advertising to children (HFSS), enforcing that HFSS products are not shown during programmes which are targeted at children below 16 years of age (Advertising Standards Authority, 2017), demonstrate that the exposure of unhealthy messages to children are a concern.

A number of participants in the present study suggested that information regarding healthy eating could be disseminated via leaflets, suggested menus for meals at home or information on a notice board. This was interesting as the results of the situational environment demonstrated that the physical environment largely contained information about the physical activity offer. Sports arenas are considered captive settings (Turley and Shannon, 2000), as customers remain in an environment for a period of time and can be exposed to a variety of stimuli. Although on a smaller scale, activities taking place within a

leisure centre could create a captive setting in the café as parents/guardians wait for children. It is therefore preferable from a public health standpoint that the food environment is conducive to healthy food choice behaviour. This requirement was reinforced by the restriction on own food recorded in both leisure centres, which is most likely in place to encourage purchases in the leisure centre. The results of the situational analysis and the interviews have so far demonstrated concern about changing the food offer, but offer an opportunity to provide more information in the food environment.

6.3.2 Nutritional information to support healthy choices

Neither of the leisure centres in the present study provided nutritional information on their menus, or elsewhere in the café or on the vending machines. A number of leisure centre café users thought that nutritional information at the point of purchase would enable an informed decision, as supported by Hodgkins *et al.* (2015), and it was considered expected in modern society. Mills and Thomas (2008) support the notion that customers expect nutritional information, and found a particularly strong expectation for Calorie information in restaurants. The present study found nutritional information to be seen as a tool that equips consumers with the 'right' information. The word 'right' is particularly apt, as it is possible that consumers may perceive a product to be more healthy or lower energy (kcal), if the information is not provided.

This is supported by Feinberg (2011) who carried out a study in a university café and found that perceived energy (kcal) intake and actual energy (kcal) intake from beverages can differ (Feinberg, 2011).

Despite the overwhelming positive response from the participants, regarding the provision of nutritional information in the leisure centre café, a small number of leisure centre users anticipated that the information would not be of personal interest to them. This may reflect differences in values, as some individuals place a greater value on health and healthy behaviours (Lau, Hartman and Ware, 1986; Pohjanheimo and Sandell, 2009). As a result, consumers who value health may be more likely to engage with nutritional information. For example, Hodgkins *et al.* (2015) found that consumers with an interest in health, reviewed health logos on product packaging. The second stage of the research

will therefore capture individual motivation to make healthy choices, this information can then be used to profile consumers and compare characteristics and food choice behaviour.

Catering managers and managers also demonstrated a positive attitude towards the provision of nutritional information. LC1 had considered providing this information, however concern about format and standardisation were barriers to change. LC2 also reported a desire to provide this information, and had previously offered Calorie counted portions of cake. The latter was no longer available at the time of the study as there were not enough staff members available to be able to calculate this information. Although back-of-pack nutritional labelling is mandatory for pre-packed food (Department of Health, 2013), requiring energy (kcal; KJ), fat, saturated fat, carbohydrate, sugar, protein and salt content, voluntary guidelines are also provided for non-pre-packed food. The present study demonstrates that leisure centres may wish to voluntarily provide this information, however they may require adequate support and guidance to enable implementation. Traffic light labelling has been found to increase the purchase of healthy food choices within a leisure centre setting in Canada (Olstad *et al.*, 2015b), demonstrating that nutritional information could be effective. The aforementioned study was reportedly the first to assess the impact of traffic light labelling in a real-world setting, outside of the home environment. Although Olstad *et al.* (2015b) focussed on traffic light labelling, Calorie information would arguably be the most pertinent aspect to consider within the present study. This is due to the focus on the obesogenicity/leptogenicity of the food environment. Excess energy from the diet can result in obesity (NHS Choices, 2016b), demonstrating the link between energy and the obesogenicity of a food offer. Furthermore, with regards to research in the UK, Grunert *et al.* (2010) identified that 27% of UK-based individuals used front-of-pack labelling. This was higher than the percentage from the remaining five European countries under the same observation, suggesting that UK consumers may be more likely to pay attention to nutritional information. As a result, it is arguable that UK consumers may be more likely to review nutritional information. In combination with the results of the present study, this suggests that a nudge strategy involving the provision of Calorie

information would be a useful method to communicate the leptogenicity of food choices to UK leisure centre café users, whilst preserving freedom of choice.

6.4 Summary

The vending offer was predominantly obesogenic in both leisure centres and the frequently purchased products were predominantly obesogenic in LC2. Despite this, some healthy options were available, and the frequently purchased products in LC1 were predominantly leptogenic. Further increasing the availability of healthy options may be met with a number of barriers. For example, there was concern that a lack of demand for healthier products could mean that any changes to the food offer would result in a loss of income. Contributing to this was the concern that healthier products may be more expensive, preventing purchase, and the desire to preserve freedom of choice. In LC1, this choice was provided by the external food offer which stimulated concerns about changing the internal food offer. These concerns suggested that stakeholders may resist changes to the food offer, however in contrast to this, some leisure centre café users expected a healthier food environment. Interestingly, there was support from all stakeholder groups for providing additional information to help consumers to make healthy choices. Neither of the leisure centres provided nutritional information and leisure centre café users largely perceived this to be useful information to facilitate informed decisions. As a result, the second stage of the research will focus on a nudge strategy, where freedom of choice is maintained, by providing Calorie information on a leisure centre café menu. The following Chapter (7) will detail the study design adopted for the second stage of the research study.

Chapter 7 Method Stage 2: Quasi-experiment and Questionnaire

7.0 Introduction

The second stage of the research involved a quasi-experiment where Calorie information was presented on a leisure centre café menu to try and increase PBC, and nudge leptogenic food choice intentions and behaviours. In order to determine personal intention and behaviour prior to and during the intervention, a questionnaire informed by the ATPB was distributed to leisure centre café users. The following section will detail the sampling approach adopted for this stage of the research study, the study design, and the analytical procedures.

7.1 Sampling approach

7.1.1 Leisure centres

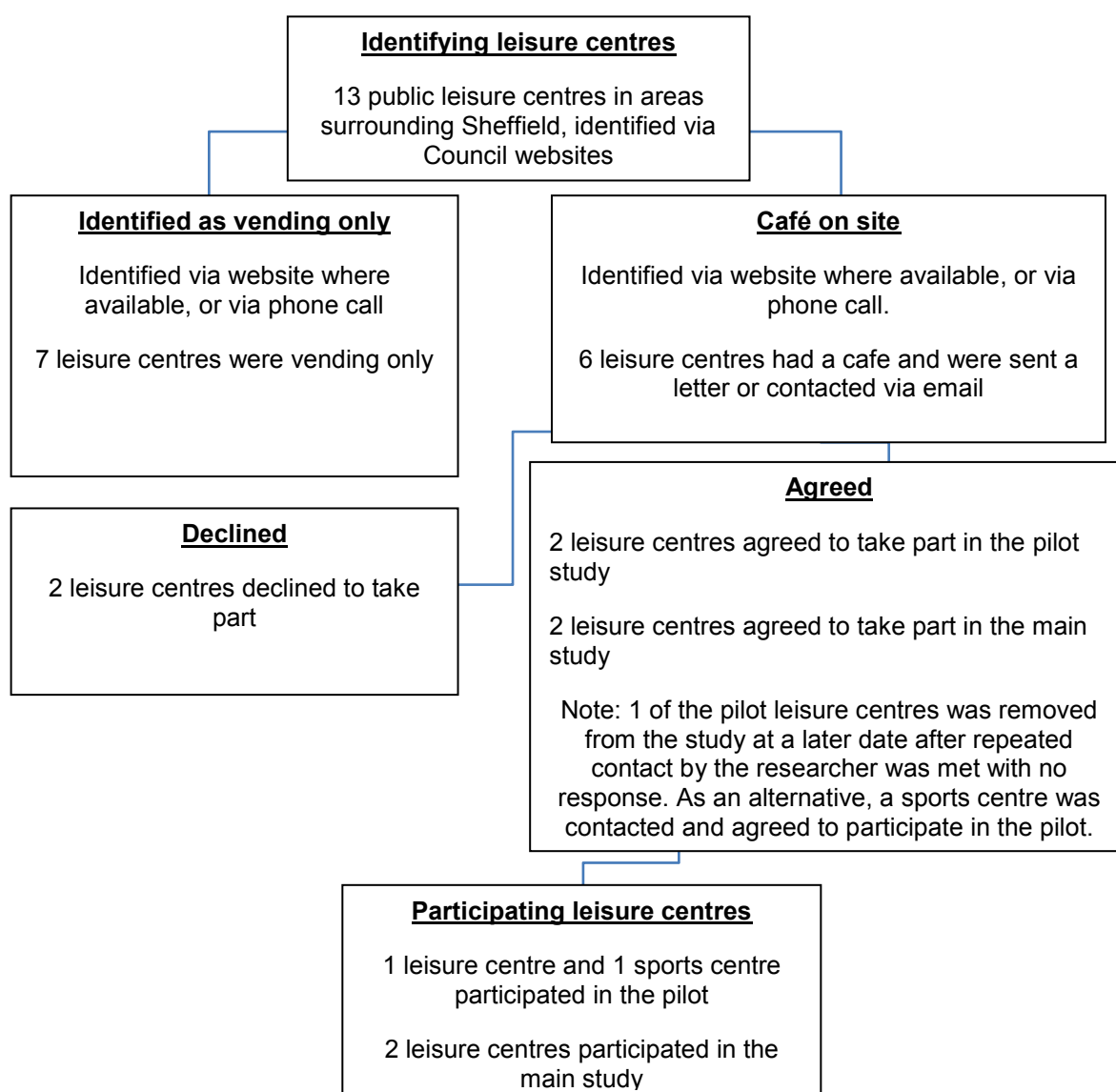


Figure 9: Schematic representation of the approach to leisure centre recruitment

7.2 Ethical approval

Ethical approval was obtained from Sheffield Business School Faculty Research Ethics Committee (SBS-19) (Appendix 9), prior to the pilot study for stage 2. Consumers who agreed to complete a questionnaire were provided with a participant information sheet (Appendix 10) and a consent form (Appendix 11). No children or vulnerable people were asked to participate.

7.3 Pilot study

A nudge approach was deemed the most appropriate given employee concerns about changing the food offer and about preserving freedom of choice. The availability of healthy options within the café meant that a nudge approach would be possible. Stakeholder interest in nutritional information demonstrated the suitability of the implementation of Calorie information as the intervention.

The pilot study was carried out in May 2015 to identify any potential practical and methodological issues during preparation for the experiment, during the experiment, during questionnaire completion and data analysis. The pilot took place on 6 days across a 2 week period. Data was collected from the control and intervention centres across 3 days in week 1, where no nutritional information was available, and 3 days in week 2, where nutritional information was provided on the menu in the intervention centre. The questionnaire used in the pilot can be found in Appendix 12.

It became clear during the preparation phase, that details of the cooking method of each product were required for the nutritional analysis. This included information such as the type of oil used for frying. Furthermore, the pilot confirmed that space restrictions on the menu meant that it would be difficult for energy to be displayed with fat, saturated fat, sugar and salt, however energy (kcal) alone could be displayed more clearly. The pilot also identified a number of changes to the questionnaire to help with clarity and to ensure that the instrument was measuring the intended construct (Table 16).

Table 16: Detail and rationale for changes to the questionnaire following the pilot

Included in pilot study	Removed, Adapted or Added	Rationale
What is the main purpose of your visit to the leisure centre today? Please state.	<i>Removed</i>	This question was omitted because another question, which was more quantifiable, already captured whether the participant was completing an activity.
Statements used to measure Motives, Attitudes, Subjective Norms, PBC and Intention were all included in a single table, on a 7 point scale of Strongly disagree to Strongly agree	<i>Adapted</i> The statements related to Motives were separated and transferred onto a scale which reflected the scale for the 'Concern' construct; How motivated are you to make food choices that meet the following criteria? The new scale was 'Extremely motivated' – 'Not at all motivated'. The statements related to Attitudes were included in a separate table. Subjective Norms and PBC were included in a table together, and statements related to Intention were included in a separate table. Attitudes, Subjective Norms, PBC and Intention all remained on the original 'Strongly disagree' to 'Strongly agree' scale	The change in the scale for Motives, meant that participants were directly asked 'how motivated' they were to make particular choices. The statements were separated into smaller tables as the pilot demonstrated that such a large table looked quite overwhelming to participants and also led to some omissions as it wasn't easy for participants to keep track of the questions.
Each of the scales included a statement for each point, e.g. 1 = Extremely concerned, 2 = Concerned, all the way through to 7 = Not concerned at all	<i>Adapted</i> Statements removed for points 2-6 in the following constructs; Concern, Motives, and Confidence. The scale was adapted so that the ends were anchored for these constructs (e.g. 1 = Extremely concerned, 7 = Not concerned at all) and statements in-between were excluded.	In the literature, statements are used for a Strongly disagree - Strongly agree scale. Therefore, constructs with this scale retained all 7 statements however constructs with a scale devised by the researcher were anchored with statements at points 1 and 7.

Included in pilot study	Removed, Adapted or Added	Rationale
'I like to try and eat a healthy diet'	<i>Adapted</i> The original statement was removed, however 2 new statements were included which mirrored the purpose of the original; 'I am very particular about how healthy my diet is' and 'I always follow a healthy and balanced diet'	The new statements were adapted from a validated questionnaire on Attitudes (Roininen, Lähteenmäki and Tuorila, 1999).
'I like to limit the amount of fat I eat to a healthy amount', 'I like to limit the amount of saturated fat I eat to a healthy amount', 'I like to limit the amount of salt I eat to a healthy amount', 'I like to limit the amount of sugar I eat to a healthy amount' and 'I like to limit the amount of calories I eat to a healthy amount'	<i>Adapted</i> 'It is important to me that my diet is low in fat', 'It is important to me that my diet is low in saturated fat', 'It is important to me that my diet is low in salt', 'It is important to me that my diet is low in sugar' and 'It is important to me that my diet is low in calories'	Each of these statements were adapted to reflect a validated questionnaire on Attitudes (Roininen, Lähteenmäki and Tuorila, 1999), which was used to inform the two new statements identified above.
Questions not included in pilot	<i>Added</i> 'People who are important to me think I should make healthy choices in the leisure centre cafe' and 'People who influence my buying behaviour think I should make healthy choices in the leisure centre café'	The subjective norms construct was comprised of two items for the pilot however a minimum of 3 items per construct is more desirable. Two further items were included to measure subjective norms, totalling 4 items for this construct.
Construct not included in pilot	<i>Added</i> 'Confidence' construct added to assess understanding of nutritional information and perceived ability to determine the healthiness of products	The pilot established a need for this question, based on the nature of the nudge, where nutritional information was presented on a leisure centre café menu.
'My family want me to make healthy choices within the leisure centre café' and 'My friends want me to make healthy choices in the leisure centre cafe'	<i>Adapted</i> 'My family think I should make healthy choices in the leisure centre cafe' and 'My friends think I should make healthy choices in the leisure centre cafe'	Adapted in line with a validated scale (Vermeir and Verbeke, 2008).

Included in pilot study	Removed, Adapted or Added	Rationale
'I should make healthy food choices because I am in a leisure centre', 'I am confident I can make healthy choices in the leisure centre cafe if I want to', 'I feel that I need more information to be able to make healthy choices within the leisure centre cafe' and 'I feel that the information provided in the leisure centre cafe makes me make healthy choices'	<i>Adapted</i> 'Whether I choose to make healthy choices in the leisure centre café is entirely up to me', 'I have control over whether I choose to make healthy choices in the leisure centre cafe', 'The information in the leisure centre cafe today helps give me complete control over whether I make healthy choices' and 'Even if I want to make healthy choices in the leisure centre cafe, I do not think I would be able to do so'	The statements were adapted to reflect statements included within a validated scale (Chen, 2007) and to ensure that the items were clearly related to the research. For example, the statement about the 'information provided' was included to directly relate to the nudge.
All items for the intention construct were written as follows; 'I intend to make healthy food choices within the leisure centre cafe'	<i>Adapted</i> 'Definitely' was added to all of the statements in this construct, for example "I definitely intended to make healthy food choices within the leisure centre cafe"	This was adapted in line with a validated scale (Chen, 2007) which measured intentions.
What food/beverages did you purchase in the café today? Please list all choices in the box below.	<i>Adapted</i> What <i>items</i> did you purchase in the café today? Please list all choices in the box below, <i>and be as specific as possible (e.g. white/brown bread)</i>	End of sentence added in to encourage participants to be more specific. This enabled energy (kcal) to be identified more accurately.
The categories for 'purpose of the purchase' were as follows; Snack, Breakfast, Lunch, Tea, Other	<i>Adapted</i> Drink, Snack, Breakfast, Lunch, Evening Meal, Other	'Tea' was causing some confusion. It was intended to refer to an evening meal, however some participants selected it where they had tea to drink. Therefore, 'Drink' was added in as an option and 'Evening Meal' was included in place of 'Tea' to be more specific.

7.4 Main study

7.4.1 Sampling approach

In contrast to qualitative techniques, quantitative approaches often employ probability sampling to ensure that the data is representative of the population group. Power calculations, based on the size of the population are often used to determine sample size. However, as the present study took place in a leisure centre café, the size of the population was unknown. The design of the study also meant that the researcher was limited to the cohort of leisure centre users who used the café during the study period. As a result, convenience sampling was used to recruit participants, in line with previous research which has investigated consumer attitudes towards nutritional information within restaurants (Josiam and Foster, 2009). All consumers ≥ 18 years of age were systematically asked to participate in the research study during the research period to ensure that all leisure centre café users had an equal chance of taking part. This is reflective of a probabilistic design, which is desirable in quantitative studies (Creswell and Plano Clark, 2011). Previous research regarding food choice has also been carried out at specific time periods throughout the week (Mitterer-Daltoé *et al.*, 2013; Olstad *et al.*, 2014). For example, in a previous study which investigated the impact of nudge strategies in a leisure centre food environment, data was collected on two to three days of the week, for five consecutive hours during each of the data collection periods (Olstad *et al.*, 2014). A similar approach was adopted in the present study, however to maximise completion rates, data was collected everyday during week 1 and week 2. Data acquisition was carried out during the school holidays of the schools under the remit of the same council as the leisure centres, to ensure the highest volume of visitors. The research hours were calculated based on the earliest time that both leisure centre cafés opened, and the latest time that both cafés closed. During week 1, research was carried out in the morning in the control centre, in the afternoon in the intervention centre, and vice versa in week 2. This was particularly important for this study, as leisure centres tend to attract repeat customers at similar times each week; for example to attend a class or lesson. This also ensured that all time periods were covered in each centre.

7.4.2 Participation rates

The present study adopted the following inclusion criteria; leisure centre café user (making a purchase); ≥ 18 years of age. Figure 10 details the recruitment process.

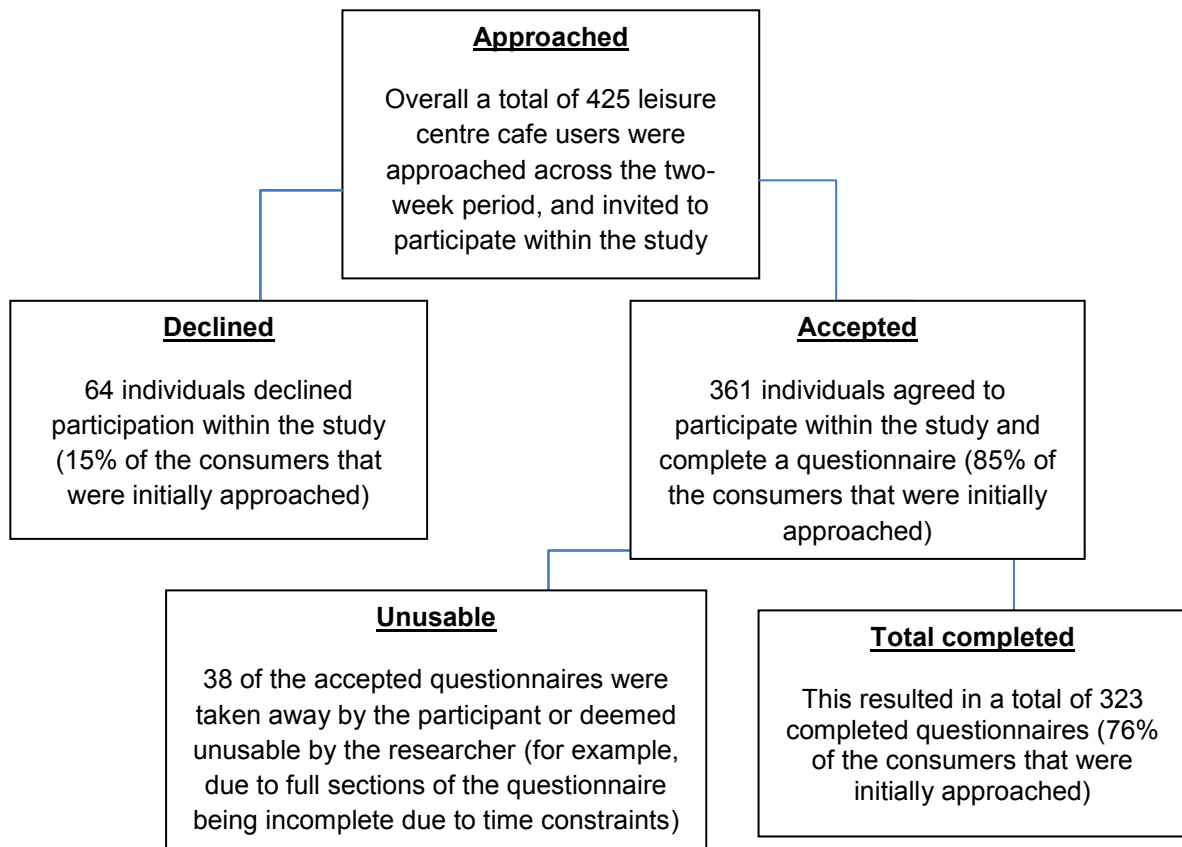


Figure 10: Schematic representation of the recruitment process

All leisure centre café users who met the inclusion criteria were systematically approached during the study period and invited to complete a questionnaire, therefore the majority of the population completed the study (Figure 10). Consumers were approached after having made their purchase, to prevent the research from influencing purchase behaviour. 85% of the consumers that were approached participated within the study and, of these, 89% of the returned questionnaires were complete and usable. Previous studies based around food choice have reported lower response rates; for example Vyth *et al.* (2010) obtained a response rate of 37% for research carried out in supermarkets, namely due to time constraints of the study population. The higher response rate in this instance could be partly due to the nature of the study, whereby participants were likely to be remaining in the leisure centre café to consume food or drink. During data collection, a number of environmental factors were

recorded to provide context to the potential influences on consumer use of the café and study participation (Table 17).

Table 17: Influences on use of the café and study participation

Factors	Influences
Weather	<ul style="list-style-type: none"> • The average temperature was 21°C during week 1 and 19°C during week 2 • Weather fluctuated between sun and slight cloud, with several days of sunshine in week 1 and week 2
Influences on use of the café	<ul style="list-style-type: none"> • The time of day impacted on the number of café users. The morning was often the busiest period. • Children's parties and holiday clubs took up space in the café. Holiday clubs took place during the week in week 1 and week 2 in LC1, and children's parties took place on a weekend in week 1 and week 2 in LC2. Data was still collected at these times as the café remained open to the public. Parents/guardians of the party guests were only invited to participate in the research if they made a separate purchase from the café.
Reasons for declining participation	<ul style="list-style-type: none"> • Personal preference. The consumer did not provide any justification. • Time constraints prevented completion, especially when consumers had purchased a product to take away. • Lack of reading glasses prevented consumers from being able to read the questions. • Participants had already completed the questionnaire. This primarily occurred during the second week of the study, although it was not exclusive to the second week.

Although there was a good match in terms of number of participants across weeks at the intervention centre (Table 18), this was not the case at the control centre. The lower number of participants in week 2 was largely due to a high volume of repeat customers in the control centre and leisure centre users were asked to only complete the questionnaire once; however, the number of participants in the intervention centre was well balanced between the baseline and intervention weeks.

Table 18: Number of questionnaires collected each week, per leisure centre

Leisure centre	Week 1 (n)	Week 2 (n)
Intervention centre	66	68
Control centre	151	38

7.4.3 Study design

The study involved a quasi-experiment, where Calorie information was provided in a leisure centre café. The research was classified as a quasi-experiment because the participants were not randomly assigned to the intervention or control (Curtis and Drennan, 2013; Shadish and Luellen, 2005; Cook, 2015). Quasi-experiments have been employed previously in public health based research to test the impact of an intervention designed to encourage healthy choices (Korwanich *et al.*, 2008). A questionnaire was also used to identify demographic information, Concerns, Motives, Attitudes, PBC, Confidence, Subjective Norms, food choice Intention, purchase behaviour and influences on food choice. Questionnaires and quasi-experiments are frequently employed quantitative techniques, suggesting that they are generally considered useful approaches (Curtis and Drennan, 2013). The following sections will detail the study design for both methods.

7.4.3.1 Quasi-experiment

The experiment took place over a two week period which comprised of a pre-intervention period (week 1) and an intervention period (week 2). In the intervention centre, Calorie information was displayed on the menu during week 2. The reference intake for an average adult, 2000 kcal, was also displayed (NHS Choices 2014b). A second facility acted as a control, where no Calorie information was available throughout the study period. This is similar in design to research carried out in a leisure centre by Olstad *et al.* (2014), however they used two concessions within the same facility. Given the nature of the nudge in the present study, it was a concern that leisure centre users who see value in making healthy choices would opt to use the concession with Calorie information visible, thus skewing the data set. As a result, separate leisure centres were deemed more desirable.

Due to the emphasis on the leptogenicity of the food environment in the present study, energy (kcal) was deemed the most important. In addition, the results of the pilot demonstrated that space constraints on menu's may make it difficult to clearly provide energy + 4 (fat, saturated fat, salt and sugar), as required by the recommendations if nutrients are provided in addition to energy (Department of Health, 2013). Therefore, energy alone (kcal) was provided and the layout of the menu in the intervention centre was adapted slightly to allow space for the Calorie information. A close similarity to the original menu format was retained, including the leisure centre's original imagery, descriptions, prices and allergy information. To ensure consistency, two A1 menus were created; one without Calorie information which was used in week 1 and one with Calorie information which was displayed in week 2 (Figure 11 and Figure 12). Suitable times were negotiated with the leisure centre manager and café staff for the researcher to audit the products. Nutritional information on packaged products was recorded. Where the energy (kcal) information was not available per product, the information per 100g was recorded and the energy (kcal) per product was calculated based on the product weight. A weighed nutritional analysis was carried out for the products which were prepared on-site, and the energy (kcal) content per product was determined using Nutritics dietary analysis (version 3.74; Nutritics, Dublin, Ireland).

During stage one, the catering manager at LC1 reported concern about standardising the serving size. A standardisation booklet (Appendix 13) was therefore supplied to the intervention facility detailing the components of each product made on the premises including the number of items if applicable, weight, and accompanying images. To help support good practice, images of product components were either taken on the same size plate or on a spoon, to demonstrate portion size. The researcher requested that the food environment remained constant throughout the study period, including the food offer, food advertising and position of products. External variables, such as the weather, which may have an impact on food and drink selection, were accounted for by the control centre.

Jacket Potatoes

Plain jacket potato	£2.55
Selection of fillings:	£1.10
Cheese M	
Tuna F	
Beans	
Cottage cheese M	
Coleslaw E	
Chicken tikka mayo E, So, Mu, G	
Coronation chicken Mu, E, So	
Chicken and bacon Mu, E	

[Figure 11: Example section of the intervention menu for week 1](#)

Jacket Potatoes

Plain jacket potato (228kcal)	£2.55
Selection of fillings:	£1.10
Cheese M (add 279kcal)	
Tuna F (add 355kcal)	
Beans (add 198kcal)	
Cottage cheese M (add 130kcal)	
Coleslaw E (add 299kcal)	
Chicken tikka mayo E, So, Mu, G (add 464kcal)	
Coronation chicken Mu, E, So (add 502kcal)	
Chicken and bacon Mu, E (add 477kcal)	

[Figure 12: Example section of the intervention menu for week 2, with the energy \(kcal\) information](#)

7.4.3.2 Questionnaire

The questionnaire design was informed by the ATPB (Chapter 2). The TPB has previously been successfully used to inform questionnaire design to investigate food choice behaviour (Fila and Smith, 2006; Arvola *et al.*, 2008; Alam and Sayuti, 2011), however to the researcher's knowledge the TPB has not been employed previously in a leisure centre context. Concerns, Motives and Confidence were added to the original model. In addition to the constructs of the ATPB, participant demographics, level of physical activity completed, and influences on food choice were also obtained. The questionnaire was developed using validated scales (section 7.4.5.2). The items used in each

scale were selected based upon their relation to the research question, and were also informed by the results of the first stage of the present study.

7.4.4 Participant characteristics

In both leisure centres, the majority of the participants were female (Table 19). The proportion of males and females, and the average age of participants, were not significantly different between week 1 and week 2 in the intervention centre (sex, $p=1.000$; age, $p=.896$) or in the control centre (sex, $p=.488$; age, $p=.466$).

Table 19: Participant characteristics

	Participants (n)	Males		Females		Average age in years (SD)	Age range in years
		(n)	(%)	(n)	(%)		
<i>Intervention</i>							
Week 1	66	19	28.8	47	71.2	42±12.8	22-76
Week 2	68	19	27.9	49	72.1	42±14.4	20-84
Total	134	38	28.4	96	71.6	42±13.6	20-84
<i>Control</i>							
Week 1	152	36	23.7	116	76.3	44±15.0	18-76
Week 2	37	6	16.2	31	83.8	42±11.9	26-72
Total	189	42	22.2	147	77.8	43±14.4	18-76

7.4.5 Questionnaire design

Although the intervention for the study included energy (kcal) only on the menu, the questionnaire (Appendix 14) contained questions specifically relating to the additional four nutrients visible on front-of-pack nutrition labels to obtain a rounded view of the impact of perceptions and intentions towards healthy behaviours.

7.4.5.1 Demographic information and physical activity rates

Age and sex were recorded (Table 20). Further questions regarding the characteristics of the participant, such as ethnicity and educational attainment,

were not included as these questions were potentially intrusive and would add little value to the interpretation of the data.

[Table 20: Participant characteristics: Sex and age](#)

Question	Categories/ Items
Question 1: What is your gender?	<ul style="list-style-type: none"> • Male • Female
Question 2: What is your age?	<ul style="list-style-type: none"> • Open ended to allow for a specific age to be recorded

The semi-structured interviews which took place in the first stage of this study indicated that a number of the café users may be parents/guardians waiting for children to complete physical activity lessons. As a result participants were asked whether they had engaged in physical activity personally, and if so, the perceived level of physical activity that was completed (Table 21). A description for each level of physical activity was provided, to help maintain consistency and to control for differing perceptions of light, moderate, and vigorous activity (McLean and Tobias, 2004, cited in National Cancer Institute, 2014). Some of the descriptions used were also employed as guidance in recent interventions by the National Obesity Observatory (2011).

[Table 21: Level of physical activity completed](#)

Question	Categories/ Items
Question 3: Please specify the level of physical activity you believe you have personally completed/will personally complete in the leisure centre today	<ul style="list-style-type: none"> • No physical activity (e.g. using the café/accompanying someone else) • Light activity (does not cause you to 'huff and puff') • Moderate activity (makes you breathe harder than normal, but only a little) • Vigorous activity (makes you 'huff and puff')

7.4.5.2 Adapted TPB constructs

A number of scales, detailed in the following sections, were used to inform the design of the questionnaire. Items from the original scales were included or omitted as appropriate to the specific context, and terminology was adapted in places to reflect the nature of the study. It is considered good practice for

researchers to include a minimum of three items per construct, however a minimum of four items is preferable (Hair *et al.*, 2010). As a result, each construct within the questionnaire contained at least four items. Each TPB item was measured using a 7-point likert scale, to maintain consistency throughout.

7.4.5.2.1 Concern

The items which comprised the concern construct were based on a scale developed by Kähkönen, Tuorila and Rita (1996) which originally contained ten items. Sun (2008) confirmed the reliability of the scale based on its use in previous research. Seven of the items on the scale were retained for the present study and three were excluded (Table 22). In addition to these seven items, concern about saturated fat was included as it was the only nutrient to feature regularly on UK food labels that was not considered in the original scale. This item, 'Saturated fat in your food', was written to reflect the format of the other items in the construct, which had been adapted slightly to help with clarity and succinctness (Table 23). The original question 'How concerned are you about the following issues?' was retained for this study, and also informed the structure of the questions regarding Motives and Confidence to help maintain consistency.

Table 22: Items excluded from the original scale for concern, and rationale

Items removed	Rationale
Getting sufficient energy from my food	In terms of energy, the study was interested in kcal which formed one of the remaining items that was used.
Food additives in my food	Additives did not relate to the present study.
Getting a lot of cholesterol in my food	This question was considered to be too specific. Key diseases related to obesity were included in the items.

Table 23: Items measuring concern, amendment to the original item and rationale

Scale adopted	Item from original scale	Amendment and Rationale
<p>How concerned are you about the following issues?</p> <p>1 = Extremely concerned</p> <p>7 = Not at all concerned</p>	Getting a lot of salt in my food	<p>Item used: <i>Salt in your food</i></p> <p>Rationale: more succinct, and identifies concerns about salt in general</p>
	Getting a lot of fat in my food	<p>Item used: <i>Fat in your food</i></p> <p>Rationale: more succinct, and identifies concerns about fat in general</p>
	Getting a lot of sugar in my food	<p>Item used: <i>Sugar in your food</i></p> <p>Rationale: more succinct, and identifies concerns about sugar in general</p>
	Getting many calories	<p>Item used: <i>Calories in your food</i></p> <p>Rationale: more succinct, identifies concerns about calories in general, and relates the question specifically to food, in line with the questions regarding, salt, fat and sugar</p>
	Risk for high blood pressure	<p>Item used: Risk for high blood pressure</p> <p>Rationale: Item remained the same, as it was succinct and clear</p>
	Risk for coronary heart disease	<p>Item used: Risk for coronary heart disease</p> <p>Rationale: Item remained the same, as it was succinct and clear</p>
	Gaining weight	<p>Item used: <i>Gaining weight</i></p> <p>Rationale: Item remained the same, as it was succinct and clear</p>

7.4.5.2.2 Food motives

Motives were measured using items from the validated health motives questionnaire devised by Steptoe, Pollard and Wardle (1995), which has been applied in a similar context to the present study (Vyth *et al.*, 2010). The questionnaire is comprised of nine factors, each with three to six items attached to it, totalling thirty-six items overall. Due to the size of the scale, a restricted number of key items from factors relevant to the present study were selected for inclusion. The three factors of interest were; 'Health', 'Weight Control' and 'Price'. The items attached to the remaining six factors were excluded (Table 24). 'Health' and 'Weight Control' are both directly linked to health and weight which directly links to the obesogenicity of food choices. 'Price' was of interest as it formed part of the discussion during the interview stage with leisure centre café users in the first stage of the present study. Five items were retained to assess these three factors, of which one item was related to price and two items were related to each of the remaining factors (Table 25). Steptoe, Pollard and Wardle (1995) specify an order for the items in their questionnaire, which was retained. Three additional items based around the nutrients which feature regularly on UK food labels were added; 'Low in saturated fat'; 'Low in salt'; 'Low in sugar'. The original statement for the food choice questionnaire, 'It is important to me that the food I eat on a typical day...' was rephrased (Table 25) to reflect the format that was adopted for the Concern construct.

Table 24: Factors and items excluded from the original scale for motives, and rationale

Factors / Items removed	Rationale
Factor: Mood	This factor focussed on stress, relaxation and feelings. Whilst mood can influence food choice behaviour, the focus of the construct was on motivation to make healthy choices.
Factor: Convenience	This factor focussed on convenience regarding preparation and availability in close shops and supermarkets. The food choice was being made in the leisure centre café, so the latter was not relevant. Whilst time constraints may affect food choice, the consumers would not need to prepare anything themselves in this context.

Factors / Items removed	Rationale
Factor: Sensory Appeal	This factor focussed on the smell, look, texture and taste of the product. Although previous experience could inform food choice, it was expected that consumers may not be able to see the majority of products, limiting sensory engagement.
Factor: Natural Content	This factor focussed on the availability of additives and use of natural ingredients. This information was not provided on the leisure centre café menu, so motivation to make these choices would have been informed by perceived natural content.
Factor: Familiarity	This factor focused on what the consumer usually eats, or ate as a child. Whilst familiarity can influence food choice, the focus of the research was about motivation to make healthy choices.
Factor: Ethical Concern	This factor focussed on country of origin and environmentally friendly packaging. Some of the food available in the café was not packaged, and country of origin information was not provided. Therefore motivation to make these choices would have been informed by perceived ethical concern.
Item: Contains a lot of vitamins and minerals (Health factor)	Motivation to make choices which help the individual to maintain a healthy lifestyle was included in the questionnaire, which was deemed satisfactory.
Item: Is good for my skin/teeth/hair/nails (Health factor)	The focus of the research was on the impact of food choice on public health as opposed to cosmetic features.
Item: Is high in fibre and roughage (Health factor)	Motivation to make choices which help the individual to maintain a healthy lifestyle was included in the questionnaire, which was deemed satisfactory.
Items: Is not expensive; Is good value for money (Price factor)	One item from the price factor was deemed adequate. Motivation to make 'cheap' choices was succinct and clear.
Item: Helps me to control my weight (Weight Control factor)	Motivation to make choices low in energy (kcal) was assessed within the questionnaire which was deemed adequate.

Table 25: Items measuring motives, amendment to the original item and rationale

Scale adopted	Item from original scale	Amendment and Rationale
<p>How motivated are you to make food choices that meet the following criteria?</p> <p>1 = Extremely motivated</p> <p>7 = Not at all motivated</p>	Keeps me healthy (Factor: Health)	<p>Item used: <i>Helps me lead a healthy lifestyle</i></p> <p>Rationale: More specific</p>
	Is high in protein (Factor: Health)	<p>Item used: <i>High in protein</i></p> <p>Rationale: The amendment of the original statement to a question meant that the 'is' was unnecessary</p>
	Is cheap (Factor: Price)	<p>Item used: <i>Cheap</i></p> <p>Rationale: The amendment of the original statement to a question meant that the 'is' was unnecessary</p>
	Is low in calories (Factor: Weight control)	<p>Item used: <i>Low in calories</i></p> <p>Rationale: The amendment of the original statement to a question meant that the 'is' was unnecessary</p>
	Is low in fat (Factor: Weight control)	<p>Item used: <i>Low in fat</i></p> <p>Rationale: The amendment of the original statement to a question meant that the 'is' was unnecessary</p>

7.4.5.2.3 Confidence

The purpose of this construct was to identify confidence in understanding of healthy eating guidelines and nutrition labels. Dukeshire, Nicks and Ferguson (2014) designed a validated measure of self-efficacy for nutrition labels. The original scale to measure confidence in using nutrition labels comprised of 7 items of which 4 items were excluded (Table 26) and 3 items were adopted (Table 27). One of the items from the original scale was used to design two items, assessing understanding of terminology on labels and understanding of colours on labels. The inclusion of a question about the use of colours on labels offered a more rounded view of participants' understanding of food labelling. The original scale commenced with the following statement; "When using nutrition labels how confident do you feel that....". In line with the Concern and Motive constructs, this was amended to "How confident do you feel about the following?" to ensure consistency.

Table 26: Items excluded from the original scale for confidence, and rationale

Items removed	Rationale
You can effectively compare the nutrient value of two similar types of food products (e.g., 2 types of cookies)	It was deemed more pertinent that they can compare the nutrient value of the guidelines; so knowledge of healthy eating guidelines was assessed.
You can relate the serving size and nutrient information to the amount of food you eat.	Serving size was not provided on the menu and the energy (kcal) information was provided for the product as opposed to per/100g so this was not necessary for the study.
You can use percent daily values to determine if a food product is high or low in specific nutrients.	It was felt that this was encompassed in determining if a food product would be healthy.
You can do the math needed to use nutrition label.	The focus was on understanding of healthy eating and of terminology, as confidence in these could be increased as part of the intervention. Energy (kcal) was provided per product for the intervention, so the need for maths was minimised.

Table 27: Items measuring confidence, amendment to the original item and rationale

Scale adopted	Item from original scale	Amendment and Rationale
<p>How confident do you feel about the following?</p> <p>1 = Extremely confident</p> <p>7 = Not at all confident</p>	<p>You can understand the terms on a nutrition label</p>	<p>Item used: <i>Understanding terminology on nutrition labels (e.g. calories) and Understanding colours on nutrition labelling (red/amber/green)</i></p> <p>Rationale: The amendment made the item more succinct. The intervention involved the inclusion of calories on the menu, so calories were included as an example. Understanding of colours on nutrition labelling was also assessed.</p>
	<p>You can determine if a food product would be part of a healthy diet</p>	<p>Item used: <i>Determining if a food product would be healthy</i></p> <p>Rationale: The amendment to the question allowed the item to be more succinct</p>
	<p>You can distinguish between the nutrients you should consume and those you should limit in your diet.</p>	<p>Item used: <i>Having knowledge of healthy eating guidelines</i></p> <p>Rationale: The amendment to the question allowed the item to be more succinct</p>

7.4.5.2.4 Attitude

The purpose of this construct was to identify participants' attitudes towards making healthier, more balanced food choices, and choices which are lower in fat, saturated fat, sugar and energy (kcal). Questions from the Health and Taste Attitude Scale (HTAS) were used (Roininen, Lähteenmäki and Tuorila, 1999). Part of the scale focussed on the importance of health in food choice, which aligned well with the present study, however the taste aspect of the scale was excluded. The scale is transferable across cultures, suggesting that it is appropriate for application with a number of different population groups (Grubor *et al.*, 2015). Similar to the Food Motives Questionnaire (Stephoe, Pollard and Wardle, 1995), the HTAS is comprised of a number of factors, each including several items. The health aspect of the scale was comprised of three factors; General Health Interest, Light Product Interest and Natural Product Interest. Items from the General Health Interest factor were included in the present study, and the latter two factors were excluded (Table 28). General Health Interest has previously correlated with healthy food choice (Roininen *et al.*, 2001), validating the application of this factor in the present context. Three out of eight items were included from this factor (Table 29). Four additional statements were also included to measure attitudes towards low saturated fat, low salt, low sugar and low calorie products. One of the items included from the original questionnaire, 'It is important to me that my diet is low in fat' was adapted to measure attitudes towards the aforementioned nutrients.

[Table 28: Items excluded from the original scale for Attitude, and rationale](#)

Factors / Items removed	Rationale
Factor: Light product interest	This factor was focussed on light products, which was more specific than the present study. Furthermore, light options/alternatives were not always evident in a leisure centre café setting.
Factor: Natural product interest	This factor focussed on attitudes towards processed food, additives and organic foods, which was more specific than the present study.
Item: The healthiness of food has little impact on my food choices.	The items adopted assessed how particular the participant was about making healthy choices.

Item: I eat what I like and I do not worry much about the healthiness of food	The items adopted assessed how particular the participant was about making healthy choices.
Item: It is important for me that my daily diet contains a lot of vitamins and minerals.	The items adopted focussed on the key nutrients which are regularly found on nutrition labels, as these were the most relevant to the present study.
Item: The healthiness of snacks makes no difference to me.	The items adopted assessed how particular the participant was about making healthy choices.
Item: I do not avoid foods, even if they may raise my cholesterol.	The items adopted assessed how particular the participant was about making healthy choices. Risk of disease was assessed in Concern.

Table 29: Item measuring Attitude, amendment to the original scale and rationale

Question	Item from original scale	Amendment and Rationale
<p>Question 8: How much do you agree with the following statements?</p> <p>1 = Strongly agree 2 = Agree 3 = Slightly agree 4 = Neither 5 = Slightly disagree 6 = Disagree 7 = Strongly disagree</p>	I am very particular about the healthiness of food	<p>Item used: <i>I am very particular about how healthy my diet is</i></p> <p>Rationale: The small amendment was deemed clearer, and it was specific that the question was referring to their personal diet</p>
	I always follow a healthy and balanced diet	<p>Item used: <i>I always follow a healthy and balanced diet</i></p> <p>Rationale: Item remained the same, as it was succinct and clear</p>
	It is important to me that my diet is low in fat	<p>Item used: <i>It is important to me that my diet is low in fat</i></p> <p>Rationale: Item remained the same, as it was succinct and clear</p>

7.4.5.2.5 Subjective norms

The purpose of this construct was to identify how subjective norms could influence food choice intention and behaviour. Four out of five items were adopted from a validated scale (Vermeir and Verbeke, 2008), only one item was excluded (Table 30). The items from the original scale were contextualised to sustainability, so the items were adapted in line with the present study (Table 31).

Table 30: Items excluded from the original scale for Subjective Norms, and rationale

Items removed	Rationale
Society thinks I should buy sustainable food products	The items adopted identified the influence of people who would have the opportunity to influence food choice intention in the leisure centre café, and the impact of society was not deemed necessary for the present study.

Table 31: Items measuring Subjective Norms, amendment to the original item and rationale

Scale adopted	Item from original scale	Amendment and Rationale
How much do you agree with the following statements? 1 = Strongly agree 2 = Agree 3 = Slightly agree 4 = Neither 5 = Slightly disagree 6 = Disagree 7 = Strongly disagree	People who are important to me think I should buy sustainable food products	Item used: <i>People who are important to me think I should make healthy choices in the leisure centre café</i> Rationale: The second half of the statement was amended to mirror the purpose of the study
	Family think I should buy sustainable food products	Item used: <i>My family think I should make healthy choices in the leisure centre café</i> Rationale: The second half of the statement was amended to mirror the purpose of the study

	Friends think I should buy sustainable food products	<p>Item used: <i>My friends think I should make healthy choices in the leisure centre café</i></p> <p>Rationale: The second half of the statement was amended to mirror the purpose of the study</p>
	People who influence my buying behaviour think I should buy sustainable food products	<p>Item used: <i>People who influence my buying behaviour think I should make healthy choices in the leisure centre café</i></p> <p>Rationale: The second half of the statement was amended to mirror the purpose of the study</p>

7.4.5.2.6 Perceived behavioural control (PBC)

The purpose of this construct was to identify perceived control over food choice behaviour. Three items from the questionnaire used by Chen (2007), which was based on the validated scale devised by Bredahl (2001), were included (Table 33). Six items were used by Chen (2007) to measure PBC and perceived difficulty, which can act to influence perceived control (Chen, 2007). Two of the three items used to assess PBC were included, alongside one of the three items used to assess perceived difficulty. The remaining three items were excluded (Table 32). The items used were adapted in accordance with the present study (Table 33). A fourth item was included which related directly to the nudge strategy adopted in the present study; 'The information in the leisure centre café today helps give me control over whether I make healthy choices'.

Table 32: Items excluded from the original scale for Perceived Behavioural Control, and rationale

Items removed	Rationale
If organic foods were available in the shops, nothing would prevent me from buying it (PBC).	The present study aimed to assess perceived control over making healthy choices in the leisure centre café, given the offer provided. This item focussed more on a hypothesis of 'if the foods are available...' which was deemed unsuitable.
If organic foods were available in the shops, I could easily buy it if I wanted to (perceived difficulty).	The present study aimed to assess perceived ability over making healthy choices in the leisure centre café, given the offer provided. This item focussed more on a hypothesis of 'if the foods are available...' which was deemed unsuitable.
How difficult would it be for you to buy organic foods? (perceived difficulty)	An item was adopted which assessed how easy it would be for consumers to make healthy choices, which was perceived to be satisfactory.

Table 33: Items measuring Perceived Behavioural Control, amendment to the original item, and rationale

Scale adopted	Item from original scale	Amendment and Rationale
How much do you agree with the following statements? 1 = Strongly agree 2 = Agree 3 = Slightly agree 4 = Neither 5 = Slightly disagree 6 = Disagree 7 = Strongly disagree	Whether I will eventually buy organic foods is entirely up to me	Item used: <i>Whether I choose to make healthy choices in the leisure centre café is entirely up to me</i> Rationale: The word 'eventually' was removed as the questionnaire was completed after purchases were made. The statement was amended to mirror the purpose of the study
	How much control do you have over whether you will eventually buy organic foods? (absolutely no control - completely control)	Item used: <i>I have control over whether I choose to make healthy choices in the leisure centre cafe</i> Rationale: The statement was amended to suit the strongly agree - strongly disagree likert scale used for this construct. The statement was also amended to mirror the purpose of the study

	Even if I should want to buy organic foods, I do not think I would ever be able to do so	Item used: <i>Even if I want to make healthy choices in the leisure centre café, I do not think I would be able to do so</i> Rationale: The statement was amended to mirror the purpose of the study
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7.4.5.2.7 Intention

The purpose of this construct was to identify behavioural intention, and to act as a direct predictor of food choice behaviour. The single item included in the questionnaire by Chen (2007), which was adapted from the validated scale devised by Bredahl (2001), was used to help inform the design of the items within this construct (Table 34). Five additional items were added which aimed to measure intention to make choices which were low calorie, low salt, low fat, low saturated fat and low sugar.

Table 34: Items measuring Intention, amendment to the original item, and rationale

Scale adopted	Item from original scale	Amendment and Rationale
How much do you agree with the following statements? 1 = Strongly agree 2 = Agree 3 = Slightly agree 4 = Neither 5 = Slightly disagree 6 = Disagree 7 = Strongly disagree	If organic foods were available in the shops I would intend to (definitely avoid it - definitely buy it)	Item used: <i>I definitely intended to make healthy choices within the leisure centre café today</i> Rationale: The statement was adapted to suit the strongly agree - strongly disagree likert scale used for this questionnaire. The statement was also adapted to mirror the purpose of the study, and the statement was written in past tense as participants will have already made their purchases

7.4.5.2.8 Purchases/behaviour

The TPB hypothesises that intention predicts behaviour, however in the context of the present study actual behaviour could be captured as well. Participants were asked to record their purchases in the leisure centre café. This section was divided into two, to distinguish between purchases made for themselves and purchases made on the behalf of others (Table 35).

[Table 35: Food choice behaviour](#)

Question	Items
Question 10: What items did you purchase in the café today?	<ul style="list-style-type: none">• Purchases made for yourself• Purchases made for others

7.4.5.2.9 Influences on food choice

Question 11 was the only open ended question included in the questionnaire (Table 36), and aimed to collect information regarding influences on purchase behaviour. During the intervention it was hypothesised that consumers who were influenced by the Calorie information would record it in this space; leaving this as an open ended question ensured it was not leading in any way.

[Table 36: Influences on participant food choice](#)

Question	Items
Question 11: Has anything influenced the food choices you made within the leisure centre café today?	Open ended

7.4.5.2.10 Purpose of food choice

There are different recommendations for energy (kcal) per eating occasion (Public Health England, 2014b). Therefore, participants were asked to identify the purpose of their food/beverage purchase. Eating occasions were defined as; drink, snack, breakfast, lunch and evening meal (Table 37).

[Table 37: Purpose of the food choice event](#)

Question	Categories/ Items
Question 12: Please identify the purpose of the purchases listed above.	<ul style="list-style-type: none">• Drink• Snack• Breakfast• Lunch• Evening meal• Other (open ended)

7.4.6 Questionnaire distribution and approach

7.4.6.1 Researcher dress code and language

Smart-casual attire was worn as opposed to business wear, to help ensure approachability in a leisure centre environment. An approachable demeanour was maintained to ensure that leisure centre café users felt comfortable asking any questions they may have about the study. It was also important that the researcher was able to succinctly articulate the purpose of the study to the target audience using simple language.

7.4.6.2 Prevention of missing data

In order to determine the underlying structure of the constructs, and test the hypothesised pathways, structural equation modelling (SEM) was employed. Missing data can be a concern for SEM models, as it can lead to a reduction in sample size if some of the data collected cannot be used (Hair *et al.*, 2010), as a result, questionnaires were checked for missing information at the time of completion. Participants were politely made aware of any incomplete items, and were asked if they were happy to complete the section.

7.4.7 Analytical procedures

Prior to assessing the impact of the nudge strategy, Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) were used to assess the underlying factor structure of the proposed ATPB model and confirm which items comprise each construct. Structural Equation Modelling (SEM) was then carried out to identify the strength of the hypothesised relationships between the constructs. The impact of the intervention was then evaluated, using the constructs confirmed by the EFA and CFA. PBC and Confidence were combined to make PBCC (Chapter 8), and Concern was divided into Concern Disease and Concern Nutrients (Chapter 8). Hierarchical cluster analysis was also employed to profile participants based on their mean scores for Concern Disease, Concern Nutrients, Motives, Attitudes, Subjective Norm, PBCC and Intention. The following sections will detail the analytical procedures adopted for the EFA, CFA and SEM, comparison of the results for the intervention centre and the control centre, and the hierarchical cluster analysis.

7.4.7.1 EFA, CFA and SEM

7.4.7.1.1 Preparatory data analysis

Data screening is essential to ensure that the data is aligned with the assumptions of the main data analysis technique (Fidell and Tabachnick, 2003). Firstly, the data was checked for accuracy of input. Due to time constraints, it was not always possible to confirm details of food purchases with the participant. Therefore, some of the food purchase information was not adequate to identify energy (kcal) purchased and could not be used. A full description of the reasons for excluded behaviour data can be found in (Chapter 10, section 10.3.1). During SEM, the 'estimate means and intercepts' tool was used to allow for missing values. It is assumed within covariance-based SEM that the data is parametric, and therefore it is assumed to be normally distributed (Field, 2009). Analysis of the data revealed that a number of the items were positively skewed. Each of these items was transformed using a log 10 function to ensure normality of distribution (Table 38). A subsequent assessment identified that the transformation process created a kurtosis value outside of the acceptable range (Understanding terminology on nutrition labels (e.g. Calories)). Therefore, a square root transformation was used to correct the kurtosis measure (Tabachnick and Fidell, 2007). Tabachnick and Fidell (2007) also reported that variables need to be evaluated for multicollinearity, which can occur when two or more variables are closely correlated (Field, 2009). All correlations were checked to ensure that they were below .7 (Tabachnick and Fidell, 2007; Hoefkens *et al.*, 2012). This could only be completed once constructs were confirmed following EFA, therefore the results have been presented in Chapter 8.

Table 38: Skewness and kurtosis of each item

Construct and items	Skewness	Kurtosis	Transformed skewness	Transformed kurtosis
<i>Concern</i>				
Salt in your food	.701	-.526		
Fat in your food	1.056	.682	-.049	-.825
Saturated fat in your food	1.203	1.138	.058	-.822
Sugar in your food	1.088	.691	-.039	-.786
Calories in your food	1.041	.557	-.097	-.626
Risk of high blood pressure	.720	-.620		

Construct and items	Skewness	Kurtosis	Transformed skewness	Transformed kurtosis
<i>Concern continued</i>				
Risk of coronary heart disease	.699	-.713		
Gaining weight	1.340	1.256	.269	-.872
<i>Motives</i>				
Low in calories	.980	.454		
Low in fat	1.048	.595	-.003	-.938
High in protein	.776	-.018		
Helps me lead a healthy lifestyle	1.183	1.277	.032	-.911
Cheap	.507	-.471		
Low in saturated fat	1.129	1.215	-.040	-.837
Low in salt	.933	.324		
Low in sugar	1.050	.813	-.087	-.875
<i>Confidence</i>				
Determining if a food product would be healthy	1.189	2.134	-.063	-.811
Having knowledge of healthy eating guidelines	1.183	1.449	.032	-.881
Understanding terminology on nutrition labels (e.g. Calories)	1.088	.570	.115	-.491
Understanding colours on nutrition labels (red/amber/ green)	.983	.060		
<i>Attitudes</i>				
I am very particular about how healthy my diet is	1.111	1.459	-.220	.030
I always follow a healthy and balanced diet	.989	.775		
It is important to me that my diet is low in fat	.997	.885		
It is important to me that my diet is low in saturated fat	1.022	1.048	-.160	-.502
It is important to me that my diet is low in salt	.846	.552		
It is important to me that my diet is low in sugar	.939	.915		
It is important to me that my diet is low in calories	.926	.590		

Construct and items	Skewness	Kurtosis	Transformed skewness	Transformed kurtosis
<i>Subjective Norms</i>				
People who are important to me think I should make healthy choices in the leisure centre café	.583	.100		
My family think I should make healthy choices in the leisure centre café	.573	.293		
My friends think I should make healthy choices in the leisure centre café	.426	.258		
People who influence my buying behaviour think I should make healthy choices in the leisure centre café	.448	.307		
<i>PBC</i>				
Whether I choose to make healthy choices in the leisure centre café is entirely up to me	2.077	5.417	.830	-.187
I have control over whether I choose to make healthy choices in the leisure centre café	2.224	5.453	.891	.031
The information in the leisure centre café today helps give me control over whether I make healthy choices	.328	-.652		
<i>Intention</i>				
I definitely intended to make healthy choices within the leisure centre café today	.394	-.357		
I definitely intended to make low fat choices within the leisure centre café today	.281	-.500		
I definitely intended to make low saturated fat choices within the leisure centre café today	.216	-.533		
I definitely intended to make low salt choices within the leisure centre café today	.177	-.549		

Construct and items	Skewness	Kurtosis	Transformed skewness	Transformed kurtosis
<i>Intention continued</i>				
I definitely intended to make low sugar choices within the leisure centre café today	.309	-.449		
I definitely intended to make low calorie choices within the leisure centre café today	.291	-.488		

7.4.7.1.2 Structural Equation Modelling

SEM is used to investigate the "plausibility of theoretical models that might explain the interrelations among a set of variables" (Hu and Bentler, 1999, p.2). SEM takes a confirmatory approach to an underlying theory (Byrne, 2010) and has been described as powerful "to model a behaviour in consumer research" and "for disentangling the structures underlying food choice" (Carrillo *et al.*, 2013, p.367). Therefore the use of SEM within this study was expected to explore and confirm the factor structure underlying food choice in leisure centre cafés.

The EFA was used to identify the underlying structure of the model. Subsequently, the CFA was carried out to statistically test this structure, and to identify if the variables were loading onto their respective constructs. At this stage, the model was termed the 'measurement model'. Once the measurement model was accepted, the 'structural model' was built using the pathways hypothesised in the ATPB.

7.4.7.1.3 Exploratory Factor Analysis

For the EFA, maximum likelihood was used to extract the results, with a promax rotation. Maximum likelihood is considered the most frequently employed estimation method for SEM (Tabachnick and Fidell, 2007). There are two types of rotation available within SEM; orthogonal and oblique. Orthogonal rotations assume that factors are independent, and not highly correlated (Field, 2009). In comparison, oblique rotations assume an underlying correlation between factors. Promax is an oblique rotation method and was selected on the basis

that there was a hypothesised relationship between the factors (Field, 2005). The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy operates on a scale of 0-1. A figure closer to 1 indicates that factor analysis should obtain reliable, separate factors (Field, 2005). A further test carried out during the EFA is Bartlett's Measure of Sphericity. For factor analysis to be considered appropriate, this test ideally needs to be significant ($p < 0.05$). The results of the EFA and these tests can be found in Chapter 8.

7.4.7.1.4 Confirmatory Factor Analysis and the Structural Equation Model

7.4.7.1.4.1 Sample size and items per construct

SEM often requires a higher sample size than other multivariate techniques, however smaller samples are appropriate where a higher number of items have been employed (Hair *et al.*, 2010). In general, sample sizes of 50 or more should be appropriate for SEM as long as at least three items are measuring each construct (Iacobucci, 2010). The number of constructs employed in the present study meant that around 200 questionnaires would be appropriate for SEM (Hair *et al.*, 2010), as adopted in previous research (Mitterer-Daltoé *et al.*, 2013). One of the constructs in the present study, Concern Disease, was measured using only 2 items (Chapter 8). Both of the items loaded highly onto their factor during the EFA, and the Cronbach's alpha demonstrated good internal reliability hence the construct was retained.

7.4.7.1.4.2 Measures to assess model fit

The χ^2 goodness of fit statistic, or the chi-square, and a number of fit indexes are routinely used to assess model fit (Tabachnick and Fidell, 2007).

7.4.7.1.4.2.1 χ^2 and degrees of freedom

The fit between the sample covariance matrix and the estimated population covariance matrix can be one way to determine good model fit (Tabachnick and Fidell, 2007, p.715). To identify a good model fit, χ^2 should ideally be non-significant ($p > 0.05$). However, the χ^2 statistic can be problematic at times due to its sensitivity regarding sample size and numbers of variables (Iacobucci, 2010). As a result, reasonable fit is determined by adjusting χ^2 by the degrees

of freedom (χ^2/df) (Iacobucci, 2010). This result should be ≤ 3.0 to be acceptable (Kline 2004, cited in Iacobucci, 2010), and has previously been used in research regarding genetically modified foods (Costa-Font and Gil, 2009; Kim, Jang and Kim, 2014).

7.4.7.1.4.2.2 Root Mean Square Error of Approximation (RMSEA)

RMSEA estimates the lack of fit when compared to the saturated model, taking into account degrees of freedom (Browne and Cudeck, 1992; Tabachnick and Fidell, 2007). A smaller sample size can be potentially problematic for RMSEA. A sample size below 250 can sometimes lead to the RMSEA over-rejecting a model (Iacobucci, 2010). This can also become exaggerated with increasing number of variables. Despite this concern RMSEA is frequently considered alongside other parameters to evaluate fit (Fraser *et al.*, 2011; Mitterer-Daltoé *et al.*, 2013; Hoefkens *et al.*, 2012; Arvola *et al.*, 2008; Pieniak *et al.*, 2009).

Browne and Cudeck (1992) stated that RMSEA should be $< .08$ for a reasonable fit, and ideally $< .05$ for a close fit. More recently, Steiger (2007) has proposed that a value of $< .07$ is rigorous. To help confirm the accuracy of the RMSEA value, upper and lower confidence interval values are also computed which demonstrate a 90% confidence interval (Byrne, 2010). These limits are respectively known as the LO 90 and HI 90.

7.4.7.1.4.2.3 Goodness of Fit Index (GFI) and Adjusted Goodness of Fit Index (AGFI)

GFI has been identified as a "measure of the relative amount of variances and covariances jointly accounted for by the model" (Jöreskog and Sörbom, 1982, p.408) AGFI adjusts the GFI based on the number of items (Tabachnick and Fidell, 2007). GFI and AGFI have been identified as an alternative to the χ^2 statistic for determining good fit (Hansen, Mukherjee and Thomsen, 2011). A fit $> .9$ is acceptable for these measures (Hu and Bentler, 1999).

7.4.7.1.4.2.4 Normed Fit Index (NFI) and Incremental Fit Index (IFI)

The Bentler-Bonett NFI (Bentler and Bonett, 1980) evaluates the model by comparing the χ^2 value of the model to the χ^2 value of the independence model which is the model that corresponds to completely unrelated variables (Tabachnick and Fidell, 2007, p.716). NFI is considered acceptable at levels $>.9$ (Hu and Bentler, 1999). However, it has been posited that levels $>.95$ indicate good fit (Tabachnick and Fidell, 2007).

Bollen (1989) proposed the IFI as a measure similar to the NFI. Although the NFI was reportedly considered a widely used index at the time, the IFI adjusts for sample size and degrees of freedom. A fit $>.9$ is considered acceptable for this index (Hu and Bentler, 1999).

7.4.7.1.4.2.5 Non-Normed Fit Index (NNFI) and Tucker-Lewis index (TLI)

The NNFI is an adjustment to the NFI, and considers degrees of freedom (Tabachnick and Fidell, 2007). However, in situations where small samples are used, the value of the NNFI can indicate poor fit, despite other statistics pointing towards good fit (Bentler, 1990; Tabachnick and Fidell, 2007). The NNFI is also known as the Tucker-Lewis index (TLI). TLI is accepted $>.9$ (Hu and Bentler, 1999).

7.4.7.1.4.2.6 Comparative Fit Index (CFI)

Hansen, Mukherjee and Thomsen (2011) referred to the CFI as a revised NFI index. The CFI compares the fit of the estimated model to that of the independent model (Carrillo *et al.*, 2013). The independent model assumes no relationships between each of the variables. The CFI is considered to be one of the indexes best able to take into account sample size and is therefore widely applied (Mitterer-Daltoé *et al.*, 2013; Hoefkens *et al.*, 2012; Dunn *et al.*, 2011). This reflected the account provided by Bentler (1990, p. 245), who referred to CFI as the "best index", namely due to its ability to handle small sample sizes. A score $>.90$ is considered a reasonable fit for CFI (Hu and Bentler, 1999), however $>.95$ is desirable for good fit (Tabachnick and Fidell, 2007).

7.4.7.1.4.2.7 Fit Indexes Summary

RMSEA, CFI, IFI and TLI (Table 39) have been applied in previous research relating to food choice (Kim *et al.*, 2013; Fraser *et al.*, 2011; Carrillo *et al.*, 2013) and were used to assess model fit in the present study.

Table 39: Fit indexes and level of acceptance

Goodness of fit/ fit index	Level of acceptance	Source	Level of acceptance adopted for the present study
χ^2/df	≤ 3.0	Kline 2004, cited in Iacobucci, (2010)	≤ 3.0
RMSEA	$< .06$	Hu and Bentler (1999)	$\leq .08$
	$< .07$	Steiger (2007)	
	.0 exact fit	Browne and Cudeck (1992)	
	$\leq .05$ indicates close fit		
	$\leq .08$ considered reasonable fit		
	$> .1$ considered poor fit		
TLI/ IFI	$> .9$	Hu and Bentler (1999)	$> .9$
CFI	$> .9$ considered reasonable	Hu and Bentler (1999)	$> .9$
	$> .95$ considered good fit	Tabachnick and Fidell (2007)	

7.4.7.2 Behaviour

Actual purchase behaviour was captured in the questionnaire. Although previous research has asked participants to rate their behaviour using a likert scale (Fraser *et al.*, 2011), participants in the present study were asked to record their purchases. Whilst this meant that purchase behaviour could be identified more accurately, it also meant that energy (kcal) purchased needed to be converted onto the 7-point scale used for the study in order to be included in the CFA/SEM.

To convert the kcal information onto a 7-point scale, the recommended contribution towards daily energy (kcal) intake from each eating occasion was calculated. An eating occasion was classified as; drink, snack, breakfast, lunch or evening meal. The figures were calculated based on the recommendations

for energy consumption, for each eating occasion, for an average adult (Public Health England, 2014b) (Table 40). The reference intake for an average adult was 2000 kcal (NHS Choices 2014b). Number '4' on the 7-point likert scale was considered to be the average point. Therefore, the recommended energy (kcal) for a particular eating occasion were categorised as a '4'. The remaining scores were calculated around this recommendation. A score >4 would suggest that energy (kcal) purchased was above the recommendations for consumption, and a score ≤ 4 was within the recommendations (Table 41). The same method was adopted to categorise the following nutrients; fat, saturated fat, sugar and salt (Appendix 15). Recommendations for the contribution of drinks towards energy intake were not provided in the Public Health England (2014b) framework. Furthermore, the eatwell guide provides a hydration message however it does not consider drinks in the main part of the guide. This suggests that recommendations do not allow for contribution to energy intake from drinks. As a result, drinks were recorded as a snack during the categorisation.

Table 40: Recommendations for % energy, total fat, saturated fat, sugar and salt to be consumed, per eating occasion (Adapted from Public Health England, 2014b)

Eating occasion	Percentage of daily intake; energy, total fat, saturated fat, sugar and salt
Breakfast	20%
Lunch	30%
Evening meal	30%
Snacks (including drinks)	20%

Table 41: Conversion of energy (kcal) consumed to a 7-point scale

Snacks (including drinks) and Breakfast		Lunch and Evening meal	
Kcal purchased	Score allocated	Kcal purchased	Score allocated
≤ 100	1	≤ 300	1
101 - 200	2	301 - 400	2
201 - 300	3	401 - 500	3
301 - 400	4	501 - 600	4
401 - 500	5	601 - 700	5
501 - 600	6	701 - 800	6
≥ 601	7	≥ 801	7

7.4.7.3 Intervention

7.4.7.3.1 Participant demographics

Descriptive statistics demonstrated the average age and standard deviation for the participants. The mean age for each week 1 and week 2 was compared for the intervention centre and for the control centre using independent samples t-tests. No physical activity and light physical activity were combined for the analysis (no/light), and moderate activity and vigorous activity were also combined (moderate/vigorous). The proportion of males and females, and the proportion of participants completing no/light physical activity and moderate/vigorous physical activity in week 1 and week 2 were identified, and were compared using a chi-squared test, for each leisure centre.

7.4.7.3.2 Means and independent sample t-tests

The mean scores for each of the constructs were determined for each week, in each leisure centre. Cronbach's Alpha were calculated for each construct to ensure that the items were reliably measuring their individual constructs (Pallant, 2007). An independent samples t-test was carried out on each construct, from the ATPB, to identify if there was a significant difference between week 1 and week 2, in each leisure centre. One item, hereafter called 'PBC, based on the information provided' was analysed separately to the constructs. There was not much information provided in the leisure centre to help consumers make healthy choices prior to the provision of the Calorie information. Therefore, PBC, based on the information provided was particularly low in week 1 when compared to the rest of the items within the construct. This item was removed from the construct following the EFA (Chapter 8), however it was retained separately for analysis. In addition to the ATPB constructs, the mean energy (kcal) purchased in week 1 and week 2, in each leisure centre, was compared using an independent samples t-test. The results were analysed by eating occasion.

7.4.7.3.3 Influences on food choice

Qualitative influences on food choice behaviour, as identified in the questionnaire, were analysed via thematic analysis to determine overarching themes (Matthews and Ross, 2010) and to provide context to the quantitative data on food choice.

7.4.7.4 Hierarchical cluster analysis

Hierarchical cluster analysis, with Euclidian distance and Wards method, was used to profile participants based on their average scores for each of the ATPB constructs. The items which comprised each construct were confirmed following EFA (Chapter 8). Cluster analysis recognises similarities and patterns in responses, and groups participants so that responses in a single cluster are closer to each other than they are with responses assigned to a separate cluster (Hair *et al.*, 2010). The number of clusters was determined visually from the dendrogram. Three clusters were accepted for the data set where no intervention was present. A cluster analysis for the data set where the intervention was present was carried out separately, and was included as a point of comparison to the data where no intervention was present. Two clusters were accepted due to the small sample size. The mean score for each ATPB construct, the mean energy (kcal) purchased and the key self-reported influences on purchase behaviour, were identified for each cluster group. An ANOVA was used to compare the mean ATPB score for each construct and the average energy (kcal) purchased for each cluster group, based on the eating occasion. A post-hoc, Tukey's test was applied where appropriate. Average age was also compared per cluster group, using an independent samples t-test where there were two clusters to compare and an ANOVA, where there were three. The proportion of males and females in each cluster was compared using a chi-squared test.

7.5 Summary

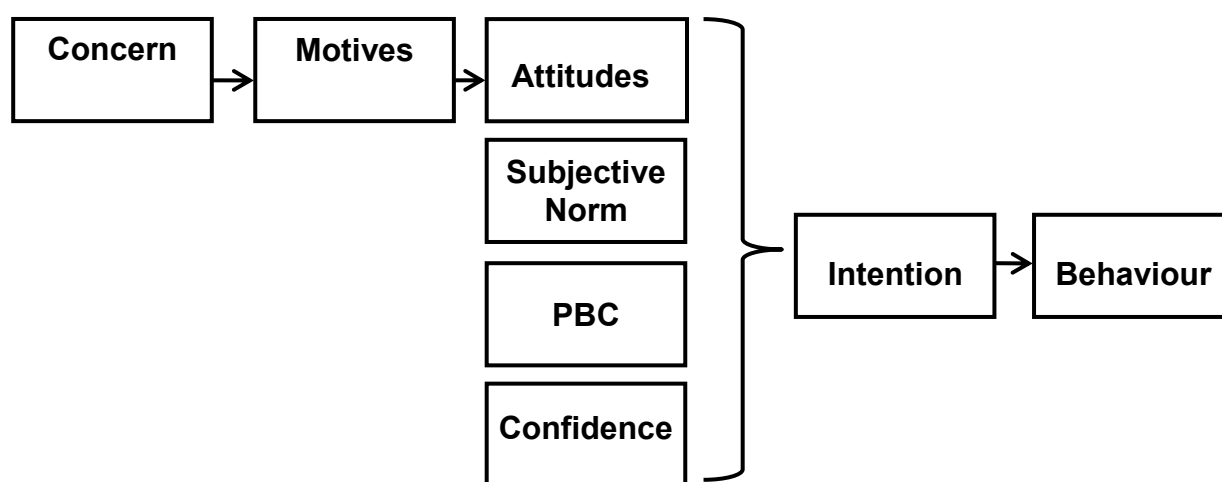
The second stage of the study involved a quasi-experiment where a nudge strategy; the provision of Calorie information, was implemented at an intervention centre. Leisure centre café user Concern, Motive, Attitude, Subjective Norm, PBC, Intention and Behaviour was identified via questionnaire, in week 1 (no intervention) and week 2 (intervention) at an intervention and a control centre. EFA was used to explore the underlying factor structure of the responses, CFA was used to confirm the factor structure, and then SEM was used to test the hypothesised pathways between the constructs. Once the model, and the items/constructs which comprised the model, were accepted, the impact of the intervention was assessed using the confirmed

constructs. Independent samples t-tests were used to compare the mean scores for each ATPB construct and the energy (kcal) purchased in week 1, when compared to week 2, in each leisure centre. Self-reported influences on food choice were analysed thematically. Hierarchical cluster analysis was used to profile participants based on their responses to the ATPB constructs, and an ANOVA was used to compare the responses for each cluster group. The results of the SEM, intervention and clustering have been presented in Chapters 8, 10 and 12, respectively.

Chapter 8 Results 2: Theoretical Relationships between Constructs

8.0 Introduction to the Chapter

Chapter 8 will commence with an exploration of the underlying factor structure of the data using Exploratory Factor Analysis (EFA). The accepted factor structure will be compared to the hypothesised Adapted TPB model (Figure 13). Any potential changes to the structure of the constructs will be evaluated and a Confirmatory Factor Analysis (CFA) will be carried out to confirm the factor structure. SEM will then be used to determine the acceptability of the proposed model, and examine the strength of the hypothesised relationships between the constructs.



[Figure 13: Adapted Theory of Planned Behaviour](#)

8.1 Data set

Chapter 8 will use the data collected where no intervention was present to examine the factor structure underlying food choice in leisure centres without any modifications to the food environment. This includes the data collected from both centres during the pre-intervention week (week 1), and the data collected from the control centre during the intervention week (week 2) (Table 42). These sections accumulated a total of 255 questionnaires.

[Table 42: Identification of the questionnaires included within the present section](#)

Leisure centre	Week 1: Pre-intervention (number)	Week 2: Intervention (number)
Experimental centre	66	Not included in this section
Control centre	151	38

8.2 Exploratory factor analysis

An EFA was carried out to examine the underlying factor structure within the data. The KMO value in the present study was 0.902 which greatly exceeded the cut-off point of $\geq .5$ (Kaiser, 1974), and is considered 'superb' (Field, 2005). Bartlett's Measure of Sphericity was significant ($p < 0.001$), thus further confirming that factor analysis was appropriate for the data.

8.2.1 Decision criteria

Using Kaiser's criteria (Kaiser, 1960; Williams, Onsman and Brown, 2010), a well used approach (Fabrigar *et al.*, 1999), only factors with an eigenvalue > 1 were retained. Based on the sample size, only loadings $> .4$ on each factor were accepted (Stevens, 2002; Field, 2009). Any items loading below this cut-off point were omitted from further analysis. Items which loaded > 1 or loaded onto multiple factors, with a $< .1$ difference between factor loadings, were also omitted from further analysis (Lee *et al.*, 2007). Out of 40 items, 8 items were removed including: Concern about 'Gaining weight', Concern about 'Saturated fat in your food', 'It is important to me that my diet is low in salt', 'Even if I want to make healthy choices in the leisure centre café I do not think I would be able to do so', 'The information in the leisure centre café today helps give me control over whether I make healthy choices', Motivated to make food choices which are 'Low in salt', Motivated to make food choices which are 'Low in sugar' and motivated to make food choices which are 'Low in saturated fat'. Justifications for their removal are provided in section 8.2.2.

8.2.2 Factor extraction

Eight factors were extracted with eigenvalues above 1. Seven of the extracted factors were retained for the analysis. The eighth factor was excluded on the basis that the majority of items either loaded below the .4 cut-off point or loaded onto another factor with $<.1$ difference (Lee *et al.*, 2007). Following the removal of these items, only one item remained on factor eight which was deemed insufficient to warrant retaining the factor. The items that comprise the seven factors retained for further analysis are identified below.

8.2.2.1 Factor 1: Intention (INT)

All six of the items regarding intention loaded onto the same factor (Table 43). All of the loadings were high, $\geq .84$. The Cronbach's alpha for this factor was .965 which is above the recommended value of $>.7$ and demonstrates good internal consistency (Pallant, 2007).

Table 43: Items and factor loadings for the Intention construct

Item	Loading
<i>How much do you agree with the following statements?</i>	
I definitely intended to make low saturated fat choices within the leisure centre café today	.994
I definitely intended to make low calorie choices within the leisure centre café today	.970
I definitely intended to make low sugar choices within the leisure centre café today	.934
I definitely intended to make healthy choices within the leisure centre café today	.884
I definitely intended to make low fat choices within the leisure centre café today	.856
I definitely intended to make low salt choices within the leisure centre café today	.840

8.2.2.2 Concern

Items relating to the Concern construct loaded onto two factors. Concern about fat, sugar, calories and salt loaded onto Factor 2, however concern about coronary heart disease (CHD) and blood pressure (BP) loaded onto Factor 7.

The internal consistency was good for Factor 2 (.869) and for Factor 7 (.963), suggesting that it was appropriate to consider the factors as two separate dimensions. Factor 2 was named Concern Nutrients and Factor 7 was named Concern Disease, based on the items which had loaded onto each factor. Once separated, their place in the ATPB needed to be reviewed. It was hypothesised that Concern Disease would inform Concern Nutrients. This was based on the recommendations that fat, sugar and salt intake should be limited to help in the prevention of CHD and BP (NHS Choices, 2014a). Therefore, individuals who are concerned about disease are more likely to be concerned about fat, sugar and salt in their food. Concern Nutrients has been considered in further detail below and Concern Disease is detailed in section 8.2.2.7.

8.2.2.2.1 Factor 2: Concern Nutrients (CN)

The Cronbach's alpha for Concern Nutrients (Table 44) was .869 which demonstrates good internal consistency (Pallant, 2007). Concern about 'Gaining weight' and 'Saturated fat in your food' also loaded onto this factor. The former item, however, was removed as it loaded below the cut-off point of .4 (Stevens, 2002; Field, 2009), and the latter item was removed as it loaded above 1 (section 8.2.1). Concern about 'Gaining weight' was originally included due to the focus on obesogenicity, and because individuals may attend leisure centres based on their motivation to lose weight (Davies, 2015). However, previous research in this field has also found weight control to be a less prominent factor (Sun, 2008). Concern about 'saturated fat' was expected to form part of this construct, based on public exposure to saturated fat content on food labels (Department of Health, 2013). However, total fat, which includes saturated fat, was retained in the factor and saturated fat still had a presence in the model, in the Intention and Attitudes constructs.

[Table 44: Items and factor loadings for the Concern Nutrients construct](#)

Item	Loading
<i>"How concerned are you about the following issues?"</i>	
Fat in your food	.895
Sugar in your food	.799
Calories in your food	.543
Salt in your food	.510
Gaining Weight (excluded)	.381
Saturated Fat (excluded)	1.11
<i>"How motivated are you to make food choices that meet the following criteria?"</i>	
Saturated Fat (excluded)	.363

8.2.2.3 Factor 3: Attitudes (ATT)

The Cronbach's alpha for this factor (Table 45) was .930 which demonstrates good internal consistency (Pallant, 2007). Attitude regarding 'low salt' loaded onto this factor and another factor, with <.1 difference between the values, so the item was removed. Attitudes towards 'low salt' was expected to form part of this construct, based on public exposure to salt content on food labels (Department of Health, 2013). However, salt still had a presence in the model, in the Intention and Concern Nutrients constructs.

[Table 45: Items and factor loadings for the Attitudes construct](#)

Item	Loading
<i>How much do you agree with the following statements?</i>	
It is important to me that my diet is low in calories	.909
It is important to me that my diet is low in fat	.891
It is important to me that my diet is low in sugar	.739
I always follow a healthy and balanced diet	.641
It is important to me that my diet is low in saturated fat	.537
I am very particular about how healthy my diet is	.525
It is important to me that my diet is low in salt (excluded)	.642

8.2.2.4 Factor 4: PBCC

The results of the EFA posited that the 'PBC' and 'Confidence' constructs were measuring a similar dimension (Table 46), which had good internal reliability (.845) (Pallant, 2007). The theoretical basis for combining these constructs was explored. Ajzen and Madden (1986, p.457) stated that "people's behaviour is strongly influenced by their confidence and their ability to perform it". This statement brings together the notion of confidence, with the individual ability to perform a particular behaviour. PBC relates to the perceived ease or difficulty of performing a particular behaviour (Conner and Armitage, 1998), which reflects individual ability. Furthermore, greater levels of confidence in depicting nutrition labels is synonymous with greater perceived control. As a result it was deemed theoretically justifiable for Confidence and PBC to be combined to make a 6-item construct which was entitled 'PBCC'.

Two further items which formed part of the original PBC construct were 'Even if I want to make healthy choices in the leisure centre café I do not think I would be able to do so' and 'The information in the leisure centre café today helps give me control over whether I make healthy choices'. The factor analysis indicated that neither of these items formed part of a construct as they did not load above the cut-off point on any factor. As a result both items were removed from this stage of the analysis. Although the former item was removed completely, the latter item, named 'PBC, based on the information provided' will be considered within Chapter 10, as explained in Chapter 7.

[Table 46: Items and factor loadings for the PBCC construct](#)

Item	Loading
<i>How confident do you feel about the following?</i>	
Determining if a food product would be healthy	.925
Having knowledge of healthy eating guidelines	.873
Understanding terminology on nutrition labels (e.g. Calories)	.828
Understanding colours on nutrition labelling (red/amber/green)	.657
<i>How much do you agree with the following statements?</i>	
Whether I choose to make healthy choices in the leisure centre café is entirely up to me	.451

Item	Loading
<i>How much do you agree with the following statements?</i>	
I have control over whether I choose to make healthy choices in the leisure centre café	.416

8.2.2.5 Factor 5: Subjective Norms (SN)

All four items regarding Subjective Norms (Table 47) loaded highly onto the same factor ($\geq .77$). The Cronbach's alpha demonstrated good internal consistency (.938) (Pallant, 2007).

[Table 47: Items and factor loadings for the Subjective Norms construct](#)

Item	Loading
<i>How much do you agree with the following statements?</i>	
My family think I should make healthy choices in the leisure centre café	.954
My friends think I should make healthy choices in the leisure centre café	.901
People who are important to me think I should make healthy choices in the leisure centre café	.873
People who influence my buying behaviour think I should make healthy choices in the leisure centre café	.772

8.2.2.6 Factor 6: Motives (MOT)

The Cronbach's alpha for this factor (Table 48) was .846 which demonstrates good internal consistency (Pallant, 2007). Motivation to make food choices that are 'Low in sugar' and 'Low in saturated fat' loaded onto this factor and onto an additional factor with $< .1$ difference, and were therefore excluded. Saturated fat was expected to form part of this construct, based on public exposure to saturated fat content on food labels (Department of Health, 2013). However, saturated fat still had a presence in the model, in the Intention and Attitude constructs. In addition to loading onto two factors with $< .1$ difference, 'Low in sugar' also loaded onto the Motive factor $< .4$. Public interest in sugar became more prominent about two months after data collection was completed following the release of the sugar reduction report published by Public Health England (2015a). This prompted a proliferation in media interest in sugar, which

maximised exposure of the topic in a public domain (The Guardian, 2015; NHS Choices, 2015a). The greater awareness of sugar could have led to this item loading more clearly onto the Motive construct. Although sugar was removed from the Motive construct it still had a place in the model, in the Intention, Concern Nutrients and Attitude constructs.

Motivation to make food choices that are 'Low in salt' was the only item which originally comprised the 'Motive' construct which did not load onto the factor. This item did however load onto Factor 8, however this factor was excluded completely as it was problematic and only comprised of this single item. However, salt still had a presence in the model, in the Intention and Concern Nutrient constructs.

Table 48: Items and factor loadings for the Motives construct

Item	Loading
<i>How motivated are you to make food choices that meet the following criteria?</i>	
Low in Calories	.832
Low in Fat	.774
High in protein	.619
Helps me lead a healthy lifestyle	.574
Cheap	.506
Low in saturated fat (excluded)	.429
Low in sugar (excluded)	.330

8.2.2.7 Factor 7: Concern Disease (CD)

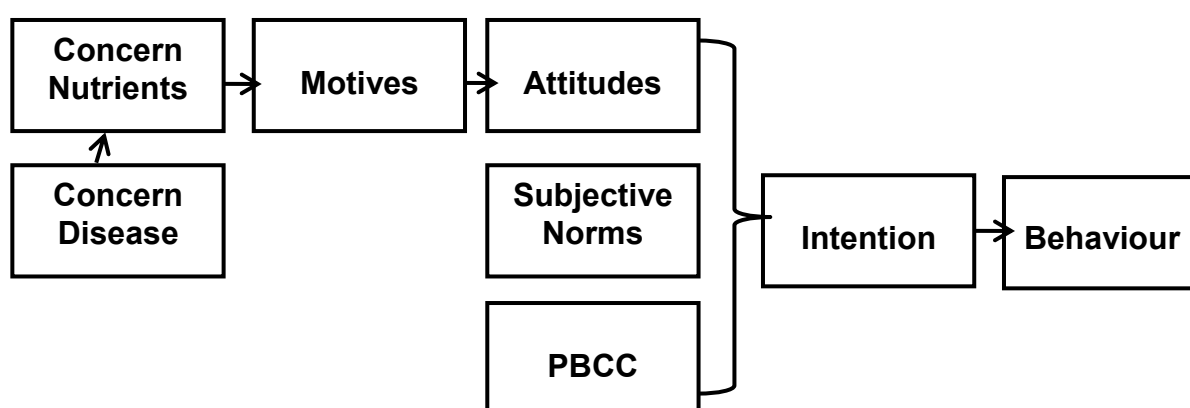
The second factor relating to concern included items relating to concern about getting CHD and high BP, and was therefore named Concern Disease (Table 49). High BP is linked with the onset of CHD, which may offer an explanation for the two items loading relatively strongly together onto the same dimension (NHS Choices, 2014a). Although a minimum of three items is usually deemed desirable for a single construct (Iacobucci, 2010), both of the items loaded highly onto this factor; $\geq .86$. Furthermore, the Cronbach's alpha was .963 which demonstrated very good internal consistency (Pallant, 2007).

[Table 49: Items and factor loadings for the Concern Disease construct](#)

Item	Loading
<i>"How concerned are you about the following issues?"</i>	
Risk of high blood pressure	.905
Risk of coronary heart disease	.858

8.3 Adapted TPB model

In support of the ATPB model, it was evident from the EFA that each item largely loaded onto the factor that it was intended to measure. However the results of the EFA also suggested changes to the structure of Concern, PBC, and Confidence. Concern was separated into Concern Disease and Concern Nutrients, and it was hypothesised that the former would inform the latter. PBC and Confidence were combined to make PBCC (Figure 14).



[Figure 14: Re-structured Adapted Theory of Planned Behaviour \(ATPB\)](#)

8.4 Correlation matrix

[Table 50: Correlation matrix for the constructs of the adapted TPB model](#)

	1	2	3	4	5	6	7
1. CN	1						
2. CD	.649**	1					
3. MOT	.474**	.303**	1				
4. ATT	.556**	.283**	.684**	1			
5. SN	.272**	.230**	.277**	.389**	1		
6. PBCC	.349**	.263**	.303**	.415**	.144*	1	
7. INT	.360**	.164**	.477**	.587**	.411**	.215**	1

** p<0.01 *p<0.05

As discussed in Chapter 7, it is required that the data is checked for evidence of multicollinearity before SEM is carried out. In the present research, all correlations were below .7 (Table 50). This confirmed that there was no concern regarding multicollinearity within the data (Tabachnick and Fidell, 2007; Hoefkens *et al.*, 2012).

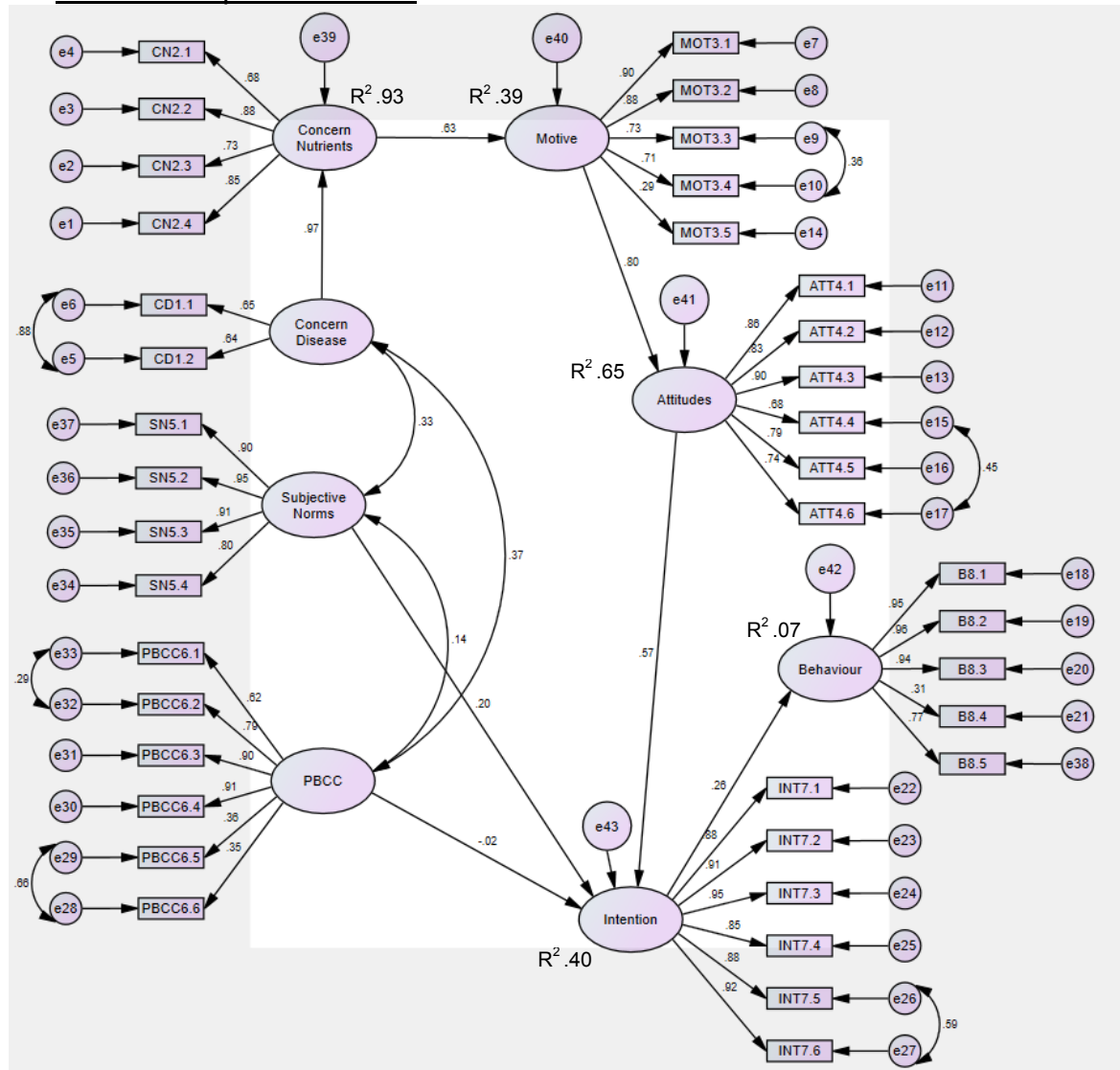
8.5 Measurement model/CFA

[Table 51: Fit indexes for the CFA](#)

χ^2	df	χ^2/df	p value	RMSEA	HI 90	LO 90	IFI	TLI	CFI
1336.5	632	2.11	.000	.066	.061	.071	.92	.90	.92

RMSEA was <.07 (Table 51), which was the level of acceptance for the present study (Steiger, 2007), however it was above the <.05 value desired for a close fit (Browne and Cudeck, 1992). CFI, IFI and TLI were all accepted (Hu and Bentler, 1999), however CFI was below the >.95 value desired for a close fit (Tabachnick and Fidell, 2007). As the results were within the level of acceptance set for the present study (Chapter 7), the measurement model was accepted and the researcher proceeded to build the structural model using the hypothesised pathways (Figure 15).

8.6 Structural equation model*



*All of the hypothesised relationships were significant ($p < 0.001$), except for PBC to Intention ($p = 0.719$). The covariance between PBC and Subjective Norms was significant at $p = 0.027$

[Figure 15: Adapted Theory of Planned Behaviour](#)

Concern Disease: **CD1.1** Risk of high blood pressure; **CD1.2** Risk of coronary heart disease

Concern Nutrients: **CN2.1** Salt in your food; **CN2.2** Fat in your food; **CN2.3** Calories in your food; **CN2.4** Sugar in your food

Motives: **MOT3.1** Low in Calories; **MOT3.2** Low in Fat; **MOT3.3** Helps me lead a healthy lifestyle; **MOT3.4** High in protein; **MOT3.5** Cheap

Attitude: **ATT4.1** It is important to me that my diet is low in calories; **ATT4.2** It is important to me that my diet is low in sugar; **ATT4.3** It is important to me that my diet is low in fat; **ATT4.4** I always follow a healthy and balanced diet; **ATT4.5** It is important to me that my diet is low in saturated fat; **ATT4.6** I am very particular about how healthy my diet is

Subjective Norms: **SN5.1** People who are important to me think I should make healthy choices in the leisure centre café; **SN5.2** My family think I should make healthy choices in the leisure centre café; **SN5.3** My friends think I should make healthy choices in the leisure centre café; **SN5.4** People who influence my buying behaviour think I should make healthy choices in the leisure centre café

PBCC: **PBCC6.1** Understanding colours on nutrition labelling (red/amber/green); **PBCC6.2** Understanding terminology on nutrition labels (e.g. Calories); **PBCC6.3** Having knowledge of healthy eating guidelines; **PBCC6.4** Determining if a food product would be healthy; **PBCC6.5** Whether I choose to make healthy choices in the leisure centre café is entirely up to me; **PBCC6.6** I have control over whether I choose to make healthy choices in the leisure centre café

Intention: **INT7.1** I definitely intended to make healthy choices within the leisure centre café today; **INT7.2** I definitely intended to make low fat choices within the leisure centre café today; **INT7.3** I definitely intended to make low saturated fat choices within the leisure centre café today; **INT7.4** I definitely intended to make low salt choices within the leisure centre café today; **INT7.5** I definitely intended to make low sugar choices within the leisure centre café today; **INT7.6** I definitely intended to make low calorie choices within the leisure centre café today

Behaviour: **B8.1** Calories; **B8.2** Fat; **B8.3** Saturated Fat; **B8.4** Sugar; **B8.5** Salt

8.7 Model fit and relationships within the SEM model

8.7.1 Model fit

The final model was accepted based on the fit indices (Table 52).

Table 52: Fit indexes for the SEM

χ^2	df	χ^2/df	p value	RMSEA	HI 90	LO 90	IFI	TLI	CFI
1421.724	649	2.19	.000	.068	.064	.073	.91	.90	.91

The RMSEA was $<.07$ and therefore demonstrates an acceptable fit (Steiger, 2007). This is also reflective of the values for models which have been validated elsewhere (Mitterer-Daltoé *et al.*, 2013; Hoefkens *et al.*, 2012; Pieniak *et al.*, 2009). A larger sample size may have been required to obtain a close fit ($<.05$), as sample sizes below 250 can lead to RMSEA over rejecting a model, which is close to the sample size for the present study (n 255). Despite this, the HI90 value, which provides the upper limit based on a 90% confidence interval (Byrne, 2010), still demonstrated a reasonable model fit (.073).

The values for the IFI, TLI and CFI were accepted (Hu and Bentler, 1999; Browne and Cudeck, 1992). The values in the present study were also reflective of the values for models which have been validated elsewhere (Mitterer-Daltoé *et al.*, 2013; Carrillo *et al.*, 2013).

The chi-square or χ^2 statistic evaluates the overall fit of the model (Hooper, Coughlan and Mullen, 2008) by assessing “the magnitude of discrepancy between the sample and fitted covariance matrices” (Hu and Bentler, 1999, p.2). As a result, the χ^2 statistic should ideally have a p value which is not significant, however the statistic is known to be sensitive to sample size and the number of variables (Iacobucci, 2010; Hooper, Coughlan and Mullen, 2008; Kenny and McCoach, 2003), and has been significant in a number of validated models (Hoefkens *et al.*, 2012; Arvola *et al.*, 2008; Carrillo *et al.*, 2013). The χ^2/df is an alternative statistic which is less affected by sample size. This statistic was ≤ 3.0 (2.19), as desired (Kline 2004, cited in Iacobucci, 2010), and was accepted in place of the p value for the χ^2 statistic.

8.7.2 Covariances

Inspection of the model shows that six covariances were added between items (Table 53) ($p < 0.001$). The highest covariance (.88) was between CD1.1 (Risk of high blood pressure) and CD1.2 (Risk of coronary heart disease). The justification for each covariance can be found in Table 53.

Table 53: Covariances between items within the SEM model

Item and item code		Level of covariance	Justification
Item 1	Item 2		
CD1.1 Risk of high blood pressure	CD1.2 Risk of coronary heart disease	.88	As identified earlier (section 8.2.2.7), high BP is linked to the onset of CHD (NHS Choices, 2014a). Combined with their shared similarities in risk factors, this provides a theoretical explanation for why the two diseases share a high covariance.
PBCC6.5 Whether I choose to make healthy choices in the leisure centre café is entirely up to me	PBCC6.6 I have control over whether I choose to make healthy choices in the leisure centre café	.66	These two items are similar in wording, aside from the fact that PBCC6.6 specifically asks about control. The remaining similarities in terminology could explain the covariance, however both questions are adapted from a previous questionnaire (Chen, 2007), which was based on a validated scale (Bredahl, 2001).

Item and item code		Level of covariance	Justification
Item 1	Item 2		
INT7.6 I definitely intended to make low Calorie choices within the leisure centre café today	INT7.5 I definitely intended to make low sugar choices within the leisure centre café today	.59	Consumption of food and drinks with added sugar can increase energy (kcal) intake (NHS Choices, 2015b). Some drinks which are branded as 'energy' drinks may contain added sugar, beyond the recommended intake (Action on Sugar, 2015). Although the covariance can be theoretically explained, sugar and Calories are separate on food labels, demonstrating their purpose as individual items within the model.
ATT4.6 I am very particular about how healthy my diet is	ATT4.4 I always follow a healthy and balanced diet	.45	In this construct, the remaining items related to a particular nutrient, whereas these two items referred to a 'healthy diet'. This similarity may provide an explanation for the covariance. Both items were however developed from the original validated scale (Roininen, Lähteenmäki and Tuorila, 1999).

Item and item code		Level of covariance	Justification
Item 1	Item 2		
MOT3.4 High in protein	MOT3.3 Helps me lead a healthy lifestyle	.36	It is arguable that the covariance could reflect the fact that these two items were more positive in nature and focussed on increasing a behaviour, when compared to the remaining items such as 'Low in fat' which focussed on reducing a behaviour. The covariance here also suggests that consumers may equate high protein with health, which could be a reflection of the individuals who engage with leisure centres.
PBC6.1 Understanding colours on nutrition labelling (red/amber/green)	PBC6.2 Understanding terminology on nutrition labels (e.g. Calories);	.29	Both items relate to the understanding of nutrition labels, which can explain the relationship between the two. However, the colours used in traffic light labelling have been posited to help consumers understand nutrition labels more (Sonnenberg <i>et al.</i> , 2013; Olstad <i>et al.</i> , 2015b), hence it was important to consider traffic light colours and terminology separately.

Covariances were also drawn between each construct, where a direct path did not enter the construct (Table 54) ($p < 0.001$, except for PBCC to Subjective Norms; $P = 0.027$). The covariances were drawn, as it was posited that the constructs would not be entirely independent. This is supported by the design of the original TPB (Ajzen, 1991), which has covariances between the three factors that inform intention.

Table 54: Covariances between the constructs within the SEM model

Construct		Level of covariance
Construct 1	Construct 2	
Concern Disease	PBCC	.37
Concern Disease	Subjective Norms	.33
PBCC	Subjective Norms	.14

8.7.3 Relationships between constructs

All of the hypothesised pathways between constructs were significant ($p < 0.001$), except for the relationship between PBCC and Intention ($p = 0.719$). This pathway demonstrated a slight inverse relationship from PBCC to Intention as well as demonstrating the weakest relationship ($-.02$). In contrast, Attitude demonstrated the strongest relationship with Intention ($.57$). Subjective Norms also established a positive, significant relationship with Intention ($.20$).

The relationship between Concern Disease and Concern Nutrients was the strongest pathway ($.97$). A strong relationship was also demonstrated in the remainder of the pathways based on the adapted model proposed by Sun (2008). This pathway includes the path from Concern Nutrients to Motives, which was positive and significant ($.63$), as was the subsequent path from Motives to Attitudes ($.80$).

The hypothesised relationship from Intention to Behaviour was also positive ($.26$).

8.8 Summary

The structure of the constructs, and the items which comprise the constructs, was confirmed via the EFA. PBC and Confidence were collated into a single construct; PBCC, and Concern was separated into two constructs; Concern Disease and Concern Nutrients. The CFA demonstrated an acceptable fit to the data, which allowed SEM to be performed. The resulting SEM model was accepted. The creation of an SEM model is novel to explain the structure

underlying food choice in leisure centre cafés. The accepted model therefore provides a unique and useful framework from which to evaluate the influences on Intention and Behaviour in leisure centre cafés. All of the hypothesised pathways, except for PBCC to Intention, were supported within the model, and will be evaluated in Chapter 9.

Chapter 9 Discussion 2: Pathways to Modify Intention

and Behaviour in Leisure Centres

9.0 Introduction

Chapter 9 will evaluate the structure underlying food choice in leisure centre cafés. Central to the Theory of Planned Behaviour (Ajzen, 1991), the positive relationship found between Intention and Behaviour will be evaluated in the context of relevant literature. Following on from this, the Chapter will discuss and evaluate the influence of the three antecedents of Intention within the model; Attitudes, Subjective Norms and PBCC. The role of the antecedents of Attitudes, which were based on the adapted model proposed by Sun (2008), will also be discussed. Critically, each of these sections will identify which constructs are the most influential in the context of the present research. Hypothesis 1 (H_1), below, relates to the SEM and will be evaluated as part of this discussion.

Null hypothesis 1 (H_0): No relationship will be observed between Concern*, Motives, Attitudes and Intention, between Confidence* and Intention, between Subjective Norms and Intention, or between PBC* and Intention. No relationship will be observed between Intention and Behaviour.

Alternative hypothesis 1 (H_1): Concern* and Motives will inform Attitudes which can predict Intention, alongside Confidence*, Subjective Norms and PBC* which will also inform Intention. Intention will predict Behaviour.

* PBC and Confidence were combined to make PBCC. Concern was divided into Concern Disease and Concern Nutrients.

9.1 Intention and Behaviour

This research has shown that Intention is an antecedent of Behaviour in the context of leisure centre cafés, as hypothesised by the TPB (Ajzen, 1991), therefore the null hypothesis was rejected. The relationship was positive and significant, however a relatively low weighting was observed (.26) when compared to the majority of pathways within the model and when compared to models in the literature (Mitterer-Daltoé *et al.*, 2013; Dunn *et al.*, 2011). This could be explained by the use of actual purchase behaviour in the Behaviour

construct. Although this was viewed as a strength of the present study, it can lead to a lower weighting when compared to self-reported behaviour. For example, when using SEM to analyse fast-food consumption, Dunn *et al.* (2011) found a relatively strong relationship between Intention and self-reported Behaviour (0.62). Interestingly, the strength of the relationship was slightly reduced (0.58) when actual Behaviour, determined from a diet diary, replaced self-reported Behaviour. However, this data is likely to be more accurate, therefore the results are likely to be more trustworthy.

Historically, decision-making models such as the TPB have largely relied on self-reported data (Armitage and Conner, 2001). Whilst some food based studies, that have employed the TPB structure for SEM, have collected self-reported behaviour (Mitterer-Daltoé *et al.*, 2013), others have omitted measures of behaviour entirely (Arvola *et al.*, 2008; Costa-Font and Gil, 2009). In addition, within the literature base there are examples of where the accuracy of self-reported data is called into question. For example, Dunn *et al.* (2011) found that self-reported consumption, which was recalled retrospectively, was significantly lower than actual consumption behaviour. Retrospective methods, such as 24 hour recall and the food frequency questionnaire, can lead to under-reporting of energy consumption, however so can prospective methods, such as a diet diary (Trabulsi and Schoeller, 2001). This is because prospective methods can influence individuals to adapt their choices, and they can lead to reporting bias. Whilst retrospective methods help to overcome this limitation, accuracy is inherently difficult to achieve based on the reliance on memory. Participants in the study recorded their purchases after the purchase was made, which helped to prevent changes to behaviour. However, the purchase behaviour data had to be transformed onto a 7-point scale for the SEM (Chapter 7). It is therefore possible that a different methodology to transform the data could have produced different results, which could reflect a limitation of the research.

One explanation for the relatively low weighting of the pathway from Intention to Behaviour could be that consumers intended to make a healthy choice, however they may not have the information required to enable them to accurately identify a healthy choice. Where nutritional information is not provided, it leaves decision-making open to alternative sources of information

(Sütterlin and Siegrist, 2015). These heuristics may influence consumers' perceptions of the healthiness of food. For example, the first stage of the study demonstrated that consumers acquired their knowledge from different sources of information, such as weight management groups, who may not provide standardised advice. This could result in a multitude of perspectives regarding what is healthy. Furthermore, stereotypes and branding can create beliefs and assumptions about the healthiness of products (Provencher and Jacob, 2016), and it is arguable that the leptogenic physical activity environment within a leisure centre could also transfer a healthy image onto the food offer in some instances. Bucher *et al.* (2016a) carried out a study with adolescents, to understand the evaluation criteria that they used to form their perceptions of the healthiness of foods. Sugar, chocolate and fat were seen as key markers of unhealthy products, and fruit and nuts were seen as key indicators of healthy products. Furthermore, terminology can influence consumer perception of the healthiness of food. For example, Sütterlin and Siegrist (2015) found that the perceived healthiness of a product increased where the term 'sugar' was replaced with 'fruit sugar'. Previous research in a leisure centre setting has also used terminology to nudge children to make a healthier choice (Olstad *et al.*, 2014). Products were named to encourage the perception that the product was fun and appealing, which led to an initial 12.7% increase in the sales of healthy products. Despite the increase not being significant, this demonstrates the influence that terminology can have on perception. It also demonstrates the potential impact that a nudge could have if it was adopted from a commercial standpoint. This demonstrates the importance of a food environment which is transparent, informative and supportive of healthy consumer behaviours, to ensure that behaviours mirror intention.

9.2 Pathways to Intention

The results demonstrated two antecedents of Intention; Attitudes and Subjective Norms, thus rejecting H_0 . Contrary to this, PBCC was not found to inform intention so part of the null hypothesis, which hypothesised no relationship between PBCC and Intention, was accepted. The role of each construct will be evaluated in the following sections.

9.2.1 Attitudes

The strongest antecedent to Intention was Attitudes (.57). The positive relationship was significant ($p < 0.001$) and therefore supportive of the relationship proposed in the ATPB model. Furthermore, based on the adapted conceptual model proposed by Sun (2008), a positive, significant ($p < 0.001$) relationship was identified from Motives to Attitudes (.80), from Concern Nutrients to Motives (.63), and from Concern Disease to Concern Nutrients (.97).

Attitudes are considered to be important drivers of obesity trends (Butland *et al.*, 2007). The results of the present study suggest that positive attitudes towards healthy food choice are essential to predict healthy food choice intentions, which can ultimately inform Behaviour. In support of this, Dunn *et al.* (2011) and Arvola *et al.* (2008) also found Attitudes to positively inform Intention. However, in the study by Dunn *et al.* (2011), the pathway was weaker (.23) than the pathway observed in the present study. This could be partly explained by the difference in context; the present study focussed on healthy choices, however Dunn *et al.* (2011) focussed on influences on fast-food consumption. Further to this, Arvola *et al.* (2008) investigated intention to purchase organic apples and intention to purchase organic pizza. The pathway from Attitudes to Intention was stronger for the apples (.37) when compared to the pizza (.30). This suggests that the pathway from Attitudes to Intention may be weaker when considering less healthy food choices, such as fast food and pizza, in comparison to more healthy choices such as apples, and the focus on healthy choices adopted in the present study.

9.2.1.1 Antecedents of Attitudes

Whilst it is important to consider Attitudes in future interventions, it is also important to recognise the antecedents of Attitudes; Motives, Concern Nutrients and Concern Disease.

Motives were a strong predictor of Attitude (.80), which was in support of previous research (Sun, 2008; Chen, 2011). Therefore, H_0 was rejected. In the

present study, a number of items in the Motives construct were developed from the 'Health' factor within the Food Choice Questionnaire (Steptoe, Pollard and Wardle, 1995), which has previously been found to be a predictor of Attitude (0.41) (Sun, 2008). However, despite the strength of the pathway from Motives to Attitude, motivation to make a 'cheap' food choice had the lowest loading within the model (.29). This item was included within the model due to the perception that healthy food is more expensive (Morris *et al.*, 2014), which was a concern raised by leisure centre staff in the first stage of the study. The lower loading could demonstrate that cheap products are not an equitable motivator when compared to calories, fat, protein and leading a healthy lifestyle. This is consistent with the results of a study by Russell, Worsley and Liem (2015) who found nutrients to be a more important motivator than cost, when considering parent's motivations whilst making a food choice for their children. However, although 90% of participants considered it important to select snack options which would be healthy, 90% also indicated that they would be motivated by their child's personal preference. Further research in the study demonstrated that the more motivated parents were to make choices aligned with the child's personal preference, the more likely the child was to dislike products such as vegetables and cereals. Therefore, certain motivations could have a potentially negative impact on food choice and health. The finding in the present study, that motivation to make a 'Cheap' choice did not load as strongly as the nutrition based items, could also be explained by the fact that the former motivation may not be viewed as socially desirable. Despite this, it did still form part of the model demonstrating that it does contribute to motivation towards food choice in a leisure centre café context.

Concern Nutrients were found to positively influence Motives in the present study (.63). This is supported by the previous point that nutrients are an important motivator in food choice (Russell, Worsley and Liem, 2015), which suggests that concern about nutrients would inform motivation well. The results are also consistent with research carried out by Sun (2008), who investigated the impact of concern about disease and concern about calories on consumer motivations. Although concern was found to inform health motivation, it was also found to inform mood and familiarity motives which were not considered in the present model. Health concerns have previously been found to influence

motivation and attitudes towards smoking in adolescents (Chang, 2009). External positive motives, such as feeling confident and cool, internal positive motives, such as feeling relaxed, and internal negative motives, such as the reduction of stress and anxiety, were key motivators to increase positive attitudes towards smoking. However, short-term health concerns, such as bad breath, were found to motivate less favourable attitudes towards smoking when compared to long-term health concerns, such as cancer and heart disease, which did not. In explanation, it was suggested that this could have been due to the adolescent population studied, who may be less concerned about long-term effects. This may not be the case in the present study, as the first stage of the research identified that some leisure centre users are referred to leisure centres, following recovery from a particular disease. Furthermore, previous research has demonstrated that 59% of public leisure centres ($n = 44$) in London provided access to weight loss programmes, even though concern about 'gaining weight' was removed from the model following the EFA, or operated a GP referral scheme (Nowak, Jeanes and Reeves, 2012). Therefore, there is likely to be a population segment who engage with leisure centres with potential concerns about disease, who as a result may have greater concern about nutrients.

The strongest relationship within the model was the path from Concern Disease to Concern Nutrients (.97). Concern about disease often leads to a greater value placed on health (Lau, Hartman and Ware, 1986), helping to explain the strong relationship that was observed between these constructs. Furthermore, individuals with disease are more likely to use food labels (Lewis *et al.*, 2009), demonstrating their interest in additional information about nutrients. It was interesting for example that concern about 'salt in your food' loaded onto the Concern Nutrients construct, despite a number of salt related items being removed from further analysis. This could be explained by the fact that salt is recognised, in academic research and on public platforms, to be a particular contributor towards BP (He, Li and MacGregor, 2013; NHS Choices, 2014a), which formed part of the Concern Disease construct, and subsequently informed Concern Nutrients.

Anxiety during food choice is considered to be a negative feeling motivated by the potential harmful outcomes of food choice (Hansen, Mukherjee and Thomsen, 2011). It is therefore arguable that anxiety could result from concern about a particular disease. Anxiety can also result in a more informed choice, as it can encourage consumers to consider a number of factors (Hansen, Mukherjee and Thomsen, 2011). This concept is therefore supportive of the proposition that nutritional information should be made available to consumers to support informed choice (Hodgkins *et al.*, 2015).

9.2.2 Subjective Norms

The model demonstrated a positive relationship from Subjective Norms to Intention (.20). The relationship was significant at ($p < 0.001$), however it demonstrated a relatively weaker relationship when compared to the other pathways. In support of this, Armitage and Conner (2001) recognised that Subjective Norms have previously demonstrated poor performance as a predictor of Intention. Dunn *et al.* (2011) explained that subjective norms include the individuals' personal motivation to meet the expectations of significant others. Therefore, the low weighting could be explained by low motivation to meet these expectations. Contrary to the findings in the present study, previous research in the field, that has adopted the TPB, has found Subjective Norms to be the strongest predictor of Intention (Dunn *et al.*, 2011; Arvola *et al.*, 2008). This could be partly explained by the context of these studies, as Dunn *et al.* (2011) focussed on fast-food consumption and Arvola *et al.* (2008) looked at organic pizzas for one of their studies, in comparison to the focus on the purchase of healthy food that was adopted in the present study.

The nature of the population group could also influence the strength of the relationship between Subjective Norms and Intention. For example, friends are particularly influential on food choice for adolescents (SyLOW and Holm, 2009). However, in the present study, all participants were aged ≥ 18 years, therefore peers could have been less influential on food choices. The influence of health professionals has formed part of a Subjective Norms construct previously (Dunn *et al.*, 2011), however they were found to be the least influential factor in the context of that research. For the present context however, the potential for GP

referrals and concern about disease suggests that the influence of health professionals could be useful to consider going forward. Subjective norms evaluate the impact of others on purchase behaviour, however previous research has also observed 'personal norms' which assess behavioural intention adopted on behalf of others (Mitterer-Daltoé *et al.*, 2013). The research, which focussed on purchase behaviour of fish, included items such as 'To give my family a nutritious meal, I buy fish'. This could be extrapolated to research based around healthy food choices, or low energy (kcal) food choices, to evaluate the role that adults play when purchasing food on behalf of others.

9.2.3 Perceived Behavioural Control and Confidence

PBCC demonstrated no relationship with Intention (-.02), therefore rejecting the hypothesised path within the model and accepting H_0 . The results suggest that PBCC does not inform Intention in this context. Interestingly, PBC has previously been removed from a model that focussed on the purchase intention of organic apples and pizza, due to its 'insignificant' relationship with Intention (Arvola *et al.*, 2008). Hoefkens *et al.* (2012) found a significant inverse relationship between 'subjective understanding' and energy intake (-0.18), whilst investigating the impact of nutritional information in a university canteen. Subjective understanding was based on ease to interpret and understand information, which covers similar aspects as the PBCC construct in the present study. It was posited that the result may have indicated that the population studied were in a 'learning stage' and not ready to adapt their behaviour. This is interesting, as repeated use of nutrition labels can increase knowledge of healthy choices (Roseman, Mathe-Souleik and Higgins, 2013).

Another factor that could have influenced the observed result is age. A meta-analysis of 42 journal articles and 4 Dissertations combined the research regarding the TPB and healthy eating, identifying the r value for the pathway from PBC to Intention. When comparing the r values based on the age of participants, the r value for participants ≥ 30 was lower (0.45) than that for participants aged 18-29 (0.55) (McDermott *et al.*, 2015). This reduction was not observed for the remaining pathways, and suggests a possible difference in the strength of the relationship between PBC and Intention based on age. The

average age for the present study was ~43 years, which suggests that a high number of participants were within the ≥ 30 bracket, which could provide an explanation for the weakness of the pathway. It is also possible that consumers could have felt confident in their control over making healthy choices but chose not to. This will be explored more in Chapters 10 and 11, which will identify the mean scores for PBCC and Intention before and during the intervention.

9.3 Summary

A significant relationship was identified between Intention and Behaviour in the present study. Attitudes were found to be the strongest predictor of Intention, demonstrating their importance in future research in this field. Motives were a predictor of Attitudes, Concern Nutrients informed Motives, and Concern Disease informed Concern Nutrients. Subjective Norms were a weaker predictor of Intention, and may benefit from the inclusion of alternative influential people, such as health professionals, and from the consideration of personal norms to take into account the influence that the individual has on the purchases for others. Based on the significance of these pathways, H_0 was rejected, except for the hypothesised pathway from PBCC to Intention where H_0 was accepted. This could be explained by participant age and also suggests that participants may have feelings of control and confidence over making healthy choices, but do not intend to make healthy choices. This will be explored more in the following chapters (10/11), alongside the evaluation of the impact of Calorie information on the remaining ATPB constructs, behaviour, and self-reported influences on behaviour.

Chapter 10 Results 3: Impact of the Nudge Strategy

10.0 Introduction

Chapter 10 will show the impact of the Calorie intervention on Concern Disease, Concern Nutrients, Motives, Attitudes, Subjective Norms, PBCC, PBC, based on the information provided, Intention and energy (kcal) purchased for drinks, snack-items and lunch. Self-reported influences on food choice in the leisure centre café have been included to add context to the quantitative findings. Section 10.1 will identify the division of the data set for the present chapter and confirm the questionnaire reliability, prior to the presentation of the results.

10.1 Data set and reliability

10.1.1 Division of the data set

In this chapter the data have primarily been split by week and by leisure centre (Table 55). However the qualitative data, in section 10.4, has been presented as the control centre combined with intervention centre week 1 (n 255) versus intervention centre week 2 (n 68). This enabled comparison between self-reported influences on food choice where no Calorie information was available, and where the Calorie information was available.

[Table 55: Number of questionnaires collected each week, per leisure centre](#)

Leisure centre	Week 1 (n)	Week 2 (n)
Intervention centre	66	68
Control centre	151	38

Although there was a good match in the number of participants across weeks at the intervention centre (Table 55), this was not the case at the control centre. The lower number of participants in week 2 was largely due to a high volume of repeat customers in the control centre and leisure centre users were only asked to complete the questionnaire once.

10.1.2 Questionnaire reliability

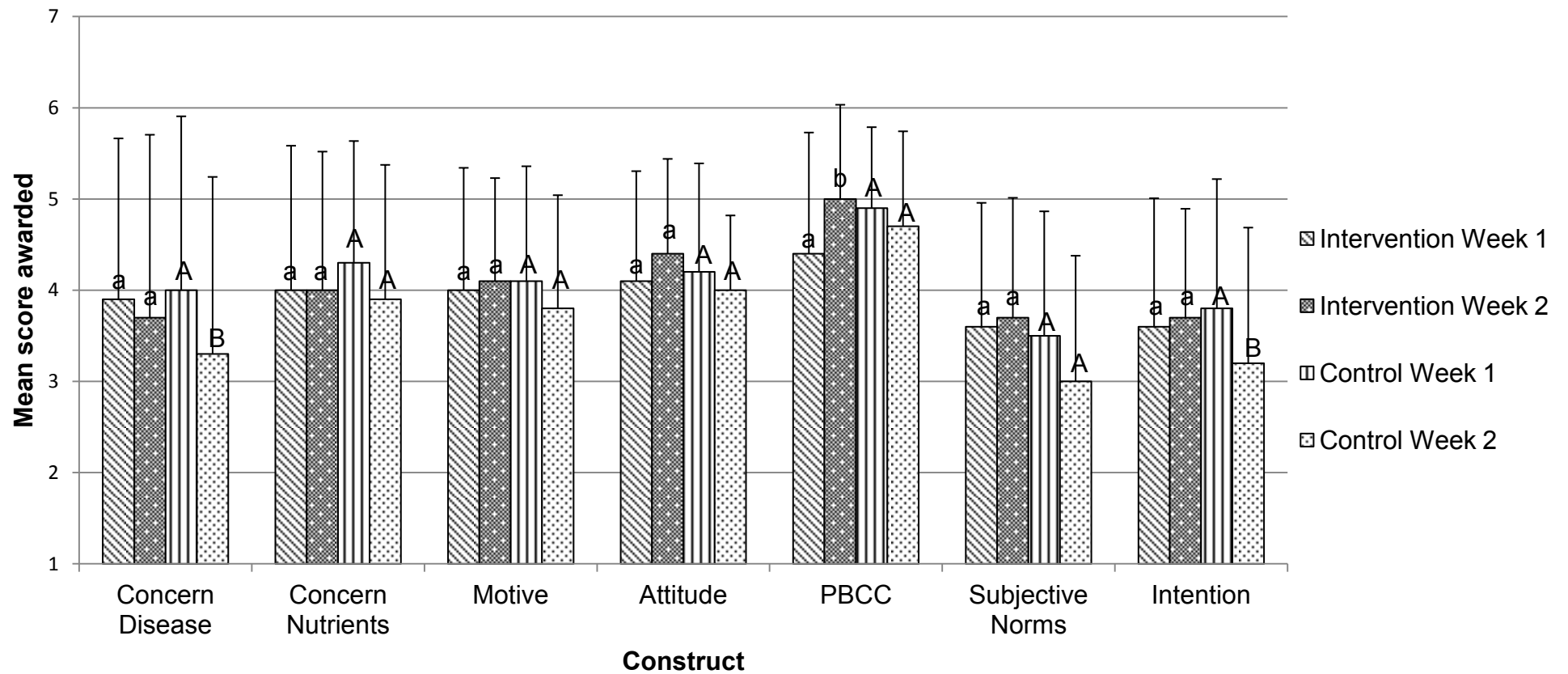
Cronbach's alpha is a measure of reliability which can be used to check that the items within a questionnaire reflect their assigned construct (Field, 2009). Due to the division of the data set in this research, the Cronbach's alpha was determined for each week within each of the leisure centres, and also for the 255 participants who completed the questionnaire where no intervention was present (Table 56). All of the constructs demonstrated a good level of reliability with values higher than the recommended threshold of .7 (Pallant, 2007), which meant that the mean scores could be used for the analysis.

[Table 56: Cronbach's alpha for each construct](#)

Construct	Cronbach's Alpha				255 participants
	Intervention		Control		
	Week 1	Week2	Week 1	Week 2	
Concern Disease	.944	.982	.970	.965	.963
Concern Nutrients	.927	.886	.842	.844	.869
Motive	.892	.756	.832	.811	.846
Attitude	.956	.911	.931	.832	.930
Subjective Norms	.959	.942	.926	.949	.938
PBCC	.893	.823	.800	.808	.845
Intention	.968	.951	.965	.954	.965

10.2 Mean scores for TPB constructs

Mean scores for week 1 and week 2, in each leisure centre, were compared using an independent samples t-test (Figure 16).



[Figure 16: Mean scores for each of the constructs, and error bars +1 SD](#)

Data are presented as means and standard deviations

Different letters in the same construct denote means that are significantly different to one another ($p < 0.05$). Lower case letters represent the intervention centre. Upper case letters represent the control centre.

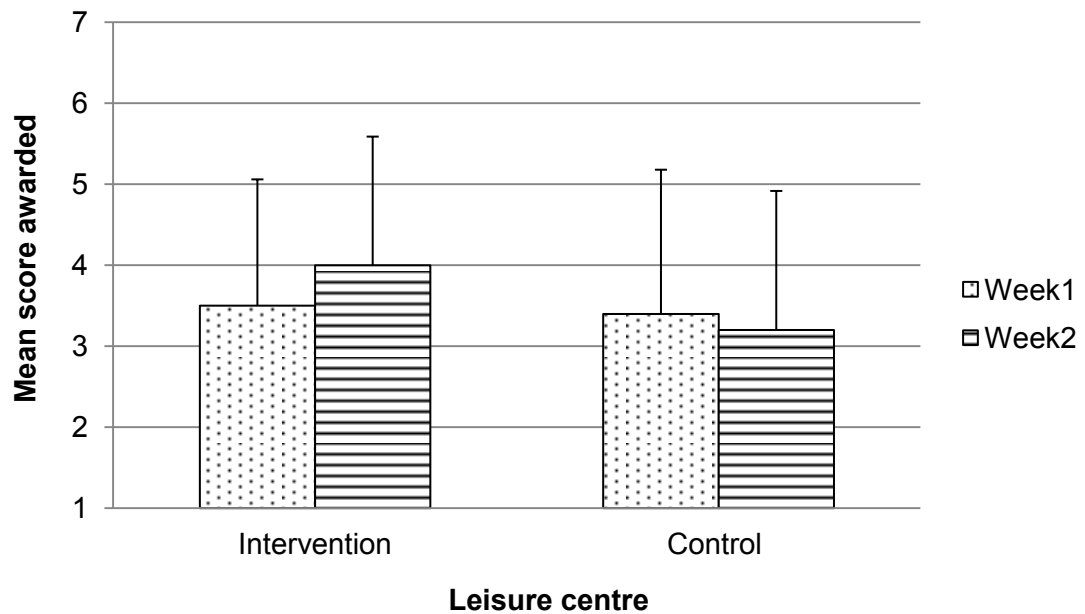
The nudge strategy significantly increased PBCC ($p=.003$) in the intervention centre. The mean increase was 0.6 on a 7 point scale (95% CI 0.2, 1.0). The effect size for this observation was .25, which is just below the .30 threshold for a medium effect (Field, 2009). In comparison, no significant difference was identified for PBCC within the control centre ($p=.259$). The mean difference was 0.2 (95% CI -0.5, 0.1). The mean score for PBCC was above '4' across both weeks, in both of the leisure centres, demonstrating that perceived control over making healthy choices in the leisure centre cafe was above average. As demonstrated by the significant increase in PBCC, this effect was emphasised during the nudge strategy.

No increase was observed in Concern Disease ($p=.476$), Concern Nutrients ($p=.936$), Motive ($p=.537$), Attitude ($p=.164$), Subjective Norm ($p=.532$) or Intention ($p=.778$) in the intervention centre. In the control centre, a significant reduction was observed in Concern Disease ($p=.038$) and Intention ($p=.028$), however no change was observed in Concern Nutrients ($p=.106$), Motive ($p=.121$), Attitude ($p=.170$) or Subjective Norm ($p=.060$).

Although the actual split in participant numbers for the control centre (Table 55, section 10.1.1) means that the results should be interpreted with caution, the researcher was satisfied that the effect observed in the intervention setting was not due to something external as the trends were opposite within the control centre.

10.2.1 Mean scores for PBC, based on the information provided

'PBC, based on the information provided' was analysed separately as it did not form part of a construct. The item asked participants to identify if the information in the leisure centre café helped to give them control over whether they made healthy choices.



[Figure 17: Mean scores for PBC, based on the information provided, error bars +1 SD](#)

There was a trend towards increased 'PBC, based on the information provided' in the intervention centre ($p = .064$, Figure 17). The same trend was not observed in the control centre ($p = .420$). The increase in the intervention centre meant that the mean increased from '3.5' to '4'. The initial mean was below the average point, indicating that consumers did not have perceived control and confidence over their behaviour, based on the information provided. In comparison, the non-significant increase observed in week 2 meant that the mean score reflected the average point of the scale, indicating that consumers were more likely to have perceived control and confidence over their behaviours, based on the information provided.

10.3 Food choice behaviour and physical activity

10.3.1 Food and beverage choice

Food and beverage choices were recorded for 82% of the participants. The remaining 18% either omitted the question or did not report their behaviour in enough detail to allow for accurate interpretation (e.g. 'Panini and chips').

Participants self-selected the purpose of the food/ beverage choice from the following: Drink; Snack; Breakfast; Lunch; or Evening Meal. Where a drink formed part of a meal, e.g. lunch, then the total energy (kcal) for the drink and food purchased were calculated and categorised as 'lunch'. The small amount of participants who reported the purchase as 'Breakfast' or 'Evening meal' meant that between-week comparisons for these categories were not possible (Table 57); therefore these were excluded from this analysis. The analysis therefore focussed on 'Drinks', 'Snacks' and 'Lunch', and was used to provide insight into actual purchase behaviour in leisure centre cafés. As the division of the data set resulted in a smaller sample size for each section, the results were interpreted with caution.

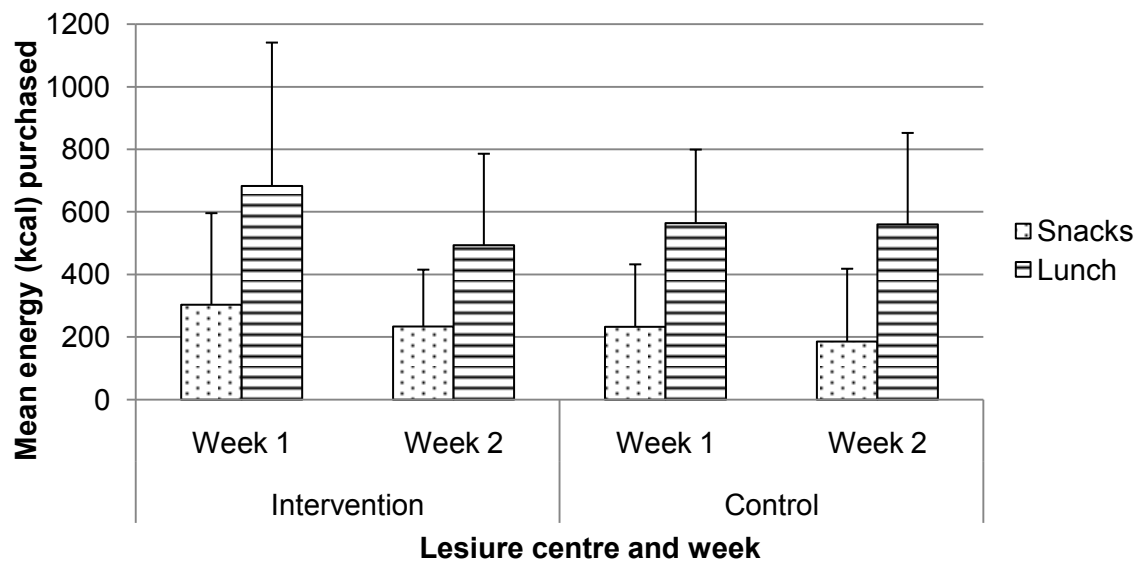
[Table 57: Number of participants for which energy \(kcal\) are available; presented by eating occasion, centre, and week](#)

Eating occasion	Intervention centre		Control centre	
	Week 1 (n)	Week 2 (n)	Week 1 (n)	Week 2 (n)
Drink	26	17	54	13
Snack	25	16	40	11
Breakfast*	0	2	6	0
Lunch	12	30	51	9
Evening meal*	1	0	0	3

*Breakfast and Evening Meal were excluded from further analysis

10.3.1.1 Average energy (kcal) purchased for snack and lunch

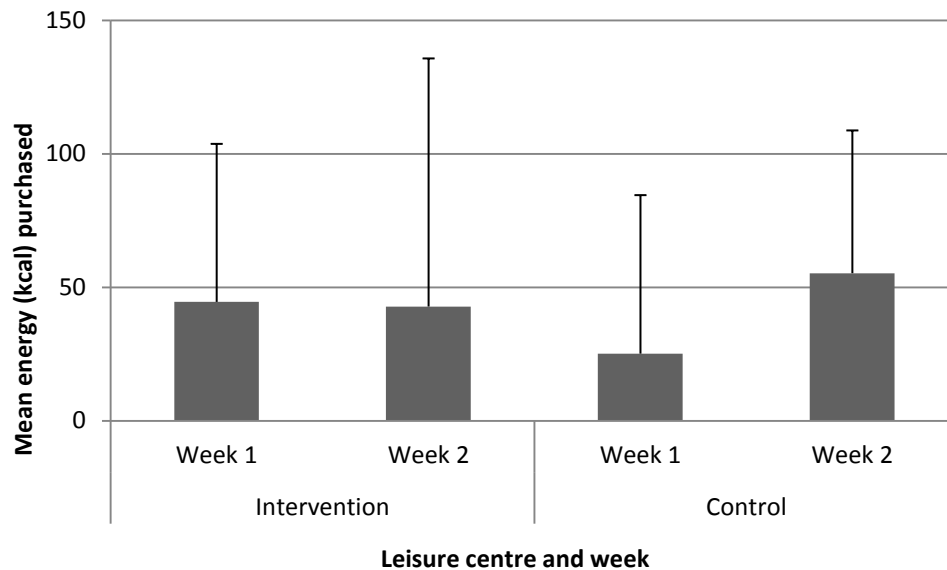
Figure 18 presents the mean energy (kcal) content of the reported food choices for snack-items and lunch across both facilities, for each week of the experiment.



[Figure 18: Average energy \(kcal\) purchased for snacks and lunch, error bars + 1 SD](#)

Average energy (kcal) purchased for lunch decreased from 683 kcal in week 1 to 494 kcal in week 2 in the intervention centre, however this was not significant ($p=.168$). In comparison, average energy (kcal) purchased for lunch remained relatively similar in week 1 (556 kcal) and week 2 (560 kcal) in the control centre ($p=.971$). Average energy (kcal) purchased for snacks also remained similar across week 1 and week 2 in the intervention centre ($p=.418$) and control centre ($p=.552$).

10.3.1.2 Average energy (kcal) purchased for drinks



[Figure 19: Average energy \(kcal\) purchased for drinks, error bars +1 SD](#)

In the intervention centre, mean energy (kcal) purchased for drinks was very similar in week 1 (45 kcal) and week 2 (43 kcal) ($p=.950$) (Figure 19). This suggested that the nudge strategy had no impact on energy (kcal) purchased for drinks. No change was observed in average energy (kcal) purchased for drinks in the control centre either ($p=.116$). The drinks data were interpreted with caution based on the low numbers of participants and the fact that added sugar in tea/coffee was not recorded. Furthermore, the large standard deviations observed for mean energy (kcal) purchased from drinks reflects the variety of drink options available which ranged from water and diet soft drinks to regular soft drinks and hot chocolate.

10.3.2 Level of physical activity

The majority of participants reported engagement with light physical activity, or no physical activity at all (Table 58). The proportion of participants completing no/light physical activity or moderate/vigorous activity differed between week 1 and week 2 in the control centre ($p=.025$), however remained consistent in the experimental centre ($p=1.000$).

Table 58: Level of physical activity completed per week within each leisure centre

	No/light physical activity (%)	Moderate/vigorous physical activity (%)
<i>Intervention</i>		
Week 1 (n 66)	66.7	33.3
Week 2 (n 68)	67.2	32.8
<i>Control</i>		
Week 1 (n 151)	56.7	43.3
Week 2 (n 38)	78.4	21.6

10.4 Self-reported influences on food choice

Participants' self-reported influences on consumer food choice helped to provide some context to the finding that there was no significant reduction observed in energy (kcal) consumed for drinks, snacks or lunch during the intervention. Self-reported influences were categorised into themes using thematic analysis. The percentage of responses in each theme were calculated for where no intervention was present (n 255) and where the intervention was present (n 68) to allow for comparison (Table 59), however the results for where the intervention is present were interpreted with caution due to the small sample size. The proportion of each theme was not statistically different when the intervention was present compared to when the intervention was not present ($p=.779$). An anonymised code has been included for each quote to identify whether the participant was from the intervention (I) or control (C) centre, participated in week 1 or 2, was male (M) or female (F), and a unique three digit participant number.

Table 59: Influences on food choice where the intervention was not present (*n* 255) and where the intervention was present (*n* 68)

Theme	% of responses	
	No intervention present (<i>n</i> 255)	Intervention present (<i>n</i> 68)
Availability and visibility of products	28%	19%
Influential people	16%	16%
Habit and preference	15%	12%
Concern about health	12%	16%
Exercise influencing food choice	11%	12%
Time of day	7%	16%
Cost of products/ special offers	6%	3%
Perception of food choice as a treat	5%	6%

10.4.1 Availability and visibility of products

The availability and visibility of products emerged as a key theme where there was no intervention present and where the intervention was present. The products available on the menu, or the consumers' knowledge of the products that were available, influenced their food choice.

Where there was no intervention present, knowledge of product availability was connected with the visibility of products. Participants reported being influenced by products which were;

"Displayed at front of counter" (C1F236)

"Easily on view" (C1F253)

Although a few participants reported some variety and an increasing number of healthy options, the dominant perception was that healthy food choices, including healthy alternatives, were limited;

"No diet drinks available except cola. Most food is not healthy in leisure centre cafés. Healthy food e.g. fruit is unappetising and not varied in choice" (I1F042)

"There isn't a healthy choice of food i.e. salads. Jacket potatoes not too bad. No low fat yoghurts" (I1F043)

"Rarely eat in the cafe as there aren't many healthy choices at all - the closest thing is a jacket potato! I would want to buy things like salad (which is appetising), sweet potato jackets, smoothies and juices (freshly made), and healthy kids choices, not just chips!" (C1F159)

"Had to eat/choose healthy options with biscuits and cakes heavily displayed at the till. I would have bought a banana (or apple) if there was available. No bananas and fruit tucked away behind a bale of crisps so I didn't readily see the fruit when I bought my drinks☹" (C1F218)

"For a leisure centre I think the food choice is terrible, lots of high sugar and fat foods available not much choice for health conscious" (C2F292)

However consumers' were also influenced by a lack of availability of products which could be considered less healthy;

"There were no sausage rolls" (C1F205)

Particular concern was raised, where there was no intervention present and where the intervention was present, about the availability of healthy choices for children;

"Choice is limited. Buying food for children - kids menu is very unhealthy" (C2F294)

"Children could only have chips as jacket potato have been taken off the children's menu" (C2F317)

"Would have liked more healthy children options other than sandwiches" (I2M071)

A perceived lack of availability of healthy choices or healthy alternatives could have prevented healthier choices. Lower energy (kcal) options could still have been seen as less healthy by consumers during the intervention. Some of the comments regarding the visibility of products suggest that consumers may not give much attention to the menu and therefore may not have been exposed to the Calorie information during the intervention.

10.4.2 Influential people

Influential people also emerged as a key theme where there was no intervention present and where the intervention was present. Participants reported purchasing the same products as their spouse, and eating at the leisure centre following an invitation from friends. Children and grandchildren were often reported to have influenced behaviours. Children would either select their preference, or would engage in 'pester power' to encourage the purchase they desired. However, it was not always clear if children influenced just what was being purchased for them, or what the parent/guardian was purchasing for themselves as well;

"Pester power! (from son - age 4)" (C1F184)

"The children were allowed to choose what they wanted" (C2F296)

"Hard to influence children when chips are on the menu" (C1F169)

"Comment by the kids (never had cheesy chips!)" (I2M082)

"Yes, my daughter wanted sweets" (C2M289)

"Yes [there were influences on my food choice], my granddaughter was with me"(C1F254)

For the latter statement, the participant reported that they had 'disagreed' in the questionnaire that they were intending to make a healthy choice, even though they were interested in healthy choices. This was because they were with their granddaughter. This demonstrates that consumers may intend to make a less healthy choice even if they value healthy choices.

10.4.3 Habit and preference

Habit and preference emerged as a key theme where there was no intervention present. Where the intervention was present, this theme was slightly less dominant. Where there was no intervention present, repeat purchases were considered to be a 'tasty' option or were purchased habitually whilst observing an activity;

"Usual drink to watch swimming lessons" (I1M003)

"What I fancied" (C1F259)

"Years of eating in this café on a regular basis" (I1M019)

The notion of habitual behaviour suggests that consumers may not have paid attention to the menu and also suggests that they may not consider alternative choices. In addition to personal preference, particular diets could also provide a reason for habitual behaviour;

"I always have the same thing, as it's the only menu option that fits with slimming world" (C1F246)

This was categorised as habitual behaviour as the participant referred to repeat purchases at the leisure centre café, however it also connects with the next theme; Concern about health.

10.4.4 Concern about health

Concern about health emerged as a theme where there was no intervention present and where the intervention was present. Participants reported selecting particular products because they were healthy, or perceived as low in energy or a particular nutrient of concern, such as sugar. As these comments were made where no intervention was present, the comments regarding 'low calories' are based on the participants own knowledge and perception;

"Yes - have chosen this for low fat, low salt, low sugar and low calorific" (C1F193)

"I did not buy the luxury hot chocolate because of the extra fat and cals. The slush is a low sugar and calorie drink made with fresh fruit" (C2F290)

Where the intervention was present, the desire to make healthy choices was emphasised if poor dietary choices were considered to have been made earlier in the week. Concern about health however may have only influenced adults' purchases for themselves as one participant identified the purchase of a 'low fat sandwich' for themselves, yet 'chips' for their daughter.

Furthermore, some participants reported particular dietary requirements such as 'gluten free' or adhering to recommendations during 'pregnancy'. Some

participants followed an 'eating plan' and food choice was influenced by their 'diet' and their 'weight';

"I am wanting to lose weight and look after my health" (C1F145)

Interestingly, where the intervention was present, one participant reported that they wished to gain weight for health reasons, suggesting that consumers could use the Calorie information to increase their energy (kcal) intake.

A number of participants also referred to dieting organisations such as 'Slimming World' as influential on their food choice;

"On slimming world, egg protein and toast is healthy choice" (C2F303)

One participant identified that they were on a diet, however saw their food choice as a 'treat'. This links with the final theme that emerged from the influences on food choice (10.4.8). This also suggests that participants who may be interested in Calorie information, and could use it at times, may not have used it at the leisure centre or on a particular day.

"Yes - we're currently on a diet / calorie counting - this is our Sunday treat after swimming" (12M095)

10.4.4.1 Calorie information

Interestingly, two participants identified that the presence of Calories on the menu during the intervention was 'a good idea!' or influential to their food choice;

"Ability to see Calories on the menu influenced choices" (I2F102)

This demonstrated that the Calorie information did influence some consumers' food choices. Participants were never asked directly about the Calorie information which suggests that these consumers had paid attention to the menu and considered the Calorie information to be influential in their food choice.

10.4.5 Exercise influencing food choice

The notion of exercise influencing food choice is particularly interesting as having a parallel physical activity environment and food environment is largely unique to a leisure centre context. A number of participants, where there was no intervention present, and where the intervention was present, reported a particular 'need' following exercise. In a number of instances the 'need' was for a high energy (kcal) product, indicating why energy (kcal) purchased during the intervention may not have been significantly lower than energy (kcal) purchased prior to the intervention. Swimming was the activity most frequently referred to as the type of exercise within this theme, however use of the gym or a bike ride prior to use of the leisure centre café were also reported;

"I have been swimming and need a high calorie drink" (C1F284)

"Needed some calories after swimming!" (C2M288)

"Doing exercise may influence unhealthy choices" (I1M025)

"Hungry, thirsty after swimming so wanted sugar" (I2F089)

10.4.6 Time of day

Following on from participants being hungry after exercise, the time of day also affected hunger and what the eating occasion was. In line with this, some participants reported either being 'hungry' or would report having already eaten;

"10.45am - coffee time and snack only" (I2M124)

Interestingly, the time of day also related to whether the visit was subject to time constraints, which meant quick and convenient choices were necessary;

"Staying for a short period of time - daughter swimming lesson 1/2 hour" (I2F006)

"15 minutes before I get my son from crèche. 15 min = 1 coffee" (C2F215)

Time constraints could have led to reduced attention paid to the menu, which could have had an impact on exposure to the Calorie information and on the effectiveness of the nudge strategy.

10.4.7 Cost of products/ special offers

A number of participants proposed that healthy options were overpriced. In contrast, products which could be perceived as less healthy were perceived as cheap.

"No. I do think that fruit is overpriced though, 50p for an apple when a pack of 6 is £1-1.50" (I1F049)

"Sausage rolls are cheap" (C1F209)

"PRICE Healthy choices have to be reduced, chips £1.00, fried egg sandwich - £1.10, Jacket pot and tuna - £2.95, fruit 70p, biscuits 50p" (C1F280)

Loyalty cards which could be used for particular drinks were identified as an influential factor on choice. In addition, one of the centres offered children access to a specified activity in combination with a cold drink, a snack, and a hot drink; the idea being that the hot drink was for the parent and the cold drink and snack was for the child. Consumers were limited to the choices available with the offer;

"Free with (specified activity) - why couldn't there be a fruit option not just biscuits?" (C1F239)

10.4.8 Perception of food choice as a treat

A number of participants saw their food choice behaviour as a 'treat'. In one instance the food choice was used for 'rewarding good behaviour'. A number of participants also stressed that the treat was perhaps more of a 'one-off' behaviour, or as part of a special day such as a trip out or a 'cheat day'.

"No, just my opinion as it is a treat not often taken" (C1F141)

"As it was a 'treat' day we all had food that was a bit unhealthy as we always eat healthy" (C2F315)

"A day off work in the holidays so treating daughter to swimming and treat" (C2F295)

10.5 Summary

A nudge strategy in the form of the provision of Calorie information proved effective to significantly increase PBCC, however no significant increase was observed for Concern Disease, Concern Nutrients, Motive, Attitude, Subjective Norms, Intention and Behaviour. The self-reported influences on food choice offered some explanation for the alternative influences on behaviour which could have prevented a significant increase in healthy intentions and healthy choices. A lack of availability of healthier options was reported, in particular for children. However, children were found to influence food choice; for example through pester power, or by being given the opportunity to make their own choice. Consumers desired more diet versions of drinks, fruit, and healthy alternatives to meals, however some habitual food choice behaviour in the leisure centre was also reported, which could prevent uptake of new products. Time constraints may also feed into habitual behaviours, as participants have limited time in the leisure centre, and healthy products were seen as overpriced by some participants demonstrating another potential barrier to increasing the availability of these options. Some participants demonstrated concern about the energy (kcal) content of products. Where the intervention was not present, statements about selecting 'low calorie' products would have been based on individual knowledge and perception, demonstrating that Calorie information can serve a purpose on menus to ensure that accurate information is provided. A couple of participants mentioned the Calorie information in week two, with one participant directly stating that it influenced their choice. However, the Calorie information could have encouraged higher energy (kcal) choices, as some participants looked for 'calories' after having completed an activity in the leisure centre. This was also the case for participants who viewed their visit to the café as a treat. The following chapter (11) will evaluate these findings in more detail.

Chapter 11 Discussion 3: Evaluation of the Impact of Calorie information on PBCC, Intention and Behaviour

11.0 Introduction to the chapter

This chapter will evaluate the finding that Calorie information increases PBCC, however does not increase 'healthy' food choice intention or purchase behaviour in a leisure centre café setting. Hypothesis 2 (H_2), below, will be evaluated as part of this Chapter.

Null hypothesis 2 (H_0): There will be no increase in PBC* or in leptogenic food choice Intention and Behaviour as a result of the provision of Calorie information

Alternative hypothesis 2 (H_2): Calorie information will increase PBC* and leptogenic food choice Intention and Behaviour

* PBC was combined with Confidence to make PBCC

11.1 Effectiveness of Calorie information

11.1.1 Perceived behavioural control and confidence

The provision of Calorie information in a leisure centre café significantly increased PBCC in the present study, therefore rejecting the null hypothesis (H_0). The PBCC construct comprised of PBC and confidence, and measured perceived control over making healthy choices in the leisure centre café as well as confidence and understanding of nutrition labels. One explanation for the increase is that the Calorie information provided consumers with accurate information, which could have given them more control over their choices. This is important because previous research has found that estimated energy (kcal) intake is significantly different from actual energy (kcal) intake (Feinberg, 2011). It is also in line with the notion that nutrition labels can increase transparency (Hodgkins *et al.*, 2015). Nudge theory adopts a libertarian paternalistic approach (Thaler and Sunstein, 2009), where consumers have freedom of choice but are supported to make a particular choice, such as a leptogenic food choice. The libertarian approach meant that freedom of choice was preserved and that consumers were able to use the information to make a lower energy (kcal) choice, however they could still make an alternative choice if they wished.

Previous research has found that individuals who feel like they do not need support with their food choice, prefer overt nudges as they are still able to make an autonomous choice (Felsen, Castelo and Reiner, 2013). So even if consumers were not motivated to make a low energy (kcal) choice, they may still have felt that they had control over their food choice, with the information present.

Previous research in leisure centre cafés has hypothesised that TLL facilitates better consumer understanding of information (Olstad *et al.*, 2015b). Although the results of the present study have demonstrated that Calorie information is adequate to increase feelings of control and confidence in a leisure centre café, the present study did not investigate the impact of TLL, therefore it is possible that TLL could have had an even greater effect. The difference in the result from the present study, and the hypothesis made by Olstad *et al.* (2015b), could also be partly explained by the fact that UK consumers are more likely to use nutrition labels relative to other cultures (Grunert *et al.*, 2010), and are therefore more likely to understand nutrition labels.

11.1.1.1 Attention

PBC, based on the information provided was also investigated alongside PBCC. This item directly assessed consumers feelings of control over their food choice, based on the information provided in the leisure centre café. A significant increase was not identified, however a trend towards increased PBC, based on the information provided, was observed. This could be explained by the attention paid to the nutritional information, however consumer acknowledgement and use of the Calorie information was not directly assessed in the present study. Only a small number of consumers would be likely to search for nutritional information (Chrysochou 2010), and consumers who have a particular health focus are more likely to pay attention to nutrition labels (van Herpen and van Trijp, 2011).

In the present study, consumers reported having a constrained amount of time in the leisure centre. Previous research in leisure centres (Olstad *et al.*, 2014) has posited that consumers using the café at different times of the day could

have interacted with the nudge intervention differently. This was based on the different results, obtained from a sub-sample of consumer purchases, taken across the same 5-hour period each day, and from the full sample of consumers who used the leisure centre. The level of attention paid to Calorie information could also be affected by time constraints, which can play a role on the effectiveness of front-of-pack nutrition labels (van Herpen and van Trijp, 2011). Whilst food shopping, consumers spend around 6 seconds on average making a decision (Hamlin, 2015). A small amount of time could also be allocated to food choice in a leisure centre café, which could have reduced the attention paid to the menu and to the Calorie information. In comparison, TLL can help to overcome this to an extent as it is considered to offer an 'informational short cut' to enable quick comparison between products (Food Standards Agency, 2010). It is also important to consider visibility of the nutritional information. Guidance regarding font size is currently available for front-of-pack labelling; however at present it is not regulated for voluntary menu labelling in the UK (Department of Health, 2013). It could be beneficial to provide guidance regarding legibility/font size for voluntary labelling, to ensure that it is clearly visible.

11.1.2 Intention

A significant increase in Intention was not observed during the intervention, thus rejecting H_0 . It was originally hypothesised that PBCC, which significantly increased as a result of the intervention, would inform Intention, however the results of the SEM (Chapter 8) demonstrated that PBCC did not inform Intention in this context. Contrary to the results, previous research in restaurants in South Korea has found that perceived behavioural control can inform intention to use nutritional labels (Kim *et al.*, 2014). However the present study focussed on intention to make healthy choices, rather than intention to use the nutritional information, which may help to explain why the increase in PBCC in the present study did not lead to an increase in Intention. Furthermore, information has been found to inform behavioural intention to consume processed foods (Seo, Kim and Shim, 2014). The study was based on the development in food processing, which can offer benefits such as affordability and enhanced nutrition. Participants were split into two groups; those reporting a lack of

information and those reporting sufficient information. The results demonstrated that consumers who have sufficient information about food additives were significantly more likely to intend to consume processed foods when compared to consumers who felt that they lacked information. The provision of nutritional information has also been found to increase intention to return to a café (Cranage, Conklin and Lambert, 2005). This could be linked with exposure to information, which could lead to higher levels of motivation to make healthy food choices over time. The notion that nutritional information could encourage customers to return is particularly interesting, given that the first stage of the study demonstrated that leisure centre staff were concerned about the financial implications of a healthier food offer.

Intention to make healthy food choices could be reduced by the culture of a leisure centre. The self-reported influences in the present study demonstrated that leisure centre users felt that they 'needed' a high energy (kcal) product following exercise. This notion of replacing energy (kcal) where physical activity was completed is somewhat contradictory to the notion that the food environment in leisure centres should be more leptogenic, and may demonstrate differences in consumer motivations within the leisure centre, which will be explored in Chapters 12 and 13. Another explanation for this finding is that leisure centre users may trade-off one behaviour against another. Giles and Brennan (2014) explored the interplay between physical activity, food choice and alcohol consumption in adolescents. They found that participants tried to be healthier in some lifestyle areas, often to compensate for an unhealthy behaviour in a different lifestyle area. This is referred to as compensatory health beliefs, where consumers believe that a healthy behaviour neutralises an unhealthy behaviour (Knäuper *et al.*, 2004). For example, consumers may consume healthy foods to compensate for sedentary behaviours. In the present study, some customers may trade-off healthy physical activity with unhealthy food choice. However consumers may not be aware of the potential discrepancy between their energy intake and their energy expenditure. For example, in the first stage of the study, the manager from LC1 reported hearing customers exiting the gym planning to 'treat' themselves despite the fact that they had 'realistically burnt 250 calories' and they will 'take

on 1000'. Physical activity equivalent labelling, which portrays the amount of activity that would need to be completed to equate to the amount of energy (kcal) in a product, could help to overcome this. Icons are used to demonstrate activities such as brisk walking, running and cycling, alongside a number to show how many minutes of that activity would need to be completed to equal energy intake for the product (NHS, 2016c). This method is considered useful to help create a link between energy intake and energy expenditure (Cramer, 2016), and would be relevant in a leisure centre context given the presence of a physical activity environment and a food environment on-site. Pang and Hammond (2013) found that physical activity equivalent labelling was considered the most effective, when compared to a menu that did not display Calories, a menu displaying Calories alone, or Calories alongside a statement of the recommended daily energy intake for an average adult. The method could also help to facilitate quick understanding, which is especially pertinent given that research has shown consumers spend around six seconds making a food choice decision (Hamlin, 2015; Royal Society for Public Health, 2016). However, it is worth noting that the majority of participants in the present study completed no/little physical activity during their visit, so additional factors could have influenced food choice intention.

A further explanation as to why intention to make healthy choices did not increase during the intervention, is due to the notion that the food choice was a 'treat'. The self-reported influences demonstrated that some participants made the choice to 'treat' themselves and/or others. The perception of food choice as a treat alludes to the role of indulgent, hedonic behaviour. Previous research has demonstrated that hedonistic consumers may not choose to purchase products which display a health logo, as they associate it with reduced taste (Vyth *et al.*, 2010). Methods to present the healthy choice as a hedonistic choice have been considered in Chapter 13. However, a treat could already be a healthy option, particularly if health conscious consumers view a healthy choice to be a hedonistic choice. The results of the self-reported influences on behaviour demonstrated that some participants demonstrated concern about health. In research carried out by Maehle *et al.* (2015), 'health-conscious' consumers were proportionately more likely to rate energy (kcal) and

healthiness as important, when compared to consumers who were categorised as 'price sensitive' or 'taste conscious'. Health conscious consumers may also intend to make a healthy choice to avoid feelings of guilt (Maehle *et al.*, 2015; Burnett and Lunsford, 1994). Differences in consumer profiles could help to explain why intention to make healthy choices increased in the present study, but did not reach statistical significance. This will be explored in more detail in Chapter 12 and Chapter 13.

11.1.3 Actual behaviour

The results of the present study demonstrated a reduction in Calorie intake relating to lunch, snack-items and drinks during the intervention, however this was not statistically significant. In support of the results, previous research in restaurants has also found that nutrition labels increased awareness but did not decrease energy (kcal) purchased (Tandon *et al.*, 2011). It was evident from the results of the present study that not all consumers would have wanted to make a healthy, lower energy (kcal) choice. Furthermore, some may have intended to have a treat, or consume higher energy (kcal) products if they felt like it was 'needed' after exercise. This could be influenced by the nature of the activity, for example, Fenzl, Bartsch and Koenigstorfer (2014) found that more was consumed when exercise is labelled as 'fat-burning' as opposed to 'endurance'. Individuals may also consume more when they consider their selection to be healthy (Provencher, Polivy and Herman, 2009), therefore this could also have contributed towards the lack of change in behaviour. Despite this, the Calorie information would have enabled those who wanted to make a healthy choice, to accurately consider the energy (kcal) content of the options.

It is recommended that snacks and lunch should respectively contribute to 20% and 30% of daily energy intake (Public Health England, 2014b). Reference intakes suggest that the average adult should consume around 2000 Calories per day (NHS Choices 2014b), which equates to 400 kcal for snacks, and 600 kcal for lunch. The average energy (kcal) purchased for lunch in the experimental centre was above this recommended level in week 1 (683 kcal), and reduced to below this level during the intervention (494 kcal). By way of

comparison, average energy (kcal) purchased in the control centre was fairly similar in week 1 (556) and week 2 (560) and remained just within the recommendations throughout the study. However, the present study focussed on purchase behaviour and the amount of food that was actually consumed was not measured. Furthermore, only energy (kcal) that participants purchased for themselves was analysed. Participants were asked to record purchases for themselves and others separately, however further information regarding the 'others' was required to fully analyse the information. For example, it was unknown how many 'other' people the purchases were for and whether these were adults or children. For snack-items, the average energy (kcal) consumed were within the recommendations across both weeks in both leisure centres. However, it is important to note that the recommended 400 kcal from snack-items should comprise all snack-items consumed in a single day. Previous research using data from the National Diet and Nutrition Survey demonstrated that men consume an average of 1.97 (\pm 1.13) snacks per day, and women consumer an average of 1.57 (\pm 0.86) snacks per day (Murakami and Livingstone, 2015), where snacks were defined as items consumed throughout the day. This shows that individuals consume more than one snack per day on average. As a result, the energy (kcal) determined within the present study may only contribute in part to overall snack purchase and/or consumption throughout the day which suggests that the recommendations could still be exceeded.

Calorie information does have the potential to significantly decrease energy (kcal) consumption (Roberto *et al.*, 2010; Pang and Hammond, 2013). For example, Roberto *et al.* (2010) investigated energy (kcal) purchased by consumers in Connecticut who were provided with a menu with no labels, consumers who were provided with a menu with Calorie labels, and consumers who were provided with a menu with Calorie labels and the recommended daily intake. Energy (kcal) purchased was significantly less for consumers who were provided with one of the Calorie labelling conditions, when compared to consumers who were provided with a menu with no information. Consumers were handed a printed menu during a focus group, which is likely to have increased attention. The time allocated for participation in the study may have led to greater exposure to the Calorie information, and time taken to make the

purchase decision. Consumers in the present study may have had less time to appraise the menu, which could have affected the outcome of the study. Time constraints were cited as influential on behaviour, as were habitual behaviours, which could have driven consumers to bypass the menu. Conner and Armitage (1998) have previously suggested that habit could be included within the TPB model, which could be interesting to consider in research in this context given that it was raised as an influential factor. In terms of time to review menus and Calorie information, a previous labelling based intervention in a leisure centre context identified that only 38% of participants reported having noticed the labelling, of which 39.3% proceeded to use the labels to support their food choices (Olstad *et al.*, 2015b). The additional influences section in the questionnaire used in the present study gave participants an opportunity to report having seen and/or used the Calorie information, however participants were not directly asked if they had seen the Calorie information. Two participants during the intervention stage did mention having seen the Calorie information, with one participant reporting that it 'influenced choices'. The results of the study by Olstad (2015b) also found that TLL could significantly reduce purchases of 'red' products and significantly increase purchases of 'green' products. Although the results of the present study have suggested that Calorie information alone is adequate to increase PBCC, different labelling formats such as TLL could prove beneficial to significantly increase healthy food choice behaviour.

Participants reported the lack of availability of healthy options as an influence, and also highlighted the importance of and visibility of healthy options, which could also have impacted on actual behaviour. A number of consumers defined healthier options as 'diet' versions or 'low fat' versions of regular products. This could prevent consumers from recognising different products as healthy alternatives. Hodgkins *et al.* (2012) suggested that a combination of non-directive labelling (e.g. Guideline Daily Amounts) and directive labelling (e.g. health logos), could be beneficial to help communicate the healthiness of a product to consumers. Where health logos have been provided on menus, they have had a greater impact on food choice than Calories listed as text (Reale and Flint, 2016). However, the aforementioned study was carried out within a

laboratory environment. It could therefore be useful for future research to consider the impact of health logos to support Calorie information in a real life setting. Previous research has also demonstrated that an increased proportion of healthy products could help to encourage healthy choice (Aschemann-Witzel *et al.*, 2013). An increase in the proportion of healthy choices, as opposed to the removal of less healthy choices, could also continue to preserve freedom of choice. This is important because freedom of choice was found to be important in stage one of the research, and it underpins a nudge approach (Thaler and Sunstein, 2009).

11.2 Concern, Motives and Attitudes towards healthy choices

The hypothesis regarding the impact of the Calorie information (section 11.0) focused on PBCC, Intention and Behaviour and did not extend to consider Subjective Norms, Concern Disease, Concern Nutrients, Motives and Attitudes. The results of this study demonstrate that the Calorie information did not have an impact on the latter five constructs, which supports the exclusion of them from the hypothesis. Despite this, the results of the SEM (Chapter 8) suggests that an intervention to target Concern Disease, Concern Nutrients, Motives and Attitudes, would be most effective to increase leptogenic Intention and Behaviour. Therefore, it's important to consider why the Calorie information may not have significantly impacted on these constructs and to explore what alternative approaches could be considered going forward. Subjective norms also had a positive, significant relationship with intention and will also be discussed.

11.2.1 Concern

It is arguable that consumers may have a relatively fixed level of concern about disease at a particular moment in time, which would not be expected to increase based on the provision of Calorie information, as observed in the present study. A lack of education can increase the prevalence of disease, such as hypertension and heart disease, suggesting that education needs to be provided. Leventhal (1971) posited that health professionals have a responsibility to communicate the danger of particular behaviours. Fear appeals could help to generate fear and deter consumers. For example, previous

research has demonstrated that fear appeals demonstrating long-term consequences of smoking, such as disease, and short-term consequences, such as yellow teeth and bad breath, have been found to be effective to reduce smoking behaviours in adolescents (Smith and Stutts, 2003). Smoking behaviours included smoking frequency and intention to continue smoking. In terms of food choice, Hollands and Marteau (2016) discussed the impact of the presentation of positive and negative health consequences alongside images of food products. Positive health consequences involved images of individuals completing physical activity, which is interesting given the context of the present study. However, negative health involved images of obese males and females. Both positive and negative health consequences were found to increase healthy food choice.

Demonstrating positive and negative health consequences is aligned with the notion of gain-framed messages and loss-framed messages. The former approach intends to emphasise “the benefits of engaging in a particular behaviour”, whereas the latter approach intends to communicate “the consequences of failing to engage in a particular behaviour” (Gallagher and Updegraff, 2012, p.101). An earlier meta-analysis found no significant difference between the two approaches with regards to dietary behaviours (O’Keefe and Jensen, 2007). However, it has been suggested that threats may result in a loss of attention to a message (Kessels *et al.*, 2011) and a more recent meta-analysis posited that gain-framed messages in general are largely more persuasive in preventing particular behaviours when compared to loss-framed messages (Gallagher and Updegraff, 2012). In addition to preventing certain behaviours, a gain-framed message could also act as positive reinforcement for more healthy food choice behaviours. Such an approach could be reflective of a ‘hug’, in terms of the exchange framework provided by French (2011). Although a ‘hug’ may often involve a financial incentive (Local Government Association, 2013), it is arguable that an intangible incentive could also be beneficial if the consumer sees value in the message. Gain-framed messages would therefore need to be based on what the population value. This will be explored in Chapters 12 and 13.

11.2.2 Motivation and exposure

Calorie information alone was not adequate to increase consumer motivation to make healthy choices. Although different labelling formats could increase attention (section 11.1.1.1), they may not be helpful to increase motivation to make healthy choices (Aschemann-Witzel *et al.*, 2013). The results of the present study are supported by Bates *et al.* (2011) who found that Calorie information alone is not sufficient as even some health motivated consumers are still influenced by taste. In the present study, participants reported a lack of availability and variety of healthy choices, with one participant referring to the healthy food as 'unappetising', suggesting that consumers motivated by taste may not be attracted to healthy options. Roseman, Mathe-Soulek and Higgins (2013) found that repeated use of nutrition labels when purchasing groceries can increase knowledge of healthy choices and motivation to make healthy choices, which could inform motivation to make a healthier selection in restaurants. This suggests that motivation to make healthy choices could develop over time with continued exposure to nutrition labelling.

11.2.3 Attitudes

Calorie information did not change Attitudes towards healthy food choices in the present study. This could be explained by the role of other factors which may also influence attitudes towards food choice. For example, previous research found 'keeps me healthy' to be one influence on food choice, however 'tastes good' and 'good value for money' were also key influences (Carrillo *et al.*, 2011). The mean score for Attitudes was around the middle point on the 7-point likert scale, demonstrating the need for positive healthy eating attitudes to be increased. This is particularly important because consumers with positive attitudes towards healthy eating are more likely to follow dietary guidelines and consume a healthier diet (Hearty *et al.*, 2007). Attitudes can change over time. Research carried out in Spain with 4,500 participants demonstrated an increase in healthy eating attitudes 10 years after the baseline measurement (Andrade *et al.*, 2017). It was found that positive attitudes towards healthy eating were most likely to increase in females, in older participants, in participants consuming a Mediterranean diet, and in participants who were physically active. The

research also showed that individuals with a higher prevalence of disease, such as hypertension or diabetes, have more positive healthy eating attitudes (Andrade *et al.*, 2017). This demonstrates the importance of highlighting health consequences, as discussed in section 11.2.1, to demonstrate the potential risks of disease, for not engaging with leptogenic food choice, and/or the potential health benefits of engaging with leptogenic food choice.

11.2.4 Subjective Norms

Subjective norms did not change between week 1 and week 2 of the present study. Furthermore, this construct received lower mean scores for each week, compared with the rest of the ATPB constructs. This suggests that there was a lack of social pressure to make a healthy food choice in this context. It was suggested in Chapter 9 that the age of the population group could make a difference, because adolescents are more likely to be influenced by social pressure than adults (SyLOW and Holm, 2009), and that personal norms could be considered alongside subjective norms. The latter is particularly pertinent because the self-reported influences on behaviour demonstrated that children may be influential towards their own food choices. It was also unclear from the present study if children were influencing the purchaser to make less healthy choices for themselves. In support of this, Olstad *et al.* (2014) found that significantly less healthy products (35.8%) were made when adults and children were both present, compared to when the choice was selected by an adult alone (43.5%), in a leisure centre setting. Purchases for others were recorded in the present study however it was not always clear who the purchases were for, for example an adult or a child, or for how many people the products were for. Additional information relating to the characteristics of the person/persons that the participant was buying for would have been beneficial. These modifications would allow for a more in-depth exploration of the data in future research.

11.3 Summary

The results demonstrate that Calorie information can increase PBCC in a leisure centre café context, however it does not significantly increase Intention

and Behaviour. Therefore, Calorie information can be useful to help consumers feel in control and confident about their food choice, however it will not modify their intent and behaviour. Further consideration needs to be given to approaches that could significantly increase leptogenic intent and behaviour. Gain-framed messages could be used to increase Concern, which has been found to inform Motives, Attitudes and Intention (Chapter 8). Alternative formats for nutrition labels, such as TLL or physical activity equivalent labelling, could be used to increase exposure and to help put into context some of the self-reported influences on behaviour, such as exercise prompting a high energy (kcal) food choice. Consumers may have different intentions and behaviours, which could have prevented the Calorie information from significantly increasing these constructs. The following chapter (12) will cluster participants according to their responses to each construct of the ATPB model, and identify any differences in the population, which could be used to inform future interventions.

Chapter 12 Results 4: Leisure Centre Consumer Segmentation

12.0 Introduction

Participants were clustered according to their responses to the items which comprised the ATPB model; Concern Disease, Concern Nutrients, Motives, Attitude, Subjective Norms, PBCC and Intention. The characteristics of participants within each of the resulting cluster groups, self-reported influences on their food choice behaviour and actual behaviour have been identified and compared.

12.1 Division of the data set

The hierarchical cluster analysis was performed on the data set where no intervention was present (n 255) and the data set where the intervention was present (n 68), separately (Table 60). This was necessary because PBCC was significantly increased during the intervention (Chapter 10), which could have affected the clustering. The data from where the intervention was present was included as a point of comparison to the data where no intervention was present, and it was interpreted with caution due to the small sample size. Three clusters were identified where no intervention was present; N1, N2 and N3. Two clusters were identified where the intervention was present; I1 and I2.

[Table 60: Identification of the questionnaires included within the present section](#)

Leisure centre	No intervention present (n)	Intervention present (n)
Intervention centre	Week 1 (66)	Week 2 (68)
Control centre	Week 1 (151)	
	Week 2 (38)	

12.2 Mean scores per construct

The mean scores for each construct were compared between clusters (Table 61). The analysis was carried out separately for the data where the intervention was present, and where the intervention was not present.

Table 61: Mean scores per construct and cluster

No intervention present			
	N1 (<i>n</i> 155)	N2 (<i>n</i> 52)	N3 (<i>n</i> 48)
Concern Nutrients	4.7 ±0.9 ^a	2.8 ±1.3 ^b	3.3 ±1.6 ^c
Concern Disease	5.1 ±0.8 ^a	2.5 ±1.5 ^b	1.4 ±1.2 ^c
Motives	4.5 ±0.8 ^a	2.4 ±1.3 ^b	4.5 ±0.8 ^a
Attitude	4.6 ±0.7 ^a	2.6 ±1.1 ^b	4.5 ±0.9 ^a
PBCC	5.0 ± 0.8 ^a	3.9 ± 1.2 ^b	4.6 ±1.1 ^a
Subjective Norms	3.7 ±1.2 ^a	2.5 ±1.2 ^b	3.5 ±1.6 ^a
Intention	4.0 ±1.2 ^a	2.2 ±1.0 ^b	4.1 ±1.3 ^a
Intervention present			
	I1 (<i>n</i> 48)	I2 (<i>n</i> 20)	
Concern Nutrients	4.7 ±0.8 ^a	2.2 ±1.4 ^b	
Concern Disease	4.8 ±1.1 ^a	1.2 ±1.2 ^b	
Motives	4.5 ±0.9 ^a	3.2 ±1.1 ^b	
Attitude	4.7 ±0.7 ^a	3.6 ±1.3 ^b	
PBCC	5.2 ±0.7 ^a	4.5 ±1.5 ^b	
Subjective Norms	4.0 ±1.1 ^a	3.0 ±1.7 ^b	
Intention	4.1 ±1.3 ^a	2.7 ±1.5 ^b	

Data are presented as means and standard deviations.

Different letters in the same row denote means that are significantly different to one another ($p < 0.05$)

The results of the ANOVA (Table 61) demonstrated that the mean scores for all constructs were significantly different between cluster groups ($p < .001$). A post-hoc Tukey test demonstrated that the mean scores for Concern Nutrients and Concern Disease were significantly higher in N1 when compared to N3 (both $p < .001$), however there were no further significant differences observed between these two clusters (PBCC, $p = .058$; Attitude, $p = .822$; Subjective Norms, $p = .637$; Intention, $p = .900$; Motives, $p = .998$). In comparison, the mean score for each construct in N2 was always significantly lower than the mean score for N1 (All constructs, $p < .001$) and for N3 (Concern Nutrients, $p = .037$; PBCC, $p = .002$;

Motives, Attitude, Subjective Norms, Intention; $p < .001$), except for Concern Disease which was significantly lower in N3 when compared to N2 ($p < .001$). All of the mean scores for N2 were also below the average score of '4' on the likert scale. As a result, N2 was categorised as the 'nutritionally disinterested' cluster. Based on the findings that N3 had a significantly lower mean score for Concern Nutrients, compared to N1, and a significantly lower score for Concern Disease than N1 and N2, N3 was categorised as 'nutritionally ambivalent'. This was based on the contradictory findings in this cluster, which demonstrate a lack of concern about disease and about making healthy choices, however the group also demonstrate Motivation, Attitude, PBCC and Intention above average. The largest cluster, N1, however demonstrated mean scores equal to, or above average for all constructs, except for Subjective Norms which was observed across all clusters. N1 was therefore categorised as the 'nutritionally motivated' cluster.

A similar trend was also observed in the intervention data set, where the larger ($n = 48$) of the two clusters, I1, was categorised as 'nutritionally motivated' and the smaller ($n = 20$) cluster, I2, was categorised as the 'nutritionally disinterested'. This was because the mean scores for I1 were significantly higher than the mean scores for I2 (PBCC, $p = .040$; Subjective Norms, $p = .005$; Attitudes, $p = .002$; Concern Nutrients, Concern Disease, Motives, Intention; $p < 0.001$). Furthermore, the mean score for all clusters was equal to, or above, average for I1, and below average for I2, except for PBCC which was relatively high across both clusters.

12.3 Characteristics of the cluster groups

12.3.1 Age and sex

N2 and I2 (nutritionally disinterested) were comprised of participants with the lowest average age and the highest proportion of males (Table 62). The mean age of participants in each cluster, and the proportion of males and females in each cluster, were not significantly different where there was no intervention present (Age, $p = .076$; Sex, $p = .775$) or where the intervention was present (Age, $p = .144$; Sex, $p = .257$).

12.3.2 Physical activity level

The majority of participants in all cluster groups reported no/light physical activity in the leisure centre (Table 62). The proportion of participants in each cluster who completed no/light physical activity was not significantly different to the proportion of participants who completed moderate/vigorous physical activity where there was no intervention present ($p = .693$) or where the intervention was present ($p = .081$). Level of physical activity could have been influenced by the purpose of the participants' visit to the leisure centre, however this was unknown. Whilst this reflects a potential limitation of the research, the results also demonstrate that the majority of leisure centre café users complete no/light physical activity in the leisure centre, regardless of their level of nutritional motivation.

Table 62: Participant characteristics, level of physical activity completed and energy purchased for drinks, snacks and lunch, by cluster

	No Intervention (n 255)			Intervention (n 68)	
	N1 (n 155)	N2 (n 52)	N3 (n 48)	I1 (n 48)	I2 (n 20)
Average age in years \pm SD	44 \pm 14	39 \pm 14.4	43 \pm 13.3	44 \pm 14.6	38 \pm 13.2
Age range (years)	21-76	21-76	18-70	21-84	20-73
Male (%)	23.9	26.9	20.8	22.9	40.0
Female (%)	76.1	73.1	79.2	77.1	60.0
No/ light physical activity (%)	62.3	66.7	58.3	59.6	85.0
Moderate/ vigorous physical activity (%)	37.7	33.3	41.7	40.4	15.0
Energy purchased for snacks in kcal \pm SD *	215 \pm 242	321 \pm 246	284 \pm 232	-	-
Energy purchased for lunch in kcal \pm SD*	566 \pm 295	636 \pm 266	552 \pm 296	-	-

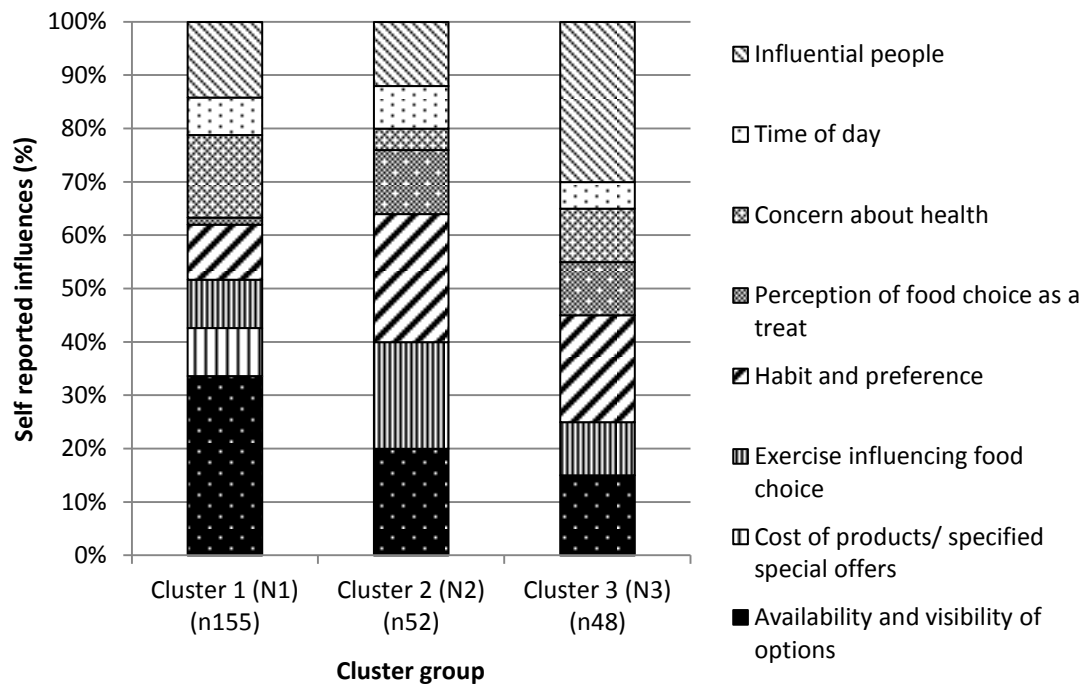
*Energy (kcal) purchased was not compared for the Intervention data due to low numbers

12.3.3 Food choice

Further division of the data to examine the eating occasion resulted in a small sample size, or violated the homogeneity of variance assumption (Pallant, 2016). Therefore differences in food choice between clusters was only observed for the data set where no intervention was present, excluding drinks, breakfast and evening meal. N2 purchased the highest amount of mean energy (kcal) in snacks and lunch (321 kcal, 636 kcal) when compared to N1 (215 kcal, 566 kcal) and N3 (284 kcal, 552 kcal) although this did not reach statistical significance (snacks, $p=.342$; lunch, $p=.680$).

12.4 Influences on food choice behaviour

Further division of the data to examine influences resulted in a small sample size for the intervention data set, so only the data where no intervention was present has been used. Self-reported influences on food choice were analysed thematically in Chapter 10. The proportion of the influences in each cluster were not significantly different ($p=.114$) (Figure 20), however the composition of each cluster highlights the key influences on food choice. N1 and N3 each had a key self-reported influence on food choice; the availability and visibility of options (34%), and influential people (30%), respectively. Habit and preference was the main influence identified for N2 (24%), however two other prominent factors were also apparent in this cluster; availability and visibility of options (20%) and exercise influencing food choice (20%). All of the factors were influential in each cluster, except for cost of offers/specified special offers which was only present in N1.



[Figure 20: Influences on food choice, per cluster group](#)

12.5 Summary

Three profiles of consumers were identified where no intervention was present, and two profiles were identified where the intervention was present. Based on the differences between the mean scores for Concern Disease, Concern Nutrients, Motives, Attitudes, PBCC, Subjective Norms and Intention, N1 and I1 were categorised as nutritionally motivated, N2 and I2 were categorised as nutritionally disinterested and N3 as nutritionally ambivalent. The characteristics of the groups were homogenous, so there were not any differences in characteristics that could help to explain the difference in level of nutritional motivation. N2 purchased the highest amount of energy (kcal) in snacks and lunch, however this did not reach statistical significance. The key self-reported influence on behaviour was different for each cluster group, where no intervention was present. N1 were primarily influenced by the availability and visibility of options, N2 were most influenced by habit and preference, and N3 were most influenced by people. These results demonstrate three distinct consumer profiles, in terms of their nutritional interest and motivation to make healthy choices. The different key influences can help to inform a tailored approach going forward to support healthy food choice in leisure centres. The following Chapter (13) will evaluate these findings in the context of previous research.

Chapter 13 Discussion 4: Consumer Segments and Nutritional Motivation

13.0 Introduction

Chapter 12 identified three cluster groups where there was no intervention present and two cluster groups where the intervention was present. The clusters were categorised as nutritionally motivated, nutritionally ambivalent and nutritionally disinterested. Chapter 13 will evaluate the differences observed between the mean scores for Concern Disease, Concern Nutrients, Motives, Attitudes, PBCC, Subjective Norms and Intention, for each of the cluster groups. The key self-reported influences on food choice behaviour will be evaluated for each cluster group. This section aims to identify tailored recommendations for future interventions to support 'healthy' food choice, based on the differences observed between the clusters.

Null hypothesis 3 (H_0): Leisure centre users will demonstrate homogenous motivations for making healthy choices in the leisure centre café.

Alternative hypothesis 3 (H_3): Leisure centre café users will demonstrate a range of motivations for using the leisure centre café and some segments of the population will be more concerned about making healthy choices.

13.1 Level of nutritional motivation

The results identified three groups with different levels of nutritional motivation thus rejecting the null hypothesis (H_0); nutritionally motivated consumers (N1, I1) who were motivated to make healthy choices in the leisure centre café, nutritionally ambivalent consumers (N3) who were motivated to make healthy choices in the leisure centre café however they were not concerned about nutrients in their food or about disease, and nutritionally disinterested consumers (N2, I2) who were not motivated to make healthy choices in the leisure centre café. Interestingly, the majority of leisure centre café users comprised the nutritionally motivated cluster (N1; 61%, I1; 71%), when compared to the nutritionally disinterested cluster (N2; 20%, I2; 29%) and the nutritionally ambivalent cluster (N3; 19%). In support of this, Hearty *et al.* (2007) also found that the majority of participants held a positive attitude towards their

healthy eating behaviour, when investigating the association between attitudes towards healthy eating and food choice. Within each of the data sets, the characteristics of the cluster groups were homogenous, and could not explain the differences observed in level of nutritional motivation. As a result, the following sections will explore alternative explanations for the level of motivation demonstrated in each of the three cluster groups, taking into consideration the key self-reported influences for each cluster.

13.1.1 Nutritionally motivated consumers

N1 and I1 were categorised as nutritionally motivated consumers. These consumers demonstrated above average levels of concern about nutrients and disease, motivation, attitude and intention to make healthy choices and perceived behavioural control and confidence over making healthy choices. They demonstrated equal to or below average subjective norms, however this was consistent with the results observed for both leisure centres in week 1 and week 2 (Chapter 10). In contrast to the nutritionally ambivalent group, who also demonstrated motivation to make healthy choices, the nutritionally motivated consumers demonstrated concern about nutrients and disease. One explanation is that this group may have experienced disease, either personally or with a close relative or friend. They may also have a personal aim which informs their concern about nutrients, such as following a particular diet. This was evidenced by the 'concern about health' factor, where participants reported their food choice being influenced by their diet (Chapter 10). Although it was anticipated that concern about health would be the strongest influence for the nutritionally motivated group, it was still the second most prominent key influence for this group. It was also anticipated that this group would contain a higher proportion females and have a higher average age because females and older groups of consumers, for example ≥ 51 years, are likely to demonstrate strong motivation and attitude towards making healthy choices when compared to males and younger groups of consumers, for example 18-35 years, respectively (Naughton, McCarthy and McCarthy, 2015; Carrillo *et al.*, 2011; Hearty *et al.*, 2007). This could be explained by context, as consumers were asked about their motivation to make healthy choices in the leisure centre

specifically. Furthermore, each cluster group was comprised of a majority of females, which reflected the observation for the study as a whole. The age range was 18-84, however the average age for each cluster group varied between 38 years and 44 years. This suggests that the majority of consumers who engage with the leisure centre café may not fit into the 'younger' consumer or 'older' consumer categories presented above, which could explain why differences were not observed.

An alternative explanation for why this group of consumers may be nutritionally motivated is that they may be more educated. Previous research has found that individuals with a higher level of education, such as tertiary education, are significantly more likely to demonstrate strong motivation for making healthy choices (Naughton, McCarthy and McCarthy, 2015). As a result, they may feel more confident in their ability to make healthy choices. PBCC was significantly higher for this group, when compared to the nutritionally disinterested group, demonstrating a high level of control and confidence over making healthy choices. In the first stage of the present study, it was proposed by a leisure centre café user that individuals would only engage with nutrition classes if they have a personal interest in nutrition. If nutritionally motivated consumers are seeking out additional information and opportunities to learn about the topic, then they are likely to be improving their knowledge of nutrition and of the relationship between nutrients and disease. These consumers could be categorised as the 'worried well'; consumers who are already engaging in healthy choices, yet continue to seek to improve their nutrition (Celis-Morales *et al.*, 2015). The fact that they are already making healthy choices can be supported by the average energy (kcal) purchased for snacks (215) and lunch (566), which was within the recommendations (Public Health England, 2014b).

Despite already making healthy choices in terms of their average energy (kcal) intake, the key influence for nutritionally motivated consumers was the availability and visibility of healthy choices (34%), which was predominantly characterised by concern that healthy options were limited, and that healthy choices such as fruit may be 'unappetising' or less visible (Chapter 10, section

10.4.1). This suggests that nutritionally motivated consumers may feel that they lack opportunity to make healthy choices, even though they have demonstrated motivation and ability to make healthy choices. However, a combination of opportunity, motivation and ability are needed to support consumers (Brug, 2008; Rothschild, 1999). Although the first stage of the present study and previous research in the UK (Nowak, Jeanes and Reeves, 2012) demonstrated that some leptogenic options were available in leisure centres (Chapter 5), further work may be required to increase the availability and the visibility of healthy products, to maximise opportunities to make healthy choices. This is particularly important because impulse buys, which are made at the point of purchase, can interfere with healthy eating motivation and can often lead to nutritionally poor food choices (Cohen and Lesser, 2016). Nutritionally motivated consumers may feel that they do not have the opportunity to make healthy choices because they are assessing the healthiness of the food environment using criteria other than energy (kcal) purchased. For example, 'fresh' products, high fibre products, and products containing fruit and vegetables can be seen as positively associated with health (Hoek *et al.*, 2017; Bucher, Müller and Siegrist, 2015). In contrast to this, products which are perceived to be processed, high sugar, high fat, and ready prepared, packaged foods are negatively associated with health (Hoek *et al.*, 2017; Bucher, Müller and Siegrist, 2015). Choice architecture, discussed in Chapter 5 and Chapter 10, could be useful in this instance to increase the visibility of healthy products (Thaler and Sunstein, 2009; van Kleef, Otten and van Trijp, 2012) and could be used to promote products that consumers associate with healthiness. Furthermore, previous research in a leisure centre setting found that increasing the proportion of the availability of healthy choices, from 9.1% to 25.0%, led to a significant increase in the percentage of healthy food choices; from 7.7% to 22.7% (Olstad *et al.*, 2015a), and could prove beneficial to increase opportunity for nutritionally motivated consumers. Where motivation and ability is present without opportunity, marketing techniques, such as the use of incentives and disincentives, should be used to encourage voluntary behaviour change (Rothschild, 1999). For example, in reference to the exchange matrix (Chapter 2, 2.5.2.1), a 'hug' and a 'nudge' could reflect incentives and a 'shove' and a 'smack' reflect disincentives (French, 2011). A combination of these approaches

could be used to create opportunity for health motivated consumers to make healthy choices.

13.1.2 Nutritionally ambivalent consumers

N3 were categorised as nutritionally ambivalent consumers. These consumers demonstrated above average levels of motivation, attitude and intention to make healthy choices and perceived behavioural control and confidence over making healthy choices, however they demonstrated significantly lower concern about nutrients than N1 and significantly lower concern about disease than N1 and N2. They also demonstrated below average subjective norms, however this was consistent with the results observed for both leisure centres in week 1 and week 2 of the research (Chapter 10). It could be hypothesised that levels of concern about making healthy choices was low for the nutritionally ambivalent group because they cannot foresee any negative consequences for their health if they engage in unhealthy food choices (Brug, 2008). This could explain why this group were influenced by the eating behaviours of other people (30%), such as spouses, or allowed their children to influence their own food choice. Despite a lack of concern about nutrients and disease, nutritionally ambivalent consumers did demonstrate motivation for making healthy choices. This could explain why nutritionally ambivalent consumers were purchasing products with average energy (kcal) that was within the recommendations for lunch (552 kcal) and for snacks (284 kcal). However, the self-reported influences section in Chapter 10 (section 10.4) demonstrated that parents find it hard to avoid making food choices for their children, which the children pester them to make, and also suggested that in some instances parents may make a nutritionally motivated choice for themselves and a different choice for their child. This suggests that food choices made on behalf of children may not have been leptogenic. Personal norms (Chapter 9, section 9.2.2) can be used to assess consumer motivation to make healthy choices on behalf of others and could be beneficial to consider in future research. Previous research has found that, during a discrete choice experiment, having a child present when making food choices on their behalf can lead to a parent selecting significantly less healthy choices compared to when the decision is made without the child being involved

(Papoutsi *et al.*, 2015). In the same study, taxes on unhealthy food and subsidies on healthy food, combined with information about the rationale for their implementation, was also shown to increase the proportion of Greek parents making a healthy choice where their child is present, from 21% to 58%. This demonstrates that policies and information could be beneficial to help limit the impact of children persuading their parents to purchase unhealthy products on their behalf. However, previous research has demonstrated that UK and US consumers prefer education and the use of choice architecture to reduce the consumption of SSB, as opposed to taxation (Petrescu *et al.*, 2016). This may suggest that taxation on unhealthy products may not be viewed as an acceptable method of behaviour change in the UK and that education and choice architecture based interventions should be fully explored in the first instance.

Further to the notion of using education and choice architecture approaches, Kraak *et al.* (2017) proposed the use of a comprehensive marketing mix in combination with nudge strategies to help create a leptogenic food environment in restaurants. Part of the marketing mix included priming and prompting, which the authors defined as information and labelling, and promotion. Priming and prompting is aligned with the nudge adopted in the present study; the provision of Calorie information. In terms of promotion, the authors promoted 'responsible marketing'. This involved adapting the name and appearance of food products and beverages to promote healthy choices and to detract from high fat, salt and sugar (HFSS) options, which reflects the aim of social marketing. As influential people were a key factor influencing the food choices of nutritionally ambivalent consumers, it could be useful to consider strategies to promote healthy choices that 'others' are making, therefore information at the point-of-purchase could help to encourage healthy behaviours. For example, descriptive norms can highlight how others behave (Mollen *et al.*, 2013). Mollen *et al.* (2013) found that participants exposed to a healthy descriptive norm, which described how many students consumed salad in a university café at lunch time, were significantly more likely to make a healthy food choice than those in the control group. This suggests that healthy descriptive norms could prove beneficial to increase

healthy food choice and could prove particularly beneficial for nutritionally ambivalent consumers who are influenced by people.

13.1.3 Nutritionally disinterested consumers

N2 and I2 were categorised as nutritionally disinterested consumers. These consumers demonstrated significantly lower levels of concern about nutrients, motivation, attitude, subjective norms and intention to make healthy choices when compared to N1 and N3, and when compared to I1, respectively. N2 and I2 also demonstrated significantly lower concern about disease when compared to N1 and I1, respectively. The mean score for PBCC was close to, or above the average for N2 (3.9) and I2 (4.5), demonstrating that nutritionally disinterested consumers largely had control and confidence over their food choices, particularly during the nudge intervention.

Despite having control and confidence over making healthy choices, average energy (kcal) purchased for lunch by the nutritionally disinterested group was above the 600 kcal recommended (Public Health England, 2014b). Furthermore, average energy (kcal) intake through snacks was 321 kcal for N2. Although this was within the recommended 400 kcal per day for snacks (Public Health England, 2014b), this was only based on purchases of snacks at a single point of time in the day, however research cited in Chapter 11 demonstrates that consumers usually consume between 1.57 and 1.97 of snacks per day, dependent on their sex. This suggests that nutritionally disinterested consumers have the control and confidence to make healthy choices, however they may choose not to. In support of this, Köster (2009) posited that consumers may be aware that their food choice is unhealthy, however they still choose to behave in a hedonistic manner. The present study did not collect BMI data so it cannot be confirmed that the nutritionally disinterested group would need to be consuming less energy (kcal). However, the notion of hedonistic food choice is supported by the key influence which was identified for this cluster group; habit and preference.

This group may be nutritionally disinterested because they value personal preference. Making changes to dietary choices, for example where consumers perceive a decrease in the palatability of their food, may be viewed as a 'loss' (Gedrich, 2003). Although there can be 'gains' in making healthy choices, nutritionally disinterested consumers may not perceive these as gains. Furthermore, the gains experienced by making healthy choices are often intangible and are not immediate (Gedrich, 2003). As a result, the consumer may not feel the effect of the gain, however they are likely to experience the loss of avoiding their personal preference. Köster (2009) suggested making the healthy choice the desirable, hedonistic choice, as opposed to trying to educate people to change their behaviours. The use of gain-framed messages to promote the benefits of a particular behaviour were discussed in Chapter 11 (Gallagher and Updegraff, 2012; O'Keefe and Jensen, 2007) and could prove useful in this instance to promote the benefits of healthy choices to nutritionally disinterested consumers. The messages would need to promote the sensory appeal of healthy food, to ensure that the group see the food choices as a gain. For example, Turnwald, Boles and Crum (2017) randomly displayed labels on selected vegetables in a university café in one of four ways; basic (e.g. carrots), healthy restrictive (e.g. carrots with sugar-free citrus dressing), healthy positive (e.g. smart-choice vitamin C citrus carrots) or indulgent (e.g. twisted citrus-glazed carrots). Significantly more customers selected the vegetable with the indulgent label when compared to the healthy restrictive, healthy positive and the basic label. This demonstrates that presenting an indulgent, hedonistic message which may be more likely to promote the sensory appeal of the product, can be effective to encourage healthy food choice. This could be extrapolated to a leisure centre setting.

The group may be nutritionally disinterested because they feel that the opportunities to make healthy choices in the leisure centre café are limited. This can be evidenced by the fact that the availability and visibility of options was the joint second most important influence for this group, alongside exercise influencing food choice. Exercise influencing food choice was characterised by a perception that the consumer needed energy (kcal) or a particular nutrient, such as fat or salt, after exercise and was discussed in Chapter 11. Nutritionally

disinterested consumers may benefit from a bridge between the physical activity environment and the food environment. As introduced in Chapter 11, physical activity equivalent labels could prove beneficial to create a link between energy intake and expenditure (Cramer, 2016; Pang and Hammond, 2013).

13.2 Summary

Three consumer segments with different levels of motivation were discussed; nutritionally motivated consumers, nutritionally ambivalent consumers and nutritionally disinterested consumers. The nutritionally motivated group may have experienced disease, and may be more educated. This group also perceive a lack of opportunity to make healthy choices. Further research could consider increasing the proportion of healthy options and using choice architecture to promote the visibility of healthy options. Nutritionally ambivalent consumers may not foresee the negative consequences of their food choices and are therefore not concerned. This group are influenced by people and may benefit from healthy descriptive norms to encourage healthy food choice. Choices made on behalf of children may be less healthy due to pestering, however further research is required in this area and could include research into personal norms. Nutritionally disinterested consumers have control and confidence over their ability to make healthy food choices however they may choose not to, and opt to behave in a hedonistic manner instead. Gain-framed messages could be used to promote the benefits of healthy choices. These messages would need to be indulgent and based around the sensory appeal of healthy food choices, to create a hedonistic feel around making healthy food choices. The availability and visibility of options also contributes towards the food choices made by this group, suggesting that they may also benefit from the interventions recommended for nutritionally motivated consumers. Furthermore, nutritionally disinterested consumers' food choice was also influenced by the completion of exercise. Physical activity equivalent labelling could be used to create a clear link between energy expenditure and energy intake in a leisure centre food environment. The following chapter (14) will summarise the key findings of the research and the recommendations for further research that have evolved from this study.

Chapter 14 Conclusions

14.0 Introduction to the chapter

Chapter 14 synthesises the key findings from stage one and stage two of the research, in relation to the relative influence of the physical, economic, political and socio-cultural environment types, nudge theory and the ATPB. The strengths and limitations of the present study will be identified, and recommendations for further research will be made.

14.1 Synthesis of the results from stage 1 and stage 2 of the study

In answer to the research question for the present study, it can be concluded from the results of stage 2 that Calorie information is beneficial to increase consumers' perceived confidence and control in making healthy choices, however it does not increase leptogenic intention or behaviour in a leisure centre café. This could be due to other factors which influence food choice, and may be seen to be of greater value to consumers than making healthy choices. Based on the findings from stage one (Chapter 5) and stage two (Chapters 8, 10 and 12), it can be concluded that each of the environment types from the ANGELO play a role in food choice in leisure centres, however the socio-cultural environment is particularly prominent.

Socio-cultural factors are defined within the ANGELO framework as 'attitudes, beliefs and values related to food' (Swinburn, Egger and Raza, 1999, p.566). According to the results of the structural equation model (Chapter 8), Attitudes were the strongest predictor of Intention. This demonstrates the importance of the socio-cultural factor in this context, and suggests that further interventions to increase positive attitudes towards leptogenic choices could be beneficial in order to significantly increase leptogenic intention. This finding also helps to develop understanding of the ATPB in this context. The ATPB proved useful to explain the strength of the antecedents of Intention and Behaviour and the model fit was accepted. The structural equation model demonstrated that Concern Disease, Concern Nutrients, Motives and Attitudes formed the strongest pathway to Intention, and that PBCC did not inform Intention in this context. This was interesting as PBC has been removed from a model previously (Arvola *et al.*, 2008) due to an insignificant relationship with Intention.

Therefore, PBC may not predict intention in some contexts. Despite this, the provision of Calorie information was effective to significantly increase PBCC in leisure centres.

Although the Calorie information significantly increased PBCC, it was not effective to increase Attitude in this context, therefore alternative interventions or alternative nudge interventions would need to be considered (see section 14.3). The results from stage one (Chapter 5) demonstrated that some café users believed that leisure centres would have a greater emphasis on health in their food offer, due to a leisure centre's focus on fitness and wellbeing. This demonstrates the role of beliefs about what is expected within a leisure centre food environment, which further demonstrates the importance of the socio-cultural environment. Furthermore, it supports the rationale for the research, which was based on the concern that the food offer in leisure centres may not support a healthy lifestyle (Nowak, Jeanes and Reeves, 2012; Olstad, Raine and McCargar, 2012). The physical environment also supported this through the results of the situational analysis (Chapter 5). The food environment was categorised as obesogenic for vending machines and the obesogenicity of the frequently purchased items in the café was contradictory between leisure centres. The results demonstrated that there were some healthy options available in the café, which made it suitable for an intervention to encourage healthy choices, however the results of the interviews demonstrated that leisure centre café users expected a greater availability of healthy options in this setting.

The relative influence of each environment type may differ between consumers. It has been suggested that nudges tailored to the context would be most effective (Olstad *et al.*, 2014). Therefore, nudges tailored to the three consumer typologies identified in leisure centres; nutritionally motivated consumers, nutritionally ambivalent consumers and nutritionally disinterested consumers, could be more likely to have a significant impact on intention and behaviour. The key influencers of food choice, raised during the second stage of the research (Chapter 10), were identified for each consumer typology. The influencers could be easily conceptualised within the ANGELO framework, of which the majority were related to the socio-cultural environment; influential

people, habit and preference, concern about health, time of day, exercise influencing food choice and perception of food choice as a treat. The remaining influencers related to the physical environment; availability and visibility of products, and the economic environment; cost of products/special offers. The results from the cluster analysis demonstrated that nutritionally motivated consumers were most influenced by the availability and visibility of options, hence they may be most influenced by changes to the physical environment. In comparison, nutritionally ambivalent and nutritionally disinterested consumers were most influenced by influential people and habit and preference, respectively, and therefore may be most influenced by changes to the socio-cultural environment. The definition of nudge theory is that it 'alters social and physical environments' (Olstad *et al.*, 2014, p.1) which places the emphasis on the socio-cultural and physical environment types. This suggests that a nudge approach would be appropriate to target the three consumer typologies that were identified within this research.

Despite the focus on the socio-cultural and physical environments, the finding that Calorie information can significantly increase perceived control and confidence is important for the political environment in leisure centres. A policy to introduce nutritional information into leisure centre cafés could be valuable. Olstad and Raine (2013) proposed that mandatory nutrition guidelines were required in recreational centres in Canada, as the adoption of voluntary nutrition guidelines was limited. Therefore, the provision of Calorie information in leisure centres may need to be mandatory in order to ensure implementation. The potential impact of a policy on the food offer was demonstrated during the interview with the manager in LC2, during the first stage of the study. LC2 had previously received NHS funding, which meant that they were not permitted to stock certain products in their vending machines. However, when this funding stopped, the vending offer became less healthy due to financial difficulties. This demonstrates that the presence of a policy can be effective in restricting the availability of unhealthy food choice. However this type of policy reflects more of a 'smack' within the exchange matrix presented by French (2011). In line with the evaluation of a nudge approach (Chapter 2), the mandatory provision of

Calorie labels could still be perceived as a nudge as it still allows freedom of choice.

As mentioned earlier, one of the influencers of food choice raised in the second stage of the study was related to the economic environment; cost of products/special offers. In particular, participants raised concerns about the relative cost of healthy and unhealthy options. For example, some options that could be perceived as unhealthy were considered to be 'cheap' which influenced that food choice. In comparison, some options that could be perceived as healthy were considered relatively expensive which possibly deterred that food choice. This was supportive of previous research which has shown that 'healthier' options may be more expensive than 'less healthy' options (Rao et al., 2013). This shows that, despite the physical environment and the socio-cultural environment, the economic environment may pose a barrier to leptogenic food choice. However, changes to the economic environment are beyond the remit of nudge theory which excludes significant changes to economic incentives (Thaler and Sunstein, 2009).

Collectively, this demonstrates that each environment type is important in order to encourage a healthy food choice in leisure centres. The ANGELO framework has proven to be a robust tool to conceptualise perceptions and influences of food choice in leisure centres. From the results, the socio-cultural environment is most prominent, and the physical environment also plays a key role in food choice in leisure centres. However, the economic environment may present a barrier to making healthy choices. The results of the research provide a recommendation for change to the political environment; to provide Calorie information in order to increase perceived confidence and control in leisure centres. Section 14.3 offers specific recommendations for further research, and practical recommendations.

14.2 Strengths and limitations of the study

To the researcher's knowledge, this is the first study in the UK that has investigated the impact of a nudge strategy involving providing Calorie information at the point of purchase, and is the first study to apply the TPB to

explain food choice in leisure centres. Behaviour was directly assessed and energy (kcal) purchased was determined from actual purchases, which was a strength of this research. Previous studies, which have adopted the TPB, have only identified intention (Arvola *et al.*, 2008; Costa-Font and Gil, 2009), and therefore relied on intention as a predictor of behaviour, or have used likert scales to identify behaviour (Mitterer-Dalton *et al.*, 2013).

It was agreed with the managers for the control and intervention centres that sales data would be provided for week 1 and week 2 of the intervention. However, the format of the sales data provided by the intervention centre was not sufficient to enable comparison of sales data between week 1 and week 2. The sales data was therefore omitted from the study. This is a limitation of the study, however the questionnaire captured purchase data for the participants so purchases made in week 1 could be compared to purchases made in week 2, in each of the leisure centres.

The use of a control leisure centre, in stage two of the research, demonstrated that the increase observed in PBCC in the intervention centre was not due to external factors. Therefore it could be concluded that the change was due to the presence of Calorie information. Ideally, the food offer in both leisure centres would have been identical, however this was not possible. Two leisure centres under the remit of the same council were used to help ensure as much consistency as possible. The two leisure centres were asked to not make any changes to the food environment during the study period. However, availability of space in the café could not be controlled. At some points during the study period, children's parties and holiday clubs took up space in the café, which may have deterred café users.

The first stage of the study adopted the NPM which categorised product healthiness per 100g and did not consider portion size (Chapter 5 and Chapter 6), however even if portion size was known, the full portion may not be consumed by all consumers. Furthermore, only non pre-packaged food products were included in the frequently purchased products, which could have limited the categorisation of the café environment as obesogenic or leptogenic.

Participants in the second stage of the study were asked to categorise the eating occasion for their purchase. A strength of this approach was that it prevented researcher bias, however the approach was also limited because participants' choices, or their definition of each eating occasion may have varied which could have skewed the results.

The research did not identify BMI due to the focus on the obesogenicity of the food environment as opposed to individual overweight and obesity level. As a result, it could not be confirmed whether or not the participants had a healthy BMI. This would have been particularly useful for the clustering section, to identify if there was a difference in the BMI category for participants with different motivations. The clustering section was also limited by the small number of respondents for the intervention. The intervention data was primarily included as a point of comparison, and the focus was predominantly on the data set where no intervention was present. The latter data set was used to inform the three consumer segments that were identified from the clustering (Chapter 12).

In the questionnaire, participants were asked to record purchases for themselves and for others. Only the purchases for themselves were included in the results because, upon reflection, further information regarding the 'others' was required to fully analyse the information. For example, it was unknown how many 'other' people the purchases were for and whether these were adults or children. To be able to categorise this data fully, more specific information would be required.

Although there was a good match in terms of number of participants across weeks at the experimental centre, this was not the case at the control centre as there was a high number of repeat customers, who were not asked to repeat the study a second time. Although this may limit the validity of comparing the two weeks in the control centre, this would not have had an impact on the intervention centre.

The data used in the structural equation model included data from week 1 in the intervention centre and from week 1 and week 2 in the control centre. The combination of this data could have limited the results as it was derived from

two separate leisure centres and the food offer and food environments in the two leisure centres could not be fully matched. Despite this, both of the leisure centres met the inclusion criteria for the study and they were both under the remit of the same council. The combined data was only collected where there was no intervention present.

The data collection took place in the morning for the control centre and in the afternoon for the intervention centre in week 1, and vice versa in week 2. This limited the interpretation of the research at times as breakfast was only consumed in the morning and an evening meal was only consumed in the afternoon meaning that comparisons of these meals could not be made between week 1 and week 2 in each centre. Furthermore, the timing of lunch, drinks and snacks will have differed between weeks in each centre which could have impacted on the results. However, leisure centre users may attend at a similar time each week in order to engage with a particular activity, or to accompany another individual to an activity. Therefore, as leisure centre café users could only complete the questionnaire once, the design helped to maximise the number of participants. It also helped to give individuals who use the leisure centre at different times of day an opportunity to participate in the study.

14.3 Recommendations for further research and practical applications

14.3.1 Recommendation 1: Explore alternative label formats

The Calorie information increased PBCC, however it did not increase Intention and Behaviour. Alternative label formats such as TLL, or physical activity equivalent labelling could be considered in future research, to test if they have an impact on leptogenic intention and behaviour. In particular, physical activity equivalent labelling (Cramer, 2016; Pang and Hammond, 2013) is suited to the context of a leisure centre. The results of the present study have demonstrated that in some instances exercise can lead to the 'need' for a particular food choice, however it is possible that consumers may not be able to accurately identify energy expenditure and energy intake. Attention paid to food labels needs to be taken into account in future research. A previous study using eye-

tracking tested the attention paid to different nutritional label formats on menus (Reale and Flint, 2016), however the research was carried out in a laboratory setting as opposed to a real-life scenario. Eye-tracking could be employed in a leisure centre café to investigate attention paid to nutritional labels.

14.3.2 Recommendation 2: Gain-framed messages to target concern, motives and attitudes

The structural equation model demonstrated that Attitudes are the strongest predictor of Intention in this context. As a result, future research interventions should be developed to increase positive healthy eating attitudes. The model also demonstrated that Concern Disease can inform Concern Nutrients, which can inform Motives, which then informs Intention. Therefore, it could be beneficial for future research to target concern, motive and attitudes. Previous research has demonstrated that healthy eating attitudes may develop over time and that individuals with a higher prevalence of disease, such as hypertension or diabetes, have more positive healthy eating attitudes (Andrade *et al.*, 2007). Concern could be increased through the use of framing, and loss-framed messages, which highlight the consequences of not performing a particular behaviour (Gallagher and Updegraff, 2012). However, gain-framed messages, which promote the benefits of a behaviour, have been found to be more effective than loss-framed messages (Gallagher and Updegraff, 2012; Berenbaum and Latimer-Cheung, 2014) and could be used to promote the benefits of leptogenic food choice. For example, a gain-framed message could promote the lifestyle benefits of making healthy choices, such as the reduced risk of disease. Alternatively gain-framed messages could be aligned with the influences identified for the three consumer segments that were determined in the present study (Chapter 12). This will be discussed in recommendation 3, below.

14.3.3 Recommendation 3: Implement an intervention to target nutritionally motivated, nutritionally ambivalent, and nutritionally disinterested consumers

The results of the clustering (Chapter 12) demonstrated three segments of consumers; nutritionally motivated consumers, nutritionally ambivalent consumers and nutritionally disinterested consumers. Future research could involve a social marketing intervention that tailors health messages based upon the three consumer segments identified. Nutritionally motivated consumers felt that they lacked some opportunity to make healthy choices based on the availability and visibility of healthy options. Further research could consider increasing the proportion of healthy choices that are available, as per a previous study (Olstad *et al.*, 2015a), and using choice architecture to concurrently enhance the visibility of more healthy options and reduce the visibility of less healthy options. This approach would still preserve freedom of choice, as it would not remove the less healthy alternatives. The nutritionally ambivalent group were influenced by people, such as children. Further research could evaluate personal norms, to fully assess adult food choices made on behalf of others (Mitterer-Daltoé *et al.*, 2013). Furthermore, healthy descriptive norms could be used to promote the healthy choices that are being made by others in the leisure centre café. Nutritionally disinterested consumers may benefit from the healthy choice being presented as a hedonistic choice. Further research could evaluate the effect of indulgent food labels on healthy food choices in leisure centre cafés, such as in the research carried out by Turnwald, Boles and Crum (2017), in a university café (Chapter 13). This could reflect a gain-framed approach, as it communicates the positive aspects of engaging in a behaviour by promoting the sensory properties.

14.3.4 Practical recommendations

The results of the first stage of the study demonstrated that the previous financial support that LC2 had received from the NHS regulated the food offer and helped them to maintain a healthier offer. This shows the role that financial support could have to ensure a healthier food offer in leisure centres. The second stage of the study demonstrated that future policy could consider regulations for font size/legibility of voluntary nutritional information. The results

also demonstrate a clear benefit of the provision of Calorie information; consumers increased perceived control and confidence over making healthy food choices. It is therefore recommended that future policy considers the mandatory provision of Calorie information in leisure centres. This follows changes in the US, where Calorie labelling in restaurants and in vending machines, where operators own ≥ 20 vending machines, will be mandatory nationwide from May, 2018 (US Food and Drug Administration, 2017). Leisure centre food environments are an excellent platform for promoting a leptogenic lifestyle. The present study has demonstrated that Calorie information is pertinent to include in leisure centre cafés as it can contribute towards creating a leptogenic food environment by enabling accurate decisions, and by increasing consumer control and confidence in their ability to make leptogenic choices.

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Reference List

Action on Sugar (2015). *Energy drinks fuel the obesity epidemic*. [online]. <http://www.actiononsugar.org/>.

Advertising Standards Authority (ASA) (2017). *Guidance on identifying brand advertising that has the effect of promoting an HFSS product*. [online]. <https://www.asa.org.uk/>.

AJZEN, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, **50** (2), 179-211.

AJZEN, I. and FISHBEIN, M. (1980). *Understanding attitudes and predicting social behaviour*. Prentice Hall.

AJZEN, Icek (1985). From intentions to actions: A theory of planned behavior. In: *Action control*. Springer, 11-39.

AJZEN, Icek (2002). Perceived behavioral control, self-efficacy, locus of control, and the theory of planned behavior. *Journal of Applied Social Psychology*, **32** (4), 665-683.

AJZEN, Icek and MADDEN, Thomas J. (1986). Prediction of goal-directed behavior: Attitudes, intentions, and perceived behavioral control. *Journal of Experimental Social Psychology*, **22** (5), 453-474.

ALAM, S. and SAYUTI, N. (2011). Applying the Theory of Planned Behavior (TPB) in halal food purchasing. *International Journal of Commerce and Management*, **21** (1), 8-20.

ALLEN, Michael W., et al. (2006). Cultural associations and food choice: Examining the causal relationship between human values and dietary choice. *Appetite*, **47** (2), 257-257.

ANDERSON, Paul (1986). On Method in Consumer Research: A Critical Relativist Perspective. *Journal of Consumer Research (1986-1998)*, **13** (2), 155-173.

ANDRADE, Lucia, et al. (2017). Ten-Year Changes in Healthy Eating Attitudes in the SUN Cohort. *Journal of the American College of Nutrition*, **36** (5), 319-329.

ANDREW, Sharon and HALCOMB, Elizabeth J. (2009). *Mixed methods research for nursing and the health sciences*. John Wiley & Sons.

ARMITAGE, Christopher J. and CONNER, Mark (2001). Efficacy of the Theory of Planned Behaviour: A meta-analytic review. *British Journal of Social Psychology*, **40** (4), 471-499.

- ARNO, Anneliese and THOMAS, Steve (2016). The efficacy of nudge theory strategies in influencing adult dietary behaviour: a systematic review and meta-analysis. *BMC Public Health*, **16** (1), 676.
- ARVOLA, A., et al. (2008). Predicting intentions to purchase organic food: The role of affective and moral attitudes in the Theory of Planned Behaviour. *Appetite*, **50** (2), 443-454.
- ASCHEMANN-WITZEL, Jessica, et al. (2013). Effects of nutrition label format and product assortment on the healthfulness of food choice. *Appetite*, **71**, 63-74.
- BAGOZZI, R., GURHAN-CANLI, Z. and PRIESTER, J. (2002). *The social psychology of consumer behaviour*. McGraw-Hill International.
- BAGOZZI, Richard (1975). Marketing as Exchange. *Journal of Marketing*, **39** (4), 32-39.
- BANDURA, Albert (1991). Social cognitive theory of self-regulation. *Organizational Behavior and Human Decision Processes*, **50** (2), 248-287.
- BANDURA, Albert (1998). Health promotion from the perspective of social cognitive theory. *Psychology and Health*, **13** (4), 623-649.
- BARTON, Hugh (2009). Land use planning and health and well-being. *Land Use Policy*, **26**, S115-S123.
- BATES, Kenneth, et al. (2011). Battling the bulge: menu board calorie legislation and its potential impact on meal repurchase intentions. *Journal of Consumer Marketing*, **28** (2), 104-113.
- BECKER, Marshall H., et al. (1977). The Health Belief Model and prediction of dietary compliance: a field experiment. *Journal of Health and Social Behavior*, 348-366.
- BENSON, Angela and HENDERSON, Steven (2005). UK leisure centres under best value: a strategic analysis. *International Journal of Public Sector Management*, **18** (3), 196-215.
- BENTLER, Peter M. (1990). Comparative fit indexes in structural models. *Psychological Bulletin*, **107** (2), 238-246.
- BENTLER, Peter M. and BONETT, Douglas G. (1980). Significance tests and goodness of fit in the analysis of covariance structures. *Psychological Bulletin*, **88** (3), 588-606.
- BERENBAUM, Erin and LATIMER-CHEUNG, Amy (2014). Examining the link between framed physical activity ads and behavior among women.(Report). *Journal of Sport & Exercise Psychology*, **36** (3), 271-280.

- BIRKENHEAD, Karen and SLATER, Gary (2015). A Review of Factors Influencing Athletes' Food Choices. *Sports Medicine*, **45** (11), 1511-1522.
- BLACK, Jennifer L. and DAY, Meghan (2012). Availability of limited service food outlets surrounding schools in British Columbia. *Canadian Journal of Public Health*, **103** (4), e255-e259.
- BOLLEN, Kenneth A. (1989). A new incremental fit index for general structural equation models. *Sociological Methods & Research*, **17** (3), 303-316.
- BOOTH, Sarah L., et al. (2001). Environmental and Societal Factors Affect Food Choice and Physical Activity: Rationale, Influences, and Leverage Points. *Nutrition Reviews*, **59** (3), S21-S36.
- BRAUN, V. and CLARKE, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, **3** (2), 77-101.
- BREDAHL, Lone (2001). Determinants of consumer attitudes and purchase intentions with regard to genetically modified food—results of a cross-national survey. *Journal of Consumer Policy*, **24** (1), 23-61.
- BROWN, David R. and BREWSTER, Luther G. (2015). The food environment is a complex social network. *Social Science & Medicine*, **133**, 202-204.
- BROWNE, Michael W. and CUDECK, Robert (1992). Alternative ways of assessing model fit. *Sociological Methods & Research*, **21** (2), 230-258.
- BRUG, Johannes (2008). Determinants of healthy eating: motivation, abilities and environmental opportunities. *Family Practice*, **25** , i50-i55.
- BUCHER, Tamara, et al. (2016a). Adolescents' perception of the healthiness of snacks. *Food Quality and Preference*, **50** , 94-101.
- BUCHER, T., et al. (2016b). *Nudging consumers towards healthier choices: a systematic review of positional influences on food choice*. *British Journal of Nutrition*, **115** (12), 2252-2263.
- BUCHER, T., MÜLLER, B. and SIEGRIST, M. (2015). What is healthy food? Objective nutrient profile scores and subjective lay evaluations in comparison. *Appetite*, **95** , 408-414.
- BUCK, Christoph, et al. (2013). Clustering of unhealthy food around German schools and its influence on dietary behavior in school children: a pilot study. *International Journal of Behavioral Nutrition and Physical Activity*, **10** , 65.
- BURNETT, Melissa S. and LUNSFORD, Dale A. (1994). Conceptualizing Guilt in the Consumer Decision- making Process. *Journal of Consumer Marketing*, **11** (3), 33-43.

BUTLAND, Bryony, et al. (2007). *Foresight Tackling Obesity: Future Choices Project Report (Second Edition)*. Government Office for Science.

BYRNE, Barbara M. (2010). *Structural equation modeling with AMOS : basic concepts, applications and programming*. 2nd ed., New York ; London, Routledge Academic.

CARINS, Julia E. and RUNDLE-THIELE, Sharyn (2014). Eating for the better: a social marketing review (2000–2012). *Public Health Nutrition*, **17** (7), 1628-1639.

CARRILLO, E., et al. (2013). Why buying functional foods? Understanding spending behaviour through structural equation modelling. *Food Research International*, **50** (1), 361-368.

CARRILLO, E., et al. (2011). Main Factors Underlying Consumers' Food Choice: A First Step for the Understanding of Attitudes toward "healthy eating". *Journal of Sensory Studies*, **26** (2), 85-95.

CARTER, M., et al. (2013). Food, fizzy, and football: promoting unhealthy food and beverages through sport - a New Zealand case study. *BMC Public Health*, **13**, 126.

CARTER, Mary-Ann, et al. (2012). Availability and marketing of food and beverages to children through sports settings: a systematic review. *Public Health Nutrition*, **15** (8), 1373-1379.

CARTER, Mary-Ann and SWINBURN, Boyd (2004). Measuring the obesogenic food environment in New Zealand primary schools. *Health Promotion International*, **19** (1), 15-20.

CELIS-MORALES, Carlos, et al. (2015). Design and baseline characteristics of the Food4Me study: a web-based randomised controlled trial of personalised nutrition in seven European countries. *Genes & Nutrition*, **10** (1), 1-13.

CHAMBERS, Stephanie, et al. (2008). The influence of age and gender on food choice: a focus group exploration. *International Journal of Consumer Studies*, **32** (4), 356-365.

CHAMPION, Victoria L. and SKINNER, Celette Sugg (2008). The health belief model. *Health behavior and health education: Theory, Research, and Practice*, **4**, 45-65.

CHANDON, Pierre and WANSINK, Brian (2012). Does food marketing need to make us fat? A review and solutions. *Nutrition Reviews*, **70** (10), 571-593.

CHANDON, Pierre and WANSINK, Brian (2007). The Biasing Health Halos of Fast-Food Restaurant Health Claims: Lower Calorie Estimates and Higher Side-Dish Consumption Intentions. *Journal of Consumer Research*, **34** (3), 301-314.

CHANG, Chingching (2009). Psychological Motives Versus Health Concerns: Predicting Smoking Attitudes and Promoting Antismoking Attitudes. *Health Communication*, **24** (1), 1-11.

CHAPMAN, Katarzyna and OGDEN, Jane (2012). Nudging Customers towards Healthier Choices: An Intervention in the University Canteen. *Journal of Food Research*, **1** (2), p.13.

CHEN, Mei-Fang (2007). Consumer attitudes and purchase intentions in relation to organic foods in Taiwan: Moderating effects of food-related personality traits. *Food Quality and Preference*, **18** (7), 1008-1021.

CHEN, Mei-Fang (2011). The gender gap in food choice motives as determinants of consumers' attitudes toward GM foods in Taiwan. *British Food Journal*, **113** (6), 697-709.

CHEW, Fiona, PALMER, Sushma and KIM, Soohong (1995). Sources of information and knowledge about health and nutrition: can viewing one television programme make a difference? *Public Understanding of Science*, **4** (1), 17-29.

CHRYSOCHOU, Polymeros (2010). Food health branding: The role of marketing mix elements and public discourse in conveying a healthy brand image. *Journal of Marketing Communications*, **16** (1-2), 69-85.

COHEN, D. A. and LESSER, L. I. (2016). Obesity prevention at the point of purchase. *Obesity Reviews*, **17** (5), 389-396.

COHEN, Shlomo (2013). Nudging and Informed Consent. *The American Journal of Bioethics*, **13** (6), 3-11.

CONNER, Mark and ARMITAGE, Christopher J. (1998). Extending the theory of planned behavior: A review and avenues for further research. *Journal of Applied Social Psychology*, **28** (15), 1429-1464.

COOK, Thomas D. (2015). Quasi-experimental design. *Wiley Encyclopedia of Management*.

COOPER, Benjamin E. J., et al. (2012). The quality of the evidence for dietary advice given in UK national newspapers. *Public Understanding of Science*, **21** (6), 664-673.

COSTA-FONT, Montserrat and GIL, José M. (2009). Structural equation modelling of consumer acceptance of genetically modified (GM) food in the Mediterranean Europe: A cross country study. *Food Quality and Preference*, **20** (6), 399-409.

COWBURN, Gill and STOCKLEY, Lynn (2005). Consumer understanding and use of nutrition labelling: a systematic review. *Public Health Nutrition*, **8** (1), 21-28.

- CRAMER, Shirley (2016). Food should be labelled with the exercise needed to expend its calories. *British Medical Journal (online)*, **353**.
- CRANAGE, David A., CONKLIN, Martha T. and LAMBERT, Carolyn U. (2005). Effect of Nutrition Information in Perceptions of Food Quality, Consumption Behavior and Purchase Intentions. *Journal of Foodservice Business Research*, **7** (1), 43-61.
- CRESWELL, John W. (2007). *Qualitative inquiry and research design : choosing among five approaches*. 2nd ed., Thousand Oaks, Calif; London, SAGE.
- CRESWELL, John W. (2009). *Research design : qualitative, quantitative, and mixed methods approaches*. 3rd ed., Los Angeles, Calif. ; London: SAGE.
- CRESWELL, John W. and PLANO CLARK, Vicki L. (2011). *Designing and conducting mixed methods research*. 2nd ed., Los Angeles, Calif ; London: SAGE.
- CROSSLEY, Nick (2006). In the gym: Motives, meaning and moral careers. *Body & Society*, **12** (3), 23-50.
- CURTIS, Elizabeth A. and DRENNAN, Jonathan (2013). *Quantitative health research issues and methods*. Maidenhead, Berkshire, England : Open University Press.
- DANYLCHUK, Karen and MACINTOSH, Eric (2009). Food and Non-Alcoholic Beverage Sponsorship of Sporting Events: The Link to the Obesity Issue. *Sport Marketing Quarterly*, **18** (2), 69-80.
- DAVIES, Paul (2015). *Health and Fitness Clubs - UK - July 2015*. <http://academic.mintel.com/>
- DAY, Peter L. and PEARCE, Jamie (2011). Obesity- Promoting Food Environments and the Spatial Clustering of Food Outlets Around Schools. *American Journal of Preventive Medicine*, **40** (2), 113-121.
- DAYAN, Eran and BAR-HILLEL, Maya (2011). Nudge to nobesity II: Menu positions influence food orders. *Judgment and Decision Making*, **6** (4), 333-342.
- DEAN, Jennifer and ELLIOTT, Susan (2012). Prioritizing Obesity in the City. *Journal of Urban Health*, **89** (1), 196-213.
- Department of Health (2011). *Nutrient Profiling Technical Guidance*. [online]. <https://www.gov.uk/government/publications/the-nutrient-profiling-model>.
- Department of Health (2013). *Technical Guidance on Nutrition Labelling*. [online]. <https://www.gov.uk/government/publications/technical-guidance-on-nutrition-labelling>.

Derbyshire County Council (2017). *Obesity Facts and Figures*. [online]. <https://www.derbyshire.gov.uk/>.

Derbyshire Observatory (2011). *2011 Census: Summary Profile*. [online]. <https://observatory.derbyshire.gov.uk/>.

DICICCO-BLOOM, Barbara and CRABTREE, Benjamin F. (2006). The qualitative research interview. *Medical Education*, **40** (4), 314-321.

DICKSON-SPILLMANN, Maria, SIEGRIST, Michael and KELLER, Carmen (2011). Development and validation of a short, consumer-oriented nutrition knowledge questionnaire. *Appetite*, **56** (3), 617-620.

DOBBINSON, Suzanne Jane, HAYMAN, Jane Amanda and LIVINGSTON, Patricia Mary (2006). Prevalence of health promotion policies in sports clubs in Victoria, Australia. *Health Promotion International*, **21** (2), 121-129.

DOWNS, Julie S., LOEWENSTEIN, George and WISDOM, Jessica (2009). Strategies for promoting healthier food choices. *American Economic Review*, **99** (2), 159-164.

DOYLE, Peter (1992). What are the excellent companies? *Journal of Marketing Management*, **8** (2), 101-116.

DUKESHIRE, Steven, NICKS, Emily and FERGUSON, Jennifer (2014). Pilot evaluation of an in-store nutrition label education program.(Report/Rapport). *Canadian Journal of Dietetic Practice and Research*, **75** (4), 206-209.

DUNN, Kirsten I., et al. (2011). Determinants of fast-food consumption. An application of the Theory of Planned Behaviour. [online]. *Appetite*, **57** (2), 349-357.

EDWARDS, K. L., et al. (2010). The neighbourhood matters: studying exposures relevant to childhood obesity and the policy implications in Leeds, UK. *Journal of Epidemiology and Community Health*, **64** (3), 194-201.

ELINDER, Liselotte Schäfer and JANSSON, Martin (2009). Obesogenic environments—aspects on measurement and indicators. *Public Health Nutrition*, **12** (3), 307-315.

European Food Information Council (2005). *The Determinants of Food Choice*. [online]. www.eufic.org/.

FABRIGAR, Leandre R., et al. (1999). Evaluating the Use of Exploratory Factor Analysis in Psychological Research. *Psychological Methods*, **4** (3), 272-299.

FALGUERA, Víctor, ALIGUER, Núria and FALGUERA, Mercè (2012). An integrated approach to current trends in food consumption: Moving toward functional and organic products? *Food Control*, **26** (2), 274-281.

- FALK, Laura Winter, et al. (2001). Managing Healthy Eating: Definitions, Classifications, and Strategies. *Health Education & Behavior*, **28** (4), 425-439.
- FALTERMAIER, T. (1997). Why public health research needs qualitative approaches. Subjects and methods in change. *The European Journal of Public Health*, **7** (4), 357-363.
- FEINBERG, A. M. (2011). *Perceived and Actual Nutrition Knowledge of Cafe Beverages*. Journal of the American Dietetic Association, **111** (9), A103-A103.
- FELSEN, Gidon, CASTELO, Noah and REINER, Peter B. (2013). Decisional enhancement and autonomy: public attitudes towards overt and covert nudges. *Judgment and Decision Making*, **8** (3), 202-213.
- FENZL, Navina, BARTSCH, Katja and KOENIGSTORFER, Joerg (2014). Labeling exercise fat- burning increases post-exercise food consumption in self-imposed exercisers. *Appetite*, **81**, 1-7.
- FERREIRA, I., et al. (2007). Environmental correlates of physical activity in youth - a review and update. *Obesity Reviews*, **8** (2), 129-124.
- FIDELL, Linda S. and TABACHNICK, Barbara G. (2003). Preparatory data analysis. *Handbook of psychology*.
- FIELD, Andy P. (2005). *Discovering statistics using SPSS : (and sex, drugs and rock'n'roll)*. 2nd ed. London, SAGE.
- FIELD, Andy P. (2009). *Discovering statistics using SPSS : (and sex and drugs and rock 'n' roll)*. 3rd ed. Los Angeles, Calif ; London: SAGE.
- FILA, S. and SMITH, C. (2006). Applying the Theory of Planned Behavior to healthy eating behaviors in urban Native American youth. *The International Journal of Behavioral Nutrition and Physical Activity*, **3** , 11.
- Food Standards Agency (2010). *Citizens' forums on food: Front of Pack (FoP) Nutrition Labelling*. [online]. <https://www.food.gov.uk/>.
- Food Standards Agency (2014). *FSA Strategy 2015-2020*. [online]. <https://www.food.gov.uk/>.
- Food Standards Agency (2016). *Guide to creating a front of pack (FoP) nutrition label for pre-packed products sold through retail outlets*. [online]. <https://www.food.gov.uk/>.
- Food Standards Agency (2017). *Allergy and intolerance: guidance for businesses*. [online]. <https://www.food.gov.uk/business-industry/allergy-guide>.
- FOX, Elizabeth A., et al. (2011). Perceived protein needs and measured protein intake in collegiate male athletes: an observational study. *Journal of the International Society of Sports Nutrition*, **8**, 9-9.

- FRASER, LK, et al. (2011). Fast food, other food choices and body mass index in teenagers in the United Kingdom (ALSPAC): a structural equation modelling approach. *International Journal of Obesity*, **35** (10), 1325-1330.
- FREISLING, Heinz, HAAS, Karin and ELMADFA, Ibrahim (2010). Mass media nutrition information sources and associations with fruit and vegetable consumption among adolescents. *Public Health Nutrition*, **13** (2), 269-275.
- FRENCH, David P., et al. (2005). The Importance of Affective Beliefs and Attitudes in the Theory of Planned Behavior: Predicting Intention to Increase Physical Activity 1. *Journal of Applied Social Psychology*, **35** (9), 1824-1848.
- FRENCH, Jeff (2011). Why nudging is not enough. *Journal of Social Marketing*, **1** (2), 154-162.
- GALLAGHER, Kristel and UPDEGRAFF, John (2012). Health Message Framing Effects on Attitudes, Intentions, and Behavior: A Meta-analytic Review. *Annals of Behavioral Medicine*, **43** (1), 101-116.
- GEDRICH, Kurt (2003). Determinants of nutritional behaviour: a multitude of levers for successful intervention? *Appetite*, **41** (3), 231-238.
- GEORGE, Roslind, KRUGER, Estie and TENNANT, Marc (2012). Qualitative research and dental public health. *Indian Journal of Dental Research*, **23** (1), 92-96.
- GIBBS, Graham R. (2008). *Analysing qualitative data*. Sage.
- GIESEN, J. C. A. H., et al. (2013). Changing the default. How to promote healthier food choices. *Appetite*, **71** 475-475.
- GILES, Emma and BRENNAN, Mary (2014). Trading between healthy food, alcohol and physical activity behaviours. *BMC Public Health*, **14** (1), 1231.
- GLANZ, Karen, et al. (2005). Healthy nutrition environments: concepts and measures. *American Journal of Health Promotion*, **19** (5), 330-333.
- GREEN, Edward C. and MURPHY, Elaine (2014). Health belief model. *The wiley blackwell encyclopedia of health, illness, behavior, and society*, .
- GRIER, Sonya and BRYANT, Carol A. (2005). Social marketing in public health. *Annual review of public health*, **26**, 319-339.
- GRUBOR, Aleksandar, et al. (2015). Application of health and taste attitude scales in Serbia. *British Food Journal*, **117** (2), 840-860.
- GRUNERT, Klaus G., et al. (2010). Use and understanding of nutrition information on food labels in six European countries. *Journal of Public Health*, **18** (3), 261-277.

GRUNERT, Klaus G., WILLS, Josephine M. and FERNÁNDEZ-CELEMÍN, Laura (2010). Nutrition knowledge, and use and understanding of nutrition information on food labels among consumers in the UK. *Appetite*, **55** (2), 177-189.

GRUNERT, Klaus, et al. (2007). A review of European research on consumer response to nutrition information on food labels. *Journal of Public Health*, **15** (5), 385-399.

GUARTE, Jacqueline M. and BARRIOS, Erniel B. (2006). Estimation under purposive sampling. *Communications in Statistics—Simulation and Computation*, **35** (2), 277-284.

HAIR, JFJ, et al. (2010). *Multivariate Data Analysis*. 7th Ed. Prentice Hall.

HAMLIN, R. (2015). *The average time to make a food purchase is six seconds: front of pack labelling must be visible and impactful to affect decision making at point of purchase*. [online]. <http://www.nutritionociety.org/>.

HANSEN, Torben, MUKHERJEE, Ashesh and THOMSEN, Thyra Uth (2011). Anxiety and search during food choice: the moderating role of attitude towards nutritional claims. *Journal of Consumer Marketing*, **28** (3), 178-186.

HE, F. J., LI, J. and MACGREGOR, G. A. (2013). Effect of longer term modest salt reduction on blood pressure: Cochrane systematic review and meta-analysis of randomised trials. *BMJ (clinical research ed.)*, **346**, f1325.

HEARTY, Á. P., et al. (2007). Relationship between attitudes towards healthy eating and dietary behaviour, lifestyle and demographic factors in a representative sample of Irish adults. *Appetite*, **48** (1), 1-11.

HINDE, Sarah and DIXON, Jane (2005). Changing the obesogenic environment: insights from a cultural economy of car reliance. *Transportation Research part D*, **10** (1), 31-53.

HM Government (2011). *Healthy Lives, Healthy People: A Call to Action on Obesity in England*. [online]. <https://www.gov.uk/government/publications/healthy-lives-healthy-people-a-call-to-action-on-obesity-in-england>.

HODGKINS, Charo E., et al. (2015). Guiding healthier food choice: systematic comparison of four front-of-pack labelling systems and their effect on judgements of product healthiness. *British Journal of Nutrition*, **113** (10), 1652-1663.

HODGKINS, Charo, et al. (2012). Understanding how consumers categorise nutritional labels: A consumer derived typology for front-of- pack nutrition labelling. *Appetite*, **59** (3), 806-817.

HOEFKENS, Christine, et al. (2012). Explaining the effects of a point-of-purchase nutrition-information intervention in university canteens: a structural equation modelling analysis.(Research). *The International Journal of Behavioral Nutrition and Physical Activity*, **9**, 111.

HOEK, A. C., et al. (2017). Shrinking the food-print: A qualitative study into consumer perceptions, experiences and attitudes towards healthy and environmentally friendly food behaviours. *Appetite*, **108** , 117-131.

HOLLANDS, Gareth J., PRESTWICH, Andrew and MARTEAU, Theresa M. (2011). Using aversive images to enhance healthy food choices and implicit attitudes: An experimental test of evaluative conditioning. *Health Psychology*, **30** (2), 195.

HOLLANDS, Gareth J. and MARTEAU, Theresa M. (2016). Pairing Images of Unhealthy and Healthy Foods With Images of Negative and Positive Health Consequences: Impact on Attitudes and Food Choice. *Health Psychology*, **35** (8), 847-851.

HOLSTEN, Joanna E. (2009). Obesity and the community food environment: a systematic review. *Public Health Nutrition*, **12** (3), 397-405.

HOMANS, George C. (1961). *Social behavior: Its elementary forms*. New York: Harcourt, Brace and World, Inc

HOOPER, Daire, COUGHLAN, Joseph and MULLEN, Michael (2008). Structural equation modelling: Guidelines for determining model fit. *Electronic Journal of Business Research Methods*, **6** (1), 53-60.

HU, Li-tze and BENTLER, Peter M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*, **6** (1), 1-55.

HUDSON, Laurel and OZANNE, Julie (1988). Alternative Ways of Seeking Knowledge in Consumer Research. *Journal of Consumer Research*, **14** (4), 508-521.

HUNT, Shelby D. (1991). Positivism and paradigm dominance in consumer research: toward critical pluralism and rapprochement. *Journal of Consumer Research*, **18** (1), 32-44.

IACOBUCCI, Dawn (2010). Structural equations modeling: Fit indices, sample size, and advanced topics. *Journal of Consumer Psychology*, **20** (1), 90-98.

IRELAND, Robin and WATKINS, Francine (2010). Football fans and food: a case study of a football club in the English Premier League. *Public Health Nutrition*, **13** (5), 682-687.

JANSSON-BOYD, C. (2010). *Consumer psychology*. [online]. Maidenhead, McGraw-Hill/Open University Press.

JOHNSON, Phil and DUBERLEY, Joanne (2000). *Understanding management research : an introduction to epistemology*. London, SAGE.

JONES, Andy, et al. (2007). Tackling obesities: future choices—obesogenic environments—evidence review. *London: Government office for science*.

JONES, Christopher R., OLSON, Michael A. and FAZIO, Russell H. (2010). Chapter five-evaluative conditioning: The “how” question. *Advances in Experimental Social Psychology*, **43**, 205-255.

JÖRESKOG, Karl G. and SÖRBOM, Dag (1982). Recent developments in structural equation modeling. *Journal of Marketing Research*, , 404-416.

JOSIAM, Bharath and FOSTER, Charles (2009). Nutritional information on restaurant menus: Who cares and why restaurateurs should bother. *International Journal of Contemporary Hospitality Management*, **21** (7), 876-891.

JUST, David R., et al. (2008). Behavioral economic concepts to encourage healthy eating in school cafeterias: Experiments and lessons from college students, *IDEAS Working Paper Series from RePE*.

KÄHKÖNEN, Päivi, TUORILA, Hely and RITA, Hannu (1996). How information enhances acceptability of a low-fat spread. *Food Quality and Preference*, **7** (2), 87-94.

KAISER, Henry F. (1960). The application of electronic computers to factor analysis. *Educational and Psychological Measurement*, **20** (1), 141-151.

KAISER, Henry F. (1974). An index of factorial simplicity. *Psychometrika*, **39** (1), 31-36.

KELLY, B., et al. (2010). Examining opportunities for promotion of healthy eating at children's sports clubs. *Australian and New Zealand Journal of Public Health*, **34** (6), 583-588.

KELLY, Bridget, et al. (2008). Double standards for community sports: promoting active lifestyles but unhealthy diets. *Health Promotion Journal of Australia*, **19** (3), 226-228.

KELLY, Bridget, BAUMAN, Adrian E. and BAUR, Louise A. (2014). Population estimates of Australian children's exposure to food and beverage sponsorship of sports clubs. *Journal of Science and Medicine in Sport*, **17** (4), 394-398.

KELLY, Bridget, et al. (2011a). Food and drink sponsorship of children's sport in Australia: who pays? *Health Promotion International*, **26** (2), 188-195.

KELLY, Bridget, et al. (2011b). "Food company sponsors are kind, generous and cool": (Mis)conceptions of junior sports players. *The International Journal of Behavioral Nutrition and Physical Activity*, **8** , 95-95.

- KELLY, Bridget, et al. (2012). Restricting unhealthy food sponsorship: Attitudes of the sporting community. *Health Policy*, **104** (3), 288-295.
- KELLY, Bridget, et al. (2014). Identifying important and feasible policies and actions for health at community sports clubs: A consensus-generating approach. *Journal of Science and Medicine in Sport*, **17** (1), 61-66.
- KEMP, Elyria and BUI, My (2011). Healthy brands: establishing brand credibility, commitment and connection among consumers. *Journal of Consumer Marketing*, **28** (6), 429-437.
- KENNY, David A. and MCCOACH, D. Betsy (2003). Effect of the number of variables on measures of fit in structural equation modeling. *Structural Equation Modeling*, **10** (3), 333-351.
- KESSELS, Loes T. E., et al. (2011). The effects of tailored and threatening nutrition information on message attention. Evidence from an event-related potential study. *Appetite*, **56** (1), 32-38.
- KHAN, Sami Ullah, et al. (2017). Perception of Athletes about Diet and Its Role in Maintenance of Sports Performance. *Journal of Nutrition & Food Sciences*, **07** (02).
- KIESEL, Kristin, MCCLUSKEY, Jill J. and VILLAS-BOAS, Sofia B. (2011). Nutritional labeling and consumer choices. *Annual Review of Resource Economics*, **3** (1), 141-158.
- KIM, Eojina, et al. (2013). The roles of attitude, subjective norm, and perceived behavioral control in the formation of consumers' behavioral intentions to read menu labels in the restaurant industry. *International Journal of Hospitality Management*, **35**, 203-213.
- KIM, Yeong Gug, JANG, Seo Yeon and KIM, Aise Kyoungjin (2014). Application of the theory of planned behavior to genetically modified foods: Moderating effects of food technology neophobia. *Food Research International*, **62**, 947-954.
- KNÄUPER, Bärbel, et al. (2004). Compensatory health beliefs: scale development and psychometric properties. *Psychology & Health*, **19** (5), 607-624.
- KORWANICH, Kanyarat, et al. (2008). Promoting healthy eating in nursery schoolchildren: A quasi-experimental intervention study. *Health Education Journal*, **67** (1), 16-30.
- KÖSTER, E. P. (2009). Diversity in the determinants of food choice: A psychological perspective. *Food Quality and Preference*, **20** (2), 70-82.
- KOTLER, P. and LEVY, S. (1969). Broadening the concept of marketing. *The Journal of Marketing*, **33** (1) 10-15.

KOTLER, P. and ZALTMAN, G. (1971). Social marketing: an approach to planned social change. *The Journal of Marketing*, **35** (3), 3-12.

KRAAK, Vivica, et al. (2017). Progress Evaluation for the Restaurant Industry Assessed by a Voluntary Marketing-Mix and Choice-Architecture Framework That Offers Strategies to Nudge American Customers toward Healthy Food Environments, 2006–2017. *International Journal of Environmental Research and Public Health*, **14** (7), 760.

KVALE, S. and BRINKMANN, S. (2009). *Interviews: Learning the craft of qualitative research interviewing*. 2nd ed., London, SAGE.

LABROSSE, Lindsay and ALBRECHT, Julie A. (2013). Pilot intervention with adolescents to increase knowledge and consumption of folate-rich foods based on the Health Belief Model. *International Journal of Consumer Studies*, **37** (3), 271-278.

LAKE, Amelia and TOWNSHEND, Tim (2006). Obesogenic environments: exploring the built and food environments. *The Journal of the Royal Society for the Promotion of Health*, **126** (6), 262-267.

LAU, R., HARTMAN, K. and WARE, J. (1986). Health as a value: methodological and theoretical considerations. [online]. *Health Psychology*, **5** (1), 25-43.

LEE, N. and KOTLER, P. (2011). *Social marketing: Influencing behaviors for good*. Sage.

LEE, Heung-Pyo, et al. (2007). The five-factor gambling motivation model. *Psychiatry Research*, **150** (1), 21-32.

LENG, Gareth, et al. (2017). The determinants of food choice. *Proceedings of the Nutrition Society*, **76** (3), 316-327.

LEVENTHAL, H. (1971). Fear appeals and persuasion: the differentiation of a motivational construct. *American Journal of Public Health*, **61** (6), 1208.

LEWIS, J. E., et al. (2009). Food label use and awareness of nutritional information and recommendations among persons with chronic disease. *The American Journal of Clinical Nutrition*, **90** (5), 1351-1357.

LLOYD, Beverley and DUMBRELL, Susan (2011). Modifying the food supply at a community swimming pool: a case study. *Health Promotion Journal of Australia*, **22** (1), 22-26.

Local Government Association (2013). *Changing behaviours in public health. To nudge or to shove*. <https://www.local.gov.uk/>

LYTLE, Leslie A. (2009). Measuring the food environment: state of the science. *American Journal of Preventive Medicine*, **36** (4), S134-S144.

- MAEHLE, Natalia, et al. (2015). Exploring consumer preferences for hedonic and utilitarian food attributes. *British Food Journal*, **117** (12), 3039-3063.
- MALHOTRA, Aseem (2012). *Viewpoint: Ban junk food sponsors from Olympic sports*. [online]. <http://www.bbc.co.uk/news/health>.
- MARSDEN, David and LITTLER, Dale (1998). Positioning alternative perspectives of consumer behaviour. *Journal of Marketing Management*, **14** (1-3), 3-28.
- MARSHALL, Martin N. (1996). Sampling for qualitative research. *Family Practice*, **13** (6), 522-526.
- MATTHEWS, B. and ROSS, L. (2010). *Research methods: a practical guide for the social sciences*. [online]. Harlow, Longman.
- MAUBACH, Ninya, HOEK, Janet and MCCREANOR, Tim (2009). An exploration of parents' food purchasing behaviours. *Appetite*, **53** (3), 297-302.
- MCDANIEL, Stephen R. and HEALD, Gary R. (2000). Young Consumers' Responses to Event Sponsorship Advertisements of Unhealthy Products: Implications of Schema-triggered Affect Theory. *Sport Management Review*, **3** (2), 163-184.
- MCDERMOTT, Máirtín S., et al. (2015). The theory of planned behaviour and discrete food choices: a systematic review and meta-analysis. *International Journal of Behavioral Nutrition and Physical Activity*, **12** (1), 162.
- MCKINNON, Robin A., et al. (2009). Measures of the food environment: a compilation of the literature, 1990–2007. *American Journal of Preventive Medicine*, **36** (4), S124-S133.
- MCLEAN, Rachael and HOEK, Janet (2014). Sodium and nutrition labelling: a qualitative study exploring New Zealand consumers' food purchasing behaviours. *Public Health Nutrition*, **17** (5), 1138-1146.
- MEENAGHAN, Tony and SHIPLEY, David (1999). Media effect in commercial sponsorship. *European Journal of Marketing*, **33** (3/4), 328-348.
- MILLS, Juline E. and THOMAS, Lionel (2008). Assessing Customer Expectations of Information Provided On Restaurant Menus: A Confirmatory Factor Analysis Approach. *Journal of Hospitality & Tourism Research*, **32** (1), 62-88.
- Mintel (2017a). *Leisure centres and swimming pools - UK - September 2017*. [online]. <http://academic.mintel.com>.
- Mintel (2017b). *Leisure centre review - UK - December 2017*. [online]. <http://academic.mintel.com>.

- MINTZ, Sidney W. and DU BOIS, Christine M. (2002). The Anthropology of food and eating. *Annual Review of Anthropology*, **31** (1), 99-119.
- MITTERER-DALTOÉ, M. L., et al. (2013). Structural equation modelling and word association as tools for a better understanding of low fish consumption. *Food Research International*, **52** (1), 56-63.
- MOLLEN, Saar, et al. (2013). Healthy and unhealthy social norms and food selection. Findings from a field-experiment. *Appetite*, **65**, 83-89.
- MORGAN, Gareth and SMIRCICH, Linda (1980). The Case for Qualitative Research. *The Academy of Management Review*, **5** (4), 491-500.
- MORRIS, M. A., et al. (2014). What is the cost of a healthy diet? Using diet data from the UK Women's Cohort Study. *Journal of Epidemiology and Community Health*, **68** (11), 1043-1049.
- MUNT, A. E., PARTRIDGE, S. R. and ALLMAN-FARINELLI, M. (2017). The barriers and enablers of healthy eating among young adults: a missing piece of the obesity puzzle: A scoping review. *Obesity Reviews*, **18** (1), 1-17.
- MURAKAMI, Kentaro and LIVINGSTONE, M. Barbara E. (2016). Associations between meal and snack frequency and diet quality and adiposity measures in British adults: findings from the National Diet and Nutrition Survey. *Public health Nutrition*, **19** (9), 1624-1634.
- MURCOTT, Anne (1982). The cultural significance of food and eating. *Proceedings of the Nutrition Society*, **41** (2), 203-210.
- National Cancer Institute (2014). *New Zealand Physical Activity Questionnaire - Long Form (NZPAQ-LF)*. [online]. <https://epi.grants.cancer.gov/paq/q084.html>.
- National Health Service (NHS) (2012). *Obesity*. [online]. <http://www.nhs.uk/conditions/Obesity/Pages/Introduction.aspx>.
- National Institute for Health and Care Excellence (NICE) (2014). *Obesity: Identification, assessment and management*. [online]. nice.org.uk/.
- National Obesity Observatory (NOO) (2011). *Supplement: Measuring diet and physical activity in weight management interventions*. [online]. <http://www.noo.org.uk/>.
- National Social Marketing Centre (NSMC) (2016). *What is Social Marketing?* [online]. <http://www.thensmc.com/content/what-social-marketing-1>.
- NAUGHTON, Paul, MCCARTHY, Sinéad N. and MCCARTHY, Mary B. (2015). The creation of a healthy eating motivation score and its association with food choice and physical activity in a cross sectional sample of Irish adults. *International Journal of Behavioral Nutrition and Physical Activity*, **12** (1), 74.

NAYLOR, Patti-Jean, et al. (2010a). Publically funded recreation facilities: obesogenic environments for children and families? *International Journal of Environmental Research and Public Health*, **7** (5), 2208-2221.

NAYLOR, Patti-Jean, et al. (2010b). Facilitating healthier food environments in public recreation facilities: Results of a pilot project in British Columbia, Canada. *Journal of Park and Recreation Administration*, **28** (4), 37-58.

NAYLOR, Patti-Jean, OLSTAD, Dana and THERRIEN, Suzanne (2015). An Intervention To Enhance the Food Environment in Public Recreation and Sport Settings: A Natural Experiment in British Columbia, Canada. *Childhood Obesity*, **11** (4), 364-374.

NELSON, Larry and HENDERSON, Steven (2005). Best Value and the Market Orientation of UK Recreation Centres. *Local Government Studies*, **31** (2), 237-257.

NEUMAN, W. L. (2011). *Social research methods : qualitative and quantitative approaches*. 7th ed., Boston, Mass ; London: Pearson.

NEUMAN, W. L. (2014). *Social research methods : qualitative and quantitative approaches*. Seventh ed; Harlow, Essex: Pearson.

NHS Choices (2014a). *Coronary heart disease - prevention* . [online]. <http://www.nhs.uk/Conditions/Coronary-heart-disease/Pages/Prevention.aspx>.

NHS Choices (2014b). *What are 'reference intakes' on food labels?* [online]. <http://www.nhs.uk/Livewell/Goodfood/Pages/reference-intakes-RI-guideline-daily-amounts-GDA.aspx>.

NHS Choices (2015a). *Controversial 'sugar tax' report is finally published*. [online]. <http://www.nhs.uk/news/2015/10October/Pages/Controversial-sugar-tax-report-published.aspx>.

NHS Choices (2015b). *How does sugar in our diet affect our health?* [online]. <http://www.nhs.uk/Livewell/Goodfood/Pages/sugars.aspx>.

NHS Choices (2016a). *Understanding Calories*. [online]. <http://www.nhs.uk/Livewell/loseweight/Pages/understanding-calories.aspx>.

NHS Choices (2016b). *Causes of obesity*. [online]. <http://www.nhs.uk/Conditions/Obesity/Pages/Causes.aspx>.

NHS Choices (2016c). *'Exercise labels' should be added to food packets, expert argues*. [online]. <http://www.nhs.uk/news/2016/04April/Pages/Exercise-labels-should-be-added-to-food-packets-expert-argues.aspx>.

NORD, W. and PETER, J. (1980). A behavior modification perspective on marketing. [online]. *Journal of Marketing*, **44** (2), 36-47.

NOWAK, M., JEANES, Y. and REEVES, S. (2012). The food environment in leisure centres and health clubs: how appropriate is it for children? *Nutrition & Food Science*, **42** (5), 307-314.

O'KEEFE, Daniel J. and JENSEN, Jakob D. (2007). The Relative Persuasiveness of Gain-Framed Loss-Framed Messages for Encouraging Disease Prevention Behaviors: A Meta-Analytic Review. *Journal of Health Communication*, **12** (7), 623-644.

OLSTAD, Dana Lee, et al. (2011a). Improving children's nutrition environments: A survey of adoption and implementation of nutrition guidelines in recreational facilities.(Research article). *BMC Public Health*, **11** , 423.

OLSTAD, Dana Lee, et al. (2011b). Implementing the Alberta nutrition guidelines for children and youth in a recreational facility. *Canadian Journal of Dietetic Practice and Research*, **72** (4), 177.

OLSTAD, Dana, et al. (2014). Choosing healthier foods in recreational sports settings: a mixed methods investigation of the impact of nudging and an economic incentive. *International Journal of Behavioral Nutrition and Physical Activity*, **11** , 6.

OLSTAD, Dana Lee, et al. (2015a). If we offer it, will children buy it? Sales of healthy foods mirrored their availability in a community sport, commercial setting in Alberta, Canada. *Childhood Obesity*, **11** (2), 156-164.

OLSTAD, Dana Lee, et al. (2015b). Using traffic light labels to improve food selection in recreation and sport facility eating environments. *Appetite*, **91** , 329-335.

OLSTAD, Dana Lee, et al. (2015c). Policy outcomes of applying different nutrient profiling systems in recreational sports settings: the case for national harmonization in Canada. *Public Health Nutrition*, **18** (12), 2251-2262.

OLSTAD, Dana Lee and RAINE, Kim D. (2013). Profit versus public health: the need to improve the food environment in recreational facilities. *Canadian Journal of Public Health*, **104** (2), e167.

OLSTAD, Dana Lee, RAINE, Kim D. and MCCARGAR, Linda J. (2012). Adopting and implementing nutrition guidelines in recreational facilities: public and private sector roles. A multiple case study. *BMC public health*, **12** (1), 376.

PALLANT, Julie F. (2007). *SPSS survival manual: A step-by-step guide to data analysis with SPSS*. 3rd ed., New York, McGraw-Hill.

PALLANT, Julie (2016). *SPSS survival manual : a step by step guide to data analysis using IBM SPSS*. 6th ed., Maidenhead, Berkshire : McGraw-Hill Education.

- PANG, Jocelyn and HAMMOND, David (2013). Efficacy and Consumer Preferences for Different Approaches to Calorie Labeling on Menus. *Journal of Nutrition Education and Behavior*, **45** (6), 669-675.
- PAPOUTSI, Georgia S., et al. (2015). Fat tax, subsidy or both? The role of information and children's pester power in food choice. *Journal of Economic Behavior and Organization*, **117** , 196-208.
- PEARCEY, Sharon M. and ZHAN, Ginny Q. (2018). A comparative study of American and Chinese college students' motives for food choice. *Appetite*, **123** , 325-333.
- PETRESCU, Dragos C., et al. (2016). Public Acceptability in the UK and USA of Nudging to Reduce Obesity: The Example of Reducing Sugar-Sweetened Beverages Consumption. *Plos one*, **11** (6), e0155995.
- PETROVICI, Dan, et al. (2012). Nutritional knowledge, nutritional labels, and health claims on food; A study of supermarket shoppers in the South East of England. *British Food Journal*, **114** (6), 768-783.
- PETTIGREW, Simone, et al. (2012). Public support for restrictions on fast food company sponsorship of community events. *Asia Pacific Journal of Clinical Nutrition*, **21** (4), 609-617.
- PIENIAK, Zuzanna, et al. (2009). Association between traditional food consumption and motives for food choice in six European countries. *Appetite*, **53** (1), 101-108.
- PILNICK, A. and SWIFT, JA (2011). Qualitative research in nutrition and dietetics: assessing quality. *Journal of Human Nutrition and Dietetics*, **24** (3), 209-214.
- POHJANHEIMO, Terhi A. and SANDELL, Mari A. (2009). Headspace volatiles contributing to flavour and consumer liking of wellness beverages. *Food Chemistry*, **115** (3), 843-851.
- POVEY, Rachel, et al. (2000). Application of the Theory of Planned Behaviour to two dietary behaviours: Roles of perceived control and self- efficacy. *British Journal of Health Psychology*, **5** (2), 121-139.
- PRENTICE, A. M. and JEBB, S. A. (1995). Obesity in Britain: gluttony or sloth? *BMJ (clinical research ed.)*, **311** (7002), 437-439.
- PRIDGEON, Lisa and GROGAN, Sarah (2012). Understanding exercise adherence and dropout: an interpretative phenomenological analysis of men and women's accounts of gym attendance and non-attendance. *Qualitative Research in Sport, Exercise and Health*, **4** (3), 382-399.

PRIEST, Naomi, et al. (2005). Policy interventions implemented through sporting organisations for promoting healthy behaviour change. *Cochrane Database of Systematic Reviews*, (2).

PROVENCHER, Véronique, POLIVY, Janet and HERMAN, C. Peter (2009). Perceived healthiness of food. If it's healthy, you can eat more! *Appetite*, **52** (2), 340-344.

PROVENCHER, Vé and JACOB, Raphaëlle (2016). Impact of Perceived Healthiness of Food on Food Choices and Intake. *Current Obesity Reports*, **5** (1), 65-71.

Public Health England (2014a). *PHE release local authority adult obesity data*. [online]. <https://www.gov.uk/government/policies/obesity-and-healthy-eating>.

Public Health England (2014b). *Healthier and More Sustainable Catering: Nutrition Principles. The Scientific Principles for Developing Nutrient-Based Standards for Planning Nutritionally Balanced Menus*. <https://www.gov.uk/>

Public Health England (2014c). *Sheffield Unitary Authority Health Profile 2014*. [online]. <https://fingertips.phe.org.uk/profile/health-profiles/area-search-results/>.

Public Health England (2014d). *National Diet and Nutrition Survey. Results from Years 1, 2, 3 and 4 (combined) of the Rolling Programme (2008/2009 - 2011/2012)*. [online]. <https://www.gov.uk/government/statistics/national-diet-and-nutrition-survey-results-from-years-1-to-4-combined-of-the-rolling-programme-for-2008-and-2009-to-2011-and-2012>.

Public Health England (2015a). *Sugar Reduction: The evidence for action. Annexe 6: Knowledge, education, training and tools*.

Public Health England (2015b). *New Change4Life campaign encourages families to make sugar swaps*. [online]. <https://www.gov.uk/government/news/new-change4life-campaign-encourages-families-to-make-sugar-swaps>.

Public Health England (2016a). *The Eatwell Guide: how does it differ to the eatwell plate and why?* [online]. <https://www.gov.uk/government/publications/the-eatwell-guide>.

Public Health England (2016b). *Eatwell Guide: Colour PDF*. [online]. <https://www.gov.uk/government/publications/the-eatwell-guide>.

Public Health England (2016c). *Sugar Reduction. The evidence for action*. [online]. <https://www.gov.uk/government/publications/sugar-reduction-from-evidence-into-action>.

RAO, M., et al. (2013). Do healthier foods and diet patterns cost more than less healthy options? A systematic review and meta-analysis. *BMJ open*, **3** (12).

RAYNER, Mike, SCARBOROUGH, Peter and STOCKLEY, Lynn (2004). Nutrient profiles: options for definitions for use in relation to food promotion and children's diets. <https://www.researchgate.net/>

REALE, Sophie and FLINT, Stuart William (2016). The Impact of Menu Label Design on Visual Attention, Food Choice and Recognition: An Eye Tracking Study. *Journal of Sensory Studies*, **31** (4), 328-340.

RHODES, Ryan E. and COURNEYA, Kerry S. (2003). Investigating multiple components of attitude, subjective norm, and perceived control: An examination of the theory of planned behaviour in the exercise domain. *British Journal of Social Psychology*, **42** (1), 129-146.

ROBERTO, Christina A., et al. (2010). Evaluating the impact of menu labeling on food choices and intake. *American Journal of Public Health*, **100** (2), 312-317.

ROBERTS, Donald F., FOEHR, Ulla G. and RIDEOUT, Victoria (2005). *Generation M: Media in the Lives of 8-18 year olds*. Henry J. Kaiser Family Foundation.

ROBINSON, E. L. and HIGGS, S. (2011). Social influences on food choice. *Appetite*, **57** S36-S36.

ROININEN, Katariina, et al. (2001). Differences in health and taste attitudes and reported behaviour among Finnish, Dutch and British consumers: a cross-national validation of the Health and Taste Attitude Scales (HTAS). *Appetite*, **37** (1), 33-45.

ROININEN, K., LÄHTEENMÄKI, L. and TUORILA, H. (1999). Quantification of Consumer Attitudes to Health and Hedonic Characteristics of Foods. *Appetite*, **33** (1), 71-88.

ROSEMAN, Mary G., MATHE-SOULEK, Kimberly and HIGGINS, Joseph A. (2013). Relationships among grocery nutrition label users and consumers' attitudes and behavior toward restaurant menu labeling. *Appetite*, **71**, 274-278.

ROSENSTOCK, Irwin M., STRECHER, Victor J. and BECKER, Marshall H. (1988). Social learning theory and the health belief model. *Health Education Quarterly*, **15** (2), 175-183.

ROTHSCHILD, Michael L. (1999). Carrots, sticks, and promises: A conceptual framework for the management of public health and social issue behaviors. *The Journal of Marketing*, , 24-37.

Royal Society for Public Health (2016). *Introducing "activity equivalent" calorie labelling to tackle obesity*. [online]. <https://www.rsph.org.uk/our-work/policy/activity-equivalent-labelling.html>.

ROZIN, Paul, et al. (2011). Nudge to nobesity I: Minor changes in accessibility decrease food intake. *Judgment and Decision Making*, **6** (4), 323.

RUSSELL, Catherine G., WORSLEY, Anthony and LIEM, Djin G. (2015). Parents' food choice motives and their associations with children's food preferences. *Public Health Nutrition*, **18** (6), 1018.

SAKS, Mike and ALLSOP, Judy (2007). *Researching health : qualitative, quantitative and mixed methods*. Los Angeles, Calif. ; London: SAGE.

SALLIS, James F. and GLANZ, Karen (2009). Physical Activity and Food Environments: Solutions to the Obesity Epidemic. *Milbank Quarterly*, **87** (1), 123-154.

SCAMMON, Debra L., et al. (2011). Transforming consumer health. *Journal of Public Policy & Marketing*, **30** (1), 14-22.

SEO, Sunhee, KIM, Og Yeon and SHIM, Soonmi (2014). Using the theory of planned behavior to determine factors influencing processed foods consumption behavior. *Nutrition Research and Practice*, **8** (3), 327-335.

SHADISH, William R. and LUELLEN, Jason K. (2005). Quasi-experimental Designs. *Encyclopedia of Statistics in Behavioral Science*. John Wiley & Sons.

Sheffield City Council (2013). *Sheffield Wards and Wellbeing Profile 2013*. [online]. <http://www.sheffield.gov.uk/>.

Sheffield City Council (2014). *Leisure Centres, Sports and Swimming Pools*. [online]. <https://www.sheffield.gov.uk/>.

Sheffield City Council (2017). *Ward Profile*. [online]. <http://www.sheffield.gov.uk/>.

SHEPHERD, R., SPARKS, P. and GUTHRIE, C. (1995). The application of the theory of planned behaviour to consumer food choice. *European Advances in Consumer Research*, **2** , 360-365.

SIMMONS, Annie, et al. (2009). Creating community action plans for obesity prevention using the ANGELO (Analysis Grid for Elements Linked to Obesity) Framework. *Health Promotion International*, **24** (4), 311-324.

SKINNER, Burrhus Frederic (1953). *Science and human behavior*. Simon and Schuster.

SKOV, L. R., et al. (2013). Choice architecture as a means to change eating behaviour in self-service settings: a systematic review. *Obesity Reviews*, **14** 187-196.

SMITH, Dianna, et al. (2013). Does the local food environment around schools affect diet? Longitudinal associations in adolescents attending secondary schools in East London. *BMC Public Health*, **13** (1), 70.

SMITH, J. and FIRTH, J. (2011). Qualitative data analysis: the framework approach. *Nurse Researcher*, **18** (2), 52-62.

SMITH, Karen H. and STUTTS, Mary Ann (2003). Effects of short-term cosmetic versus long-term health fear appeals in anti-smoking advertisements on the smoking behaviour of adolescents. *Journal of Consumer Behaviour*, **3** (2), 157-177.

SOLOMON, M., et al. (2013). *Marketing Real People, Real Decisions*. 2nd ed., Pearson Education Limited.

SONNENBERG, Lillian, et al. (2013). A traffic light food labeling intervention increases consumer awareness of health and healthy choices at the point-of-purchase. *Preventive Medicine*, **57** (4), 253-257.

Sport England (2014a). *The National Picture*. [online]. <https://www.sportengland.org/>.

Sport England (2014b). *Sheffield - sport and active recreation participant profile*. [online]. <https://www.sportengland.org/>.

STEIGER, James H. (2007). Understanding the limitations of global fit assessment in structural equation modeling. *Personality and Individual Differences*, **42** (5), 893-898.

STEPTOE, A., POLLARD, T. and WARDLE, J. (1995). Development of a measure of the motives underlying the selection of food: the food choice questionnaire. [online]. *Appetite*, **25** (3), 267-284.

STEVENS, J. P. (2002). *Applied Multivariate Statistics for the Social Sciences*. 4th ed., Hillsdale, NJ, Erlbaum.

SUN, Y. (2008). Health concern, food choice motives, and attitudes toward healthy eating: The mediating role of food choice motives. [online]. *Appetite*, **51** (1), 42-49.

SÜTTERLIN, Bernadette and SIEGRIST, Michael (2015). Simply adding the word "fruit" makes sugar healthier: The misleading effect of symbolic information on the perceived healthiness of food. *Appetite*, **95**, 252-261.

SWINBURN, Boyd, EGGER, Garry and RAZA, Fezeela (1999). Dissecting Obesogenic Environments: The Development and Application of a Framework for Identifying and Prioritizing Environmental Interventions for Obesity. *Preventive Medicine*, **29** (6), 563-570.

SYLOW, Mine and HOLM, Lotte (2009). Building groups and independence: The role of food in the lives of young people in Danish sports centres. *Childhood*, **16** (2), 213-228.

TABACHNICK, Barbara G. and FIDELL, Linda S. (2007). *Using multivariate statistics*. 5th ed., Boston, Mass; London, Allyn and Bacon.

TANDON, Pooja S., et al. (2011). The Impact of Menu Labeling on Fast-Food Purchases for Children and Parents. *American Journal of Preventive Medicine*, **41** (4), 434-438.

TEDDLIE, Charles and YU, Fen (2007). *Mixed Methods Sampling*. Journal of Mixed Methods Research, **1** (1), 77-100.

THALER, Richard H. and SUNSTEIN, Cass R. (2009). *Nudge: improving decisions about health, wealth and happiness*. [online]. London, Penguin.

The Guardian (2013). *Leisure trusts help councils save money*. [online]. <https://www.theguardian.com/>.

The Guardian (2015). *Sugar and Britain's obesity crisis: the key questions answered*. [online]. <https://www.theguardian.com/society/2015/oct/23/sugar-britains-obesity-crisis-key-questions-answered>.

THOMAS, Heather and IRWIN, Jennifer (2010). Food Choices in Recreation Facilities: Operators' and Patrons' Perspectives. *Canadian Journal of Dietetic Practice and Research*, **71** (4), 180-185.

THOMAS, Megan, et al. (2012). Exploring Parent Perceptions of the Food Environment in Youth Sport. *Journal of Nutrition Education and Behavior*, **44** (4), 365-371.

THORNDIKE, Anne N., et al. (2014). Traffic-Light Labels and Choice Architecture: Promoting Healthy Food Choices: Promoting Healthy Food Choices. *American Journal of Preventive Medicine*, **46** (2), 143-149.

Town and Country Planning Association (TCPA) (2014). *Planning Healthy - Weight Environments - A TCPA Reuniting Health with Planning Project*. [online]. <https://www.tcpa.org.uk/healthyplanning>.

TOWNSHEND, Tim and LAKE, Amelia A. (2009). Obesogenic urban form: theory, policy and practice. *Health & Place*, **15** (4), 909-916.

TRABULSI, J. and SCHOELLER, D. A. (2001). Evaluation of dietary assessment instruments against doubly labeled water, a biomarker of habitual energy intake. *American Journal of Physiology. Endocrinology and Metabolism*, **281** (5), E891-9.

TRESIDDER, Richard and HIRST, Craig (2012). *Marketing in food, hospitality, tourism and events a critical approach*. Oxford; Woodeaton, Goodfellow.

TSIAMPARLI, Elisavet, TSAKIRIDOU, Efthimia and MATTAS, Konstadinos (2013). Greek Consumers' Perceptions of Healthy Diet. *Biotechnology & Biotechnological Equipment*, **27** (6), 4341-4343.

TURLEY, Lou W. and SHANNON, J. Richard (2000). The impact and effectiveness of advertisements in a sports arena. *Journal of Services Marketing*, **14** (4), 323-336.

TURNWALD, Bradley P., BOLES, Danielle Z. and CRUM, Alia J. (2017). Association Between Indulgent Descriptions and Vegetable Consumption: Twisted Carrots and Dynamite Beets. *JAMA Internal Medicine*, **177** (8), 1216-1218.

US Food and Drug Administration (2017). *Calorie Labeling on Restaurant Menus and Vending Machines: What You Need To Know*. [online]. <https://www.fda.gov/food/ingredientspackaginglabeling/labelingnutrition/ucm436722.htm>.

VAN HERPEN, Erica and VAN TRIJP, Hans C. M. (2011). Front-of-pack nutrition labels. Their effect on attention and choices when consumers have varying goals and time constraints. *Appetite*, **57** (1), 148-160.

VAN KLEEF, Ellen, OTTEN, Kai and VAN TRIJP, Hans CM (2012). Healthy snacks at the checkout counter: A lab and field study on the impact of shelf arrangement and assortment structure on consumer choices. *BMC Public Health*, **12** (1), 1072.

VANDER WEKKEN, Suzanne, et al. (2012). Exploring industry perspectives on implementation of a provincial policy for food and beverage sales in publicly funded recreation facilities. *Health policy*, **104** (3), 279-287.

VERMEIR, Iris and VERBEKE, Wim (2008). Sustainable food consumption among young adults in Belgium: Theory of planned behaviour and the role of confidence and values. *Ecological Economics*, **64** (3), 542-553.

VYTH, Ellis L., et al. (2010). Actual use of a front-of-pack nutrition logo in the supermarket: consumers' motives in food choice. *Public Health Nutrition*, **13** (11), 1882-1889.

WADHERA, Devina and CAPALDI-PHILLIPS, Elizabeth D. (2014). A review of visual cues associated with food on food acceptance and consumption. *Eating Behaviors*, **15** (1), 132-143.

WALLENDORF, Melanie and BELK, Russell W. (1989). *Assessing trustworthiness in naturalistic consumer research*. <http://www.acrwebsite.org/>

WANG, Wei C., WORSLEY, Anthony and HUNTER, Wendy (2012). Similar but different. Health behaviour pathways differ between men and women. *Appetite*, **58** (2), 760-766.

WANSINK, Brian, PAINTER, James and VAN ITTERSUM, Koert (2001). Descriptive menu labels' effect on sales. *The Cornell Hotel and Restaurant Administration Quarterly*, **42** (6), 68-72.

WIIG DAMMANN, Kristen and SMITH, Chery (2009). Factors Affecting Low-income Women's Food Choices and the Perceived Impact of Dietary Intake and Socioeconomic Status on Their Health and Weight. *Journal of Nutrition Education and Behavior*, **41** (4), 242-253.

WILLIAMS, Brett, ONSMAN, Andrys and BROWN, Ted (2010). Exploratory factor analysis: A five-step guide for novices. *Australasian Journal of Paramedicine*, **8** (3).

WILLIAMS, J., et al. (2014). A systematic review of the influence of the retail food environment around schools on obesity-related outcomes. *Obesity Reviews*, **15** (5), 359-374.

WONG, Michelle S., et al. (2015). Using a computational model to quantify the potential impact of changing the placement of healthy beverages in stores as an intervention to “Nudge” adolescent behavior choice. *BMC Public Health*, **15** (1), 1284.

World Health Organization (WHO) (2012). *Prioritizing Areas for Action in the Field of Population-based Prevention of Childhood Obesity*. [online]. <http://www.who.int/dietphysicalactivity/childhood/tools/en/>.

World Health Organization (WHO) (2013). *Obesity*. [online]. http://www.who.int/gho/ncd/risk_factors/obesity_text/en/.

World Health Organization (WHO) (2014). *Global Strategy on Diet, Physical Activity and Health*.

WRIEDEN, W., GREGOR, A. and BARTON, K. (2008). *Have food portion sizes increased in the UK over the last 20 years? Proceedings of the Nutrition Society*, **67**, (OCE4).

YOUNG, Lisa R. and NESTLE, Marion (2012). Reducing Portion Sizes to Prevent Obesity: A Call to Action: A Call to Action. *American Journal of Preventive Medicine*, **43** (5), 565-568.