Increasing attendances at health and fitness venues

Matthew Rand

School of Health and Related Research

Faculty of Medicine, Dentistry and Health

University of Sheffield

Thesis submitted for the Degree of Doctor of Philosophy

June 2021

Abstract

Background: There is a need for longer-term physical activity in the general population and health and fitness organisations are well placed to increase levels of physical activity. Individuals typically sign up for a membership at a health and fitness organisation of their own accord and can then choose when and how often to use venue facilities. Little is known, though, about the extent to which members of health and fitness venues maintain their attendance and the factors that explain and could promote sustained attendance at health and fitness venues.

Aims: This thesis sought to analyse members' attendance data to develop a theoretically informed evidence-based intervention to increase attendance at health and fitness venues.

Methods: In Study 1, 1726 new members' attendance data at a not-for-profit health and fitness organisation in Sheffield were analysed to chart attendance rates and assess potential correlates of attendance maintenance. In Study 2, 13 semi-structured interviews were conducted with members of the organisation who had successfully maintained their attendance to explore the factors that enable continued attendance. In Study 3, a systematic review was undertaken of previous interventions to increase attendances at health and fitness venues. Study 4 comprised a service evaluation of an intervention delivered by the health and fitness organisation that sought to increase attendance rates in new members (N = 438).

Results: Study 1 found that attendances decreased significantly over the first 12 months of membership and that age, frequency of attendance in quarter one and stability of attendance context were significantly associated with quarter four attendance. Study 2 identified five key enablers of attendance: routine, motivations for attendance, accomplishment, venue experience and convenience. Study 3 found that there was little evidence to link specific behaviour change techniques to increased attendance. Study 4 reported that a habit planner

reduced the decline in attendance by month 6 through the development of context stability in attendance behaviour.

Conclusion: The present research demonstrates that a detailed understanding of the determinants of sustained attendance behaviour can be used to develop an evidence-based intervention to reduce the decline in attendance of new health and fitness members. Crucially, the development of a stable pattern of attendance in the early stages of a membership was linked to the maintenance of attendance behaviour. The thesis therefore highlights the importance of context stability for maintaining attendances at health and fitness venues.

Acknowledgements

I would like to thank my supervisors Professor Liddy Goyder and Professor Paul Norman for your fantastic supervision. I have thoroughly enjoyed working with you and I am hugely appreciative of your support, encouragement and guidance. I am incredibly grateful for the opportunity to have worked on what has been an extremely interesting PhD project.

Thank you to all of the team at Sheffield City Trust. Particular thanks to Rob Womack who has been hugely supportive of the research project within Sheffield City Trust. It has been great working with you. Thank you to Andrew Snelling, Stuart Ridley and Tim Hicks for your time, your input and your feedback throughout the research project. I would also like to thank the wider information technology and health and fitness teams within Sheffield City Trust who have helped to make the research project possible.

I would like to thank Kirsty Tolmay and Matt Hunt for your timely support throughout the last three years. I would also like to thank the ESRC and the White Rose Doctoral Training Programme team for all of the developmental opportunities and the opportunity to collaborate with likeminded PhD researchers across the White Rose network. Thank you to my fellow PhD students at the University of Sheffield for your support and feedback. I wish you well in your studies.

Finally, thank you to my Mum, Dad and sister Anne-Marie for all of your enthusiasm and encouragement throughout the PhD process.

Table of Contents

List of Tables and Figures

List of Tables

List of Figures

List of Abbreviations

ANCOVA	Analysis of Covariance
ANOVA	Analysis of Variance
B	Unstandardized Beta
BCT	Behaviour Change Technique
CI	Confidence Interval
d	Cohen's *d*
DV	Dependent Variable
DoHA	Department of Health Australia
HM Government	Her Majesty's Government
IV	Independent Variable
METs	Metabolic Equivalents
N	Population Size
n	Sample Size
NHS	National Health Service
NICE	The National Institute For Health and Care Excellence
NIH	National Institutes of Health
p	Probability Value
PA	Physical Activity
PHE	Public Health England
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
r	Pearson Correlation Coefficient
RCT	Randomised Controlled Trial
ScHARR	School of Health and Related Research
SCT	Social Cognitive Theory
SD	Standard Deviation
SDT	Self Determination Theory
SE	Standard Error
SPSS	Statistical Product and Service Solutions
SRBAI	Self-Report Behavioural Automaticity Index
SRHI	Self-Report Habit Index
TPB	Theory of Planned Behaviour
TTM	Transtheoretical Model
UK	United Kingdom
USA	United States of America
USDHHS	United States Department of Health and Human Services
WHO	World Health Organisation
β	Beta

List of Publications from the Thesis

Rand, M., Goyder, E., Norman, P., & Womack, R. (2020). Why do new members stop attending health and fitness venues? The importance of developing frequent and stable attendance behaviour. *Psychology of Sport and Exercise*, 51.

Rand, M., Norman, P., & Goyder, E. (2020). A systematic review of interventions to increase attendance at health and fitness venues: identifying key behaviour change techniques. *BMC public health*, 20(1), 1874.

Chapter 1. Introduction

Overview

This introductory chapter outlines the prevalence of physical inactivity globally and the potential role of the health and fitness sector in increasing levels of physical activity (PA). Prior research that has aimed to increase PA at health and fitness venues is outlined, highlighting the need for more research to increase attendances at health and fitness venues.

Physical inactivity

Globally, it is estimated that 23% of the adult population are inactive (WHO, 2018a), as they do not meet the World Health Organisations (WHO) set of guidelines for the amount of PA adults should achieve. Specifically, it is recommended that adults undertake at least 150 minutes of moderate intensity aerobic activity PA in a week or 75 minutes of vigorous intensity PA in a week (WHO, 2018a). The subsequent costs of inactivity in the UK is estimated to be substantial, with one in six deaths attributed to individuals undertaking insufficient amounts of PA, costing the NHS approximately £7.4 billion each year (PHE, 2018). There are many benefits of PA on a range of physical and psychological conditions, including cardiovascular disease (Reiner et al., 2013), type 2 diabetes (Allbright et al., 2000), type 1 diabetes (Krzewska & Ben-Showronek, 2016), cancer (Clague & Bernstein, 2012), bronchial asthma (Wenzel, 2006) and anxiety (Privitera et al., 2014). For the full benefits of PA to be achieved, PA not only needs to be adopted, but maintained. The maintenance of PA behaviour may vary in frequency but is characterised by being a continual process over time (Jekauc et al., 2015).

The health and fitness sector's role in increasing PA

Given the significant levels of inactivity within the UK, Sport England, within *Towards an Active Nation*, has encouraged providers and non-providers of PA to promote PA to ensure inactive groups become more active (Sport England, 2016a). Those that are

identified include workplaces, local environments such as parks, local authorities, NHS commissioners and the sport and leisure industry (PHE, 2016a). The sport and leisure industry, and specifically a subset of the industry, the health and fitness sector, is often the first to be identified to help address the issue of inactivity, given that it provides PA as a primary service in itself (Varney, 2015). 188,000 people are estimated to be employed in this subsector including personal trainers and coaches (Statista, 2016). Thus, professionals within the industry are likely to be well placed to promote active lifestyles given their expertise in this area (Varney, 2015). Leaders of the NHS, UK Active (a not-for-profit industry association promoting the interests of health and fitness venues) and health and fitness organisations such as Pure Gym have all called on the health and fitness industry to do more to increase societal PA levels (Cave, 2015; Health Club Management, 2017; Walker, 2018).

Health and fitness membership

The health and fitness sector is typically characterised whereby members of the public pay a membership fee for access to PA facilities that can include treadmills, cycling machines, free weights, exercise classes and swimming pools (Statista, 2016). Payments are typically taken monthly or yearly and can range from £100 a year to £1,000 a year depending on the type of facilities offered. Health and fitness venues are typically either commercially run, run for not-for-profit purposes or are council led (Statista, 2016). Members of venues decide of their own accord whether they want to join (i.e. pay for a membership) and whether they want to attend. Payments and attendance rates for members are generally not linked in that regardless of the amount of times a member attends the venue, the monthly or yearly membership rate is unlikely to differ. These members are likely to be different in their initiation of their membership than other individuals who use health and fitness venues, such as those on exercise referral schemes or those that are members of organisations that hire the facilities (e.g. swimming clubs). For example, individuals on exercise referral schemes are

typically recommended to use venues by a primary care professional (e.g. doctor) and are generally enrolled onto specific exercise programmes (e.g. a set of exercise classes over a specified period). Although these individuals are often using the same facilities at the same venues as health and fitness members, the process behind which they have come to use the venues (e.g. having extrinsic motivation to attend due referral to a programme or facility by a health professional) is thus likely to be different. It is estimated that 1 in 7 (approximately 15%) of the UK population have a membership at a health and fitness organisation and are paying for a membership of their own accord (Leisure DB, 2019). Given that approximately 8.4 million people are therefore likely to be members at a venue, the health and fitness sector is ideally placed to increase levels of PA.

Health and fitness venue attendance

Measuring attendance at health and fitness venues is a useful indicator of the amount PA being undertaken by members at these venues. The maintenance of attendance of health and fitness members has followed a similar trend to other users of venues facilities, such as exercise referral schemes, where there has been a general uncertainty about whether such programmes increase PA (Pavey et al., 2011). In a study in the United States, analysis of objective measures of attendance reported that members were on average attending 4.36 times a year (DellaVigna & Malmendier, 2006). Similarly, low attendances have been reported on a group of ex-members in the Netherlands, where only 10% of members had regular attendance (defined as 4 times a month) in the first six months of their membership and 2.3% members had regular attendance for the first 24 months (Middelkamp et al., 2016). These findings demonstrate that attendances in health and fitness venues tend to be low and that there is scope to increase attendances within the sector.

Purpose of the thesis

Little is known about member attendances in the UK, although it is likely to be low given findings from the Netherlands (Middelkamp et al., 2016) and the USA (DellaVigna & Malmendier, 2006). Several questions remain unanswered, not least understanding the attendance behaviour of current members. Little is also known about what differentiates attending and non-attending members. This thesis seeks to further existing knowledge about members' use of health and fitness venues and to understand how the sector can help to increase levels of attendance in their members.

The research project has the following objectives:

1. To understand attendance levels and correlates of attendance of new members in health and fitness venues
2. To understand the enablers of attendance that might explain why members of health and fitness venues continue to use these venues
3. To understand the effectiveness of interventions designed to increase attendance at health and fitness venues
4. To develop and conduct a behavioural intervention to increase attendance at health and fitness venues in new members

The thesis reports four studies that address each of these objectives:

1. A quantitative analysis of new member attendance data at health and fitness venues
2. A qualitative investigation of continued member attendance at health and fitness venues
3. A systematic review of the effectiveness of interventions aimed to increase member attendance at health and fitness venues

4. A service evaluation of a simple intervention introduced by a health and fitness organisation that aimed to increase new members' attendance at health and fitness venues

Structure of the thesis

The research presented in this thesis therefore aims to gain a better understanding of the frequency of attendance at health and fitness venues in the UK, the correlates of attendance behaviour, and the effectiveness of an intervention to promote attendance. Four studies are presented in Chapters 3-6.

Study 1 aims to gain a better understanding of attendance at health and fitness venues through a quantitative analysis of new members' attendance data. The study sought to analyse the pattern of new members' attendance behaviour and to assess potential correlates of continued attendance, including age, gender, proximity to a venue, seasonality, frequency of early attendance and context stability (i.e., time and location of attendance). In particular, the following research questions were addressed: (1) What are the attendance levels of new members of a UK health and fitness organisation over the first 12 months of their membership? and (2) What are the correlates of continued attendance?

Study 2 aims to understand the enablers of attendance that might explain *why* members of health and fitness venues use these facilities. Aside from studies investigating attendance adherence to a specific exercise programme (e.g., Pridgeon & Grogan, 2012), very little is known in the UK about why subscription members continue to attend health and fitness venues. Study 2 therefore uses a qualitative approach to address this question, to understand the enablers associated with continued attendance at health and fitness venues.

Study 3 examines *how* greater attendance at health and fitness venues can be promoted. There is limited evidence about how health and fitness organisations can enhance member attendance levels in their venues. Study 3 therefore comprises a systematic review of

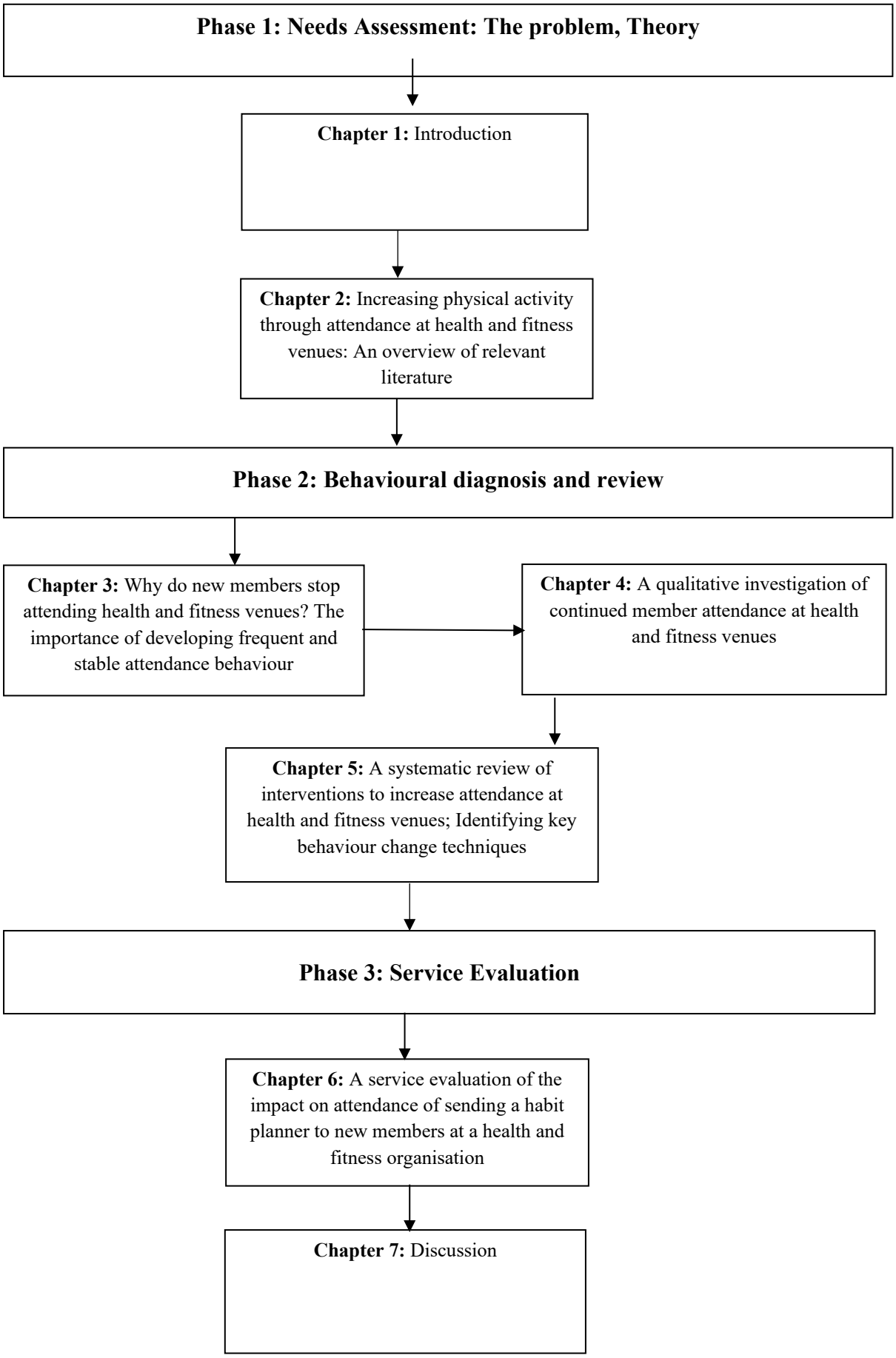
the literature on interventions that have attempted to increase attendance of members in the health and fitness sector. In particular, the study aims to identify the BCTs that have been used to successfully encourage greater attendance at health and fitness venues.

Study 4 utilises the findings from Studies 1-3, to develop and test an intervention to increase attendance levels within a health and fitness venue. The study takes the form of a service evaluation. The study considers effectiveness of the intervention and considers the implications of implementing such an approach.

In the final chapter of the thesis the principal findings from the four studies are summarised and discussed and their contribution to the literature considered. The implications of the findings for research, policy and practice are then discussed followed by the strengths and limitations of the research.

All of the data collection for the thesis was undertaken at Sheffield City Trust, a not-for-profit health and fitness organisation that operates venues in and around the city of Sheffield, UK. The organisation has six health and fitness venues in Sheffield, each offering gym equipment and group exercise classes, with five of the venues providing swimming pool facilities. Individuals can sign up to monthly or yearly contracts for access to these facilities.

Figure 1.1. Overview of the thesis chapters



Chapter 2. Increasing physical activity through attendance at health and fitness venues: An overview of relevant literature

The purpose of this chapter is to introduce the conceptual and theoretical foundations that inform the research objectives of the four studies to be included in the PhD thesis. In this chapter, eight issues are addressed: (1) definitions of physical activity (PA), (2) the benefits of PA, (3) PA recommendations in public health, (4) physical inactivity prevalence, (5) factors associated with PA, (6) interventions for increasing PA, (7) the responsibility for increasing PA, and (8) the health and fitness sector and PA.

Definitions of PA

PA is a broadly defined concept with a range of definitions, from simple statements about movement to a complex set of categories and concepts (Meyer & Gullotta, 2012; Thivel et al., 2018). PA is any bodily movement that results in an increase in energy expenditure (Rhodes et al., 2017). Similar definitions are provided by the World Health Organisation (WHO) (WHO, 2018) and the National Institutes of Health (NIH) (NIH, 2018).

PA has often been characterised by the FITT principles of frequency (how often), intensity (how vigorous), time (how long) and type (aerobic or anaerobic) (Rhodes et al., 2017). PA can encompass competitive sport and hobbies including walking, cycling and the general activities involved in daily life (e.g., gardening and housework) (NICE, 2018). Other terms may sometimes be used interchangeably with, or in place of, PA. Most notably, the term ‘exercise’ can often substitute PA in everyday language (Bouchard et al., 2007). Exercise has often been considered to be a planned and structured subset of PA (Caspersen et al., 1985; Rhodes et al., 2017). Thus, exercise typically has an intermediate or final objective such as sustained physical fitness. A distinction can also be made between sedentary behaviour and PA. Sedentary behaviour is characterised by expending low energy, for example sitting or a lying posture (Sedentary Behaviour Research Network, 2012). Where the

inconsistencies lie is generally when individuals are performing very low or non-existent levels of PA (Van der Ploeg & Hillsdon, 2017). As such, sedentary behaviour and low PA could be viewed as two distinct constructs. In an attempt to provide a consistent set of terms to describe activity or non-activity for the current research, Rhodes et al (2017) definition of PA described above will be adopted in this thesis.

Quantitative measures of PA

Quantitative measures of PA typically calculate the level of oxygen expended to undertake an activity (Haskell et al., 2007; Arem et al., 2015). The estimated intensity of PA is more commonly assessed with metabolic equivalents (METs), which indicate the oxygen requirements of different activities. METs are generally characterised into four categories: resting state is characterised by one MET; <3 METs includes light intensity PA, for example slow walking or gardening; 3-6 METs are moderate intensity activities including brisk walking or skipping and >6 METs include vigorous intensity physical activities. This latter category might include running or high intensity sports such as football or basketball (Ainsworth et al., 2000; Lee et al., 2017).

The benefits of PA

The National Health Service (NHS) in the UK estimates inactivity to be responsible for one in six UK deaths, similar to the levels attributed to smoking (PHE, 2018). In the UK, inactivity is thought to cost at least £7.4 billion each year (PHE, 2018). Sallis (2009) notes that in the United States, inactive patients cost over $1500 more per year to care for. PA has thus been associated with a number of health benefits. Sallis (2009) has even proposed that exercise should be prescribed as ‘medicine’ within primary care, given the range of health benefits it has to offer. Moderate intensity PA can have significant health benefits although vigorous PA can provide the greatest health benefits (Warburton et al., 2006). In addition, the avoidance of inactivity also has beneficial outcomes (Warburton & Bredin, 2017). According

to Hamilton and Owen (2012), being inactive for large periods of time can be dangerous for an individuals' physical health. Several studies have reported that the main benefits of the energy expenditure associated with PA are an increase in physical fitness and an increase in the capacity to do PA (Brown et al., 2015; Warburton, 2015). Long-term health effects are most often the result of frequent PA that is sustained over time (Marcus et al., 2000).

The benefits of PA on physical and psychological conditions

Research has evidenced the benefits of PA on a range of physical and psychological conditions. Specifically, research has reported benefits of PA for the prevention of specific diseases as well as on the disease itself (Rhodes et al., 2017). The impact of PA on cardiovascular diseases has received a large research focus (Reiner et al., 2013). Cardiovascular disease is a term for a group of disorders of the heart and blood vessels (NHS, 2016a). Specifically, findings across a number of large studies and assessment in a meta-analysis suggest the main benefits are on quality of life, physical function and an impact on heart failure related hospitalisation (Anderson et al., 2016). The key benefits in hypertension, commonly known as high blood pressure (NHS, 2016b), which is a risk factor for stroke and heart failure are the positive effects on normotensive and hypertensive blood pressure (Whelton et al., 2002).

Type 2 diabetes, characterised by abnormalities in fat, glucose and protein metabolism (Campbell, 2009), has a high prevalence worldwide (WHO, 2016b). There is a positive impact of PA on individuals with type 2 diabetes (Albright et al., 2000) and on individuals with the autoimmune disease, Type 1 diabetes (Krzewska & Ben-Showronek, 2016). Type 1 diabetes patients may be more likely to develop cardiovascular disease, and the main benefits of PA in this area are in its prevention mechanisms (Colberg et al., 2015). A large number of studies focusing on obesity recommend PA to increase the metabolic rate in

individuals (Swift et al., 2014). PA has also been found to prevent osteoporosis by stimulating bone formation and regulating bone maintenance (Borer, 2005).

Along with cardiovascular disease, cancer is one of the primary causes of premature death in the developed world (WHO, 2018b). Although diverse in nature, cancer is generally referred to as a group of diseases controlled by cell growth (NIH, 2015). PA has been found to protect against colon cancer, prostate cancer and endometrial cancer (Clague & Bernstein, 2012). Bronchial asthma, more commonly referred to as 'asthma', is a chronic inflammatory disorder caused by allergies, tobacco smoke and air pollution with children and adults suffering from the condition (Wenzel, 2006). A systematic review of 39 studies concluded that PA may protect against the development of asthma (Eijkemans et al., 2012).

In addition to the physical benefits of PA, there is also evidence for benefits on psychological well-being. Anxiety disorders are the most prevalent psychological health problem across the globe (WHO, 2016a). The main anxiety disorders are phobias, panic disorders and generalised anxiety disorder (WHO, 2016a). It has been estimated that at least 15% of people will experience some kind of anxiety disorder in their lifetime (NICE, 2011). The main benefits evidenced for PA on anxiety are in the short term, reducing the symptoms of anxiety and tension (NICE, 2011). Studies suggest that PA can aid individuals in providing a general positive outlook and feeling, regardless of whether they have the condition of anxiety or not (Privitera et al., 2014). In comparison to many other psychological conditions, research investigating whether PA is an appropriate intervention for depression, characterised by feelings of severe despondency and dejection (WHO, 2017), has grown substantially in recent years. Although there is little evidence to suggest a causal link between physical inactivity and depression, there is some evidence that PA can prevent the onset of depression (Harvey et al., 2018) and can have a positive effect on depressive symptoms (Josefsson et al., 2014).

PA recommendations in public health

The WHO outlines a specific set of guidelines for the amount of PA that all adults should achieve. Specifically, the WHO state that *"*Adults aged 18–64 years do at least 150 minutes of moderate-intensity aerobic PA throughout the week, or do at least 75 min of vigorous-intensity aerobic PA throughout the week, or an equivalent combination of moderate and vigorous-intensity activity*"* (WHO, 2018a, p.1). Similar amounts of PA have been recommended in Australia (DoHA, 2013), USA (USDHHS, 2008) and by PHE in the UK (PHE, 2016) suggesting that adults should be active daily. They recommend at least 150 minutes of moderate intensity activity each week in periods of 10 minutes or more. PHE further suggest that "comparable benefits can be achieved through 75 minutes of vigorous intensity activity spread across the week or combinations of moderate and vigorous intensity activity" (PHE, 2016).

Meeting the recommended levels of PA reduces the risk of non-communicable diseases (e.g., Bryan & Katzmarzk, 2011). Weed (2016) explored these recommendations from a critical policy approach and concluded that they are based on a value judgement. They propose that 90 minutes is a more effective recommendation as this is the stage where there are minimal returns on any additional PA (Weed, 2016). There are also questions related to how achievable 150 minutes is as a recommendation as previous research suggests that only 10-15% of adults typically achieve this target (Tucker et al., 2011; Garriguet & Colley, 2014).

Physical inactivity prevalence

It is estimated that, worldwide, 23% of adults aged over 18 are insufficiently active (WHO, 2018a). While the issue spreads across low and high income countries, it is in the more developed areas of the world where the levels of inactivity are highest (Dumith et al., 2011). Specifically, it is estimated that low or decreasing PA levels often associate with a

rising gross national product (WHO, 2018c). In the UK 26% of all adults are classified as inactive, i.e., not meeting the recommended guidelines for weekly PA (Sport England, 2016a). Although the prevalence of inactivity is high, the majority of adults indicate they should and would like to do higher amounts of PA (Craig et al., 2009).

Measuring PA

Measuring PA is key to charting the prevalence of activity and inactivity, exploring the correlates of PA and evaluating the effectiveness of interventions designed to increase PA levels. The assessment of PA has traditionally been conducted by self-report rather than objective measures. Although self-report measures are a relatively easy method to obtain data on PA, they could be prone to error, i.e., they are not thought to generate an accurate picture of the actual PA undertaken (Adams et al., 2005). Sources of error include social desirability, with respondents reporting answers that they believe will be viewed favourably by others (Adams et al., 2005) and recall bias, where respondents do not remember events or experiences accurately (Dowd et al., 2018). To overcome the limitations of self-report, objective measures of PA, such as those through an accelerometer, have been the preferred method of assessing PA levels as are thought to provide a more accurate measure of PA (Trost, 2020). Despite this assertion, the application of objective measures such as accelerometers has been questioned, with reliability and consistency between devices, the intensity cut off points chosen by the user, a lack of standardisation of data collection and the lack of the context in which PA has been undertaken (Pedisic & Bauman, 2014; Trost, 2020) the most prominent issues. Although no ‘perfect’ tool for measuring PA exists, objective measures that are specific to the behaviours of interest (i.e. the context) are generally thought to provide the most accurate picture of PA levels (Dowd et al., 2020).

Socio-demographics and PA

Associations have been reported between socio-demographic variables and PA. Specifically gender, age, education level and home location are factors that have been related to PA participation (Marques et al., 2016). There are contrasting results for gender; European women were identified to be more likely to meet the PA guidelines than men in one study (Marques et al., 2016), which is different from findings in other studies (Tucker et al., 2011; Hallel et al., 2012). It has been reported that PA participation levels decrease as age increases (Rhodes et al., 1999; Bauman et al., 2012), although recent research has suggested that PA may increase with age (Marques et al., 2016). One factor that may explain this association is that younger people could have increased barriers such as other commitments or competing priorities (Nikolaou et al., 2015; Strong et al., 2008). Environmental factors, such as proximity to PA locations and access to open space also have strong correlations with higher PA (Sallis et al., 2016).

Social cognition models and PA

Approaches to understanding individual differences in PA have traditionally focused on people's cognitions. There is a wealth of theory driven research that has explored the psychosocial factors associated with PA, drawing on four main psychological theories: Social Cognitive Theory (SCT), the Theory of Planned Behaviour (TPB), the Transtheoretical Model (TTM) and Self-Determination Theory (SDT) (Buchan et al., 2012).

SCT describes the factors that may determine behaviour (Davis et al., 2015). Self-efficacy, defined as an ability to accomplish a task or succeed in specific situations (Bandura, 1997), is the central variable within the theory and is thought by some researchers to be a key factor when predicting behaviour (McAuley et al., 2003). Self-efficacy influences the goals that individuals strive for and their ability to overcome obstacles in the quest to their goals (McAuley et al., 2003). Self-efficacy has been reported to be strongly associated with PA,

with the strength of this association generally consistent across a variety of health contexts (Dishman et al., 2004). Examining the factors that are associated with self-efficacy, the use of feedback referring to individuals' past performances and vicarious experience have been found to be the most effective in increasing PA (Ashford et al., 2010). In addition, 'providing an instruction', 'action planning' and 'reinforcing effort towards behaviour' have been associated with increased self-efficacy and PA (Williams & French, 2011). Self-efficacy has also been included in other theories, most notably the TPB (Buchan et al., 2012).

The TPB proposes that individuals are more likely to intend to engage in a behaviour when: 1) they have a positive attitude towards it; 2) they believe significant others want them to engage in the behaviour; and 3) they perceive it to be under their control and that they are capable of performing it (Ajzen, 1985). The theory further suggests that strong intentions and strong perceived behavioural control (comprising perceived control and self-efficacy) increases the likelihood of the behaviour (Ajzen, 1985). Perceived behavioural control and self-efficacy are conceptually similar as they both refer to an individual's belief that the behaviour is in their own control (Wallston, 2001). Operationally, perceived behavioural control is the ease or difficulty of the behaviour and self-efficacy is the confidence in being able to do the behaviour in the face of extenuating circumstances (Wallston, 2001). There is evidence that the TPB explains intentions to engage in PA (e.g., Chatzisarantis et al., 2007). Meta-analyses have estimated that the theory explains 51% of the variance in intentions to engage in PA, with all variables except perceived control as significant predictors (Chatzisarantis et al, 2007), and 29% of the variance in PA behaviour (Hagger et al., 2002). Further, self-efficacy has stronger predictive power than perceived control when predicting intentions and behaviour (Chatzisarantis et al., 2007). The TPB has been reported to explain 12.5% of PA behaviour in objective PA measurements and 25.5% of self-reported PA behaviour (McEachan et al., 2011).

The principal proposition of the TTM is that individuals pass through five stages based on their readiness to change: i.e., pre-contemplation, contemplation, preparation, action, and maintenance (Prochaska et al., 1992). The process of passing through these stages not only enhances participation in PA but decreases the chances of individuals taking up unwanted behaviours (Prochaska & Marcus, 1994). The TTM also outlines ten processes of change (i.e., consciousness raising, dramatic relief, self-re-evaluation, environmental re-evaluation, social liberation, self-liberation, helping relationships, counter-conditioning, reinforcement management, stimulus control) which individuals need to apply to move from one stage to another (Prochaska & DiClemente, 1983). A meta-analysis has indicated that individuals use all of the processes of change when attempting to change their PA and that the different stages are associated with different levels of PA in line with the TTM (Marshall & Biddle, 2001).

SDT provides an explanation of the motives underlying individuals' behaviour (Ryan & Deci, 2002). SDT is described in the form of three mini-theories: cognitive evaluation theory, organismic integration theory and basic needs theory and can therefore be described as a human motivation meta-theory to explain behaviour based on individual differences (Deci & Ryan, 2008). The first of these mini-theories, cognitive evaluation theory, explains how different social contexts affect intrinsic motivation and the effects of intrinsic motivation on behaviours (Deci & Ryan, 1985). Organismic integration theory extends this difference between intrinsic and extrinsic motivation to explain the motives behind individuals engaging in non-intrinsically motivated behaviours (Ryan & Deci, 2000). Basic needs theory highlights three essential needs in the form of autonomy, competence and relatedness (Ryan & Deci, 2000). When the three needs are supported, intrinsic motivation and the internationalisation of extrinsic factors are supported (Ryan & Deci, 2000). Tests of the validity of SDT have largely supported the relative contribution of the factors within the theory. Small-to-medium

effect sizes on PA behaviour have been reported for autonomy support (r = 0.23), intrinsic motivation (r = 0.32) and competence (r = 0.36) (Ng et al., 2012).

Critique of social cognition models

Although there is considerable evidence that behaviour can be modified through the use of social cognitive models, criticisms of these models relate to their (1) lack of attention on the maintenance of behaviour; (2) the gap between intention and behaviour and (3) their focus on deliberative and conscious processes rather than those that are automatic and impulsive.

Adoption and maintenance of behaviour

To achieve the full benefits of PA, behaviour needs to be not only adopted but maintained over time. Maintenance of behaviour is a continuous process which is accompanied by variation in PA behaviour over time (Jekauc et al., 2015; Rothman, 2000). Whilst the theories considered above provide a useful outline of the underlying processes for behaviour change, they were not specifically developed to explain the maintenance of behaviour over time. For example, in the TPB, behaviour is a function of an individual's intention to perform the behaviour which reflects the level of motivation to adopt the behaviour. Studies testing the TPB in the maintenance of PA are mixed and inconclusive, with the majority of work focusing on the features of TPB on intention. For example, only 30% of studies that included the TPB reported a moderating effect of perceived behavioural control on the maintenance of behaviour (Armitage & Conner, 2001; Armitage, 2005). Likewise, the SCT describes the factors influencing behaviour (Bandura, 2004). There is some evidence that self-efficacy predicts PA maintenance (e.g., Plotnikoff et al., 2008; White et al., 2012), although important aspects of the SCT were excluded (e.g., goals). In response to the lack of theoretical elaboration on the process of maintenance after initial change, a systematic review of behaviour change theories (Kwasnicka et al., 2016) identified five

interconnected themes (i.e., the role of motives, self-regulation, resources, habits, and environmental and social influences) that provided key explanations of behaviour change maintenance. These themes demonstrate that there are a range of factors not included in traditional cognition models that are important for the maintenance of PA behaviour.

Intention-behaviour gap

The social cognition models outlined above are primarily focused on an individual's motivation to undertake PA and have been found to provide strong predictions of the intention to do PA. For many health behaviours such as PA, an intention-behaviour gap exists and there is a weakness in models that focus on intention in understanding health behaviour change (Rhodes & de Bruijn, 2013). Thus, despite the strong explanation of intention, these models do not explain how good intentions are translated into action (i.e., PA). One way that intentions may translate into action is through implementation intentions, which describes when, where and how the goal intention will be translated into behaviour (Gollwitzer, 1993). The advantage of implementation intentions is that they pass control over performing the behaviour to environmental cues. Thus, an environmental cue can act as a prompt for the behaviour to be performed therefore ensuring that a goal intention is acted upon. It is therefore proposed that an implementation intention can increase the likelihood of the performance of a behaviour beyond intention alone.

Dual-process theories

A third criticism of the social cognition models outlined above is that they are too deliberative in nature and do not take into account the automatic and subconscious elements of cognition. Dual process theories describe behaviour as controlled by two information-process systems that can be distinguished based on the automaticity versus reflective nature of actions (Strobach et al., 2020). In PA, the automatic associations are as a result of learned PA and inactivity pleasure (or displeasure) associations that are recalled from the associative

memory network (Brand & Ekkekakis, 2018). A systematic review of 88 studies interventions aiming to change PA behaviour reported that 68% of interventions had a significant effect on behaviour, primarily through the use of prompts that operate through an automatic processes (Landais et al., 2020).

Habit and PA

Recent research has also targeted non-conscious and automatic constructs within PA through habit (Conroy & Berry, 2017). It is estimated that approximately half of individuals' daily behaviours are habitual (Wood, 2017). Habit refers to behavioural patterns that are enacted automatically and are influenced by learned cue-behaviour associations, or 'short cuts', performed in the same context (Gardner, 2015; Verplanken, 2018). These associations are learned through repeated performance in the same context (Gardner, 2015). Thus, habitual behaviour is argued to be formed through the execution of repeated behaviours when cues or contextual features are present (Wood, 2017). One advantage of developing habitual behaviour is in how behaviour is triggered; there is less need to reason, deliberate or use executive functioning capabilities about why and how to engage in the behaviour due to the behaviour being automatically triggered by a cue (Verplanken, 2018). The process that leads behaviour to develop into habits may involve the pursuit of goals and/or rewards; nevertheless, once a habit is developed, it is likely to be enacted efficiently without the need for goals and/or rewards (Hagger, 2019). Thus, when behaviour becomes habitual, it becomes less reliant on the goals that the behaviour was originally designed to serve (Wood, 2017). Individuals with strong PA habits have been found to continue with their behaviour even if they do not necessarily have the intentions to do so (Gardner et al., 2011). Similarly, runners who had developed PA habits responded quickly to word stimulus that represented their habitual behaviour (e.g. jogging) when the context of the behaviour was primed (e.g. gym) whereas running goals did not (Neal et al., 2012). Thus, with repetition of the behaviour in

stable contexts (e.g. time and place), the behaviour can shift from being guided by deliberative processes (e.g. the deliberate pursuit of goals) to automatic, non-conscious processes (Hagger, 2019). The stability of the context in which the behaviour has been performed has also been evidenced to be important along with the frequency of behaviour (Danner et al., 2008). Specifically, research has identified that as long as the context (e.g. time and place) that the behaviour is undertaken is consistent, deliberate intention is unlikely to be required (Danner et al., 2008). This finding builds on previous knowledge evidencing that behaviour is more likely to become habitual when it is performed frequently and in a stable context (Ouellette & Wood, 1998). Given the importance of sustained PA within the wider population, developing the means to promote PA habits from performing PA frequently in stable contexts could therefore have positive consequences on the maintenance of PA behaviour.

Measuring habit in PA

Studies investigating habit and PA have generally measured habitual behaviour through self-report measures; initially with the Self-Report Habit Index (SRHI) (Verplanken & Melkevik, 2008) which has demonstrated habit to be a distinct construct from frequency of behaviour, perceived behavioural control and intentions. A prominent criticism of the SRHI is that it does not include key components of the habitual experience, notably cues and context stability (Hagger, 2019). A measure that attempted to overcome this issue included 'patterned action' (e.g. "I exercise at the same location each week") (Grove et al., 2014). Context stability has also been incorporated into a measure of habit within consumers where the automaticity of behavioural response was directly cued by the context (e.g., location) (Wood & Neal, 2009). The Self-Report Behavioural Automaticity Index (SRBAI) (Gardner et al., 2012) has also been developed to assess the key component of habitual behaviour; namely, automaticity (Gardner et al., 2012). Two systematic reviews have reported medium

sized associations between measures of habit strength and PA (r = .43, Gardner et al., 2011; r = .32, Rebar et al., 2016).

Environmental factors and PA

Environmental attributes, such as those within ecological models, have been identified as key determinants of PA behaviour (Sallis & Hovell, 1990). A core focus of these models has been the physical environment or the setting that the PA is being undertaken (Humpel et al., 2002). A systematic review of environmental factors associated with adults' participation in PA found that accessibility, aesthetic factors and opportunity had significant associations with PA (Humpel et al., 2000). These included access to PA facilities, convenient access to destinations and urban 'walkability'. Lower associations were found with weather and safety (Humpel et al., 2000). Thus, interventions to encourage greater PA may benefit from considering such factors that associate strongly with PA when aiming to increase population wide PA.

Interventions for increasing PA

Although a large proportion of adults are not aware of the recommended guidelines for PA (Scholes & Mindell, 2012), it has been argued that a high number of adults are aware of the benefits of undertaking regular PA (Hunter et al., 2014). Nevertheless, awareness of the benefits of PA has not translated into behaviour. As Kelly and Barker (2016, p.111) note, "giving people information does not make them change."

Watching sporting events has been speculated to improve levels of PA and general take up of sports (Gov.uk, 2012). In 2012 London hosted the Olympic Games and in 2014 Glasgow hosted the Commonwealth Games; it was argued that conducting such events offered an opportunity to promote sport and PA within the communities they were staged (Gratton & Preuss, 2008). The rationale for hosting these types of events was partly to

stimulate community interest, utilise the new facilities and increase participation in PA based activities and sports (Murphy & Bauman, 2007). The subsequent justification was centred on PA legacy promises, as was demonstrated with the London 2012 Olympics, which was based on a legacy of promising 'motivation to be active' (Gov.uk, 2012). It is therefore somewhat surprising that there is a paucity of evidence to suggest that sporting events have affected population PA levels. For example, objective measurements of PA before and after the 2010 Canadian Winter Olympics report that PA levels did not differ (Craig & Bauman, 2014). Following the Olympic Games in Australia, PA levels among adult Australians declined slightly six weeks following the games in 2000 compared to levels in 1997 and 1999 (Bauman et al., 2001). Similar findings have been reported following the 2012 London Olympic Games, with the number of people exercising for at least 30 minutes at moderate intensity for at least once a week having declined (Sport England, 2016b). More broadly, no association has been found between watching sport and PA, even though watching sport has previously been thought to inspire people to take part in PA (Hamer et al., 2014).

The most successful interventions are typically complex and often vary in their content and delivery (Michie & Wood, 2015). The successful design of behaviour change interventions requires them to target the key determinants of a behaviour (Michie et al., 2011). Best practice guidelines for developing interventions also recommend using theory (Craig et al., 2008), as theory-based interventions are considered to be more effective than non-theory-based interventions. The Behaviour Change Wheel (BCW) is a comprehensive method for developing interventions based on a framework that aims to be applicable to a range of health behaviours including PA (Michie et al., 2011). The first stage of the BCW involves understanding the determinants of the behaviour and identifying what needs to change in relation to the 'capability', 'opportunity' and 'motivation' (COM-B). Capability is the physical and psychological capability to undertake a behaviour, opportunity refers to the

physical and social opportunities to engage in the behaviour, and motivation is the reflective and automatic processes that guide the behaviour. If the desired behaviour is not occurring, then an analysis of the determinants of the behaviour can help identify what needs to change for the desired behaviour to take place. The BCW enables interventions to be designed in a systematic way, targeting the determinants of the behaviour with specific behaviour change techniques (BCTs).

Intervention strategies to increase PA in whole populations have been categorised as behavioural, social, community-wide, informational, built environment and policy led approaches (Heath et al., 2012; Konharn et al., 2014). Where interventions are believed to be most successful is when they target multiple levels of influence. For example, it has been reported that interventions operating across personal (e.g., biological, psychological), social (e.g., family, co-workers) and built environmental (e.g., neighbourhoods that are designed to be local amenities) can increase PA (Sallis et al., 2016). Strategies at multiple levels have also combined social support interventions in community settings. Such examples include buddy systems, walking groups and behavioural contracting (Heath et al., 2012).

Interventions have been successfully applied to increase levels of PA. For example, in the workplace setting, employers are encouraging PA by providing facilities in the form of bike sheds, treadmills and showers (Ryde & Brown, 2017). Employers have further encouraged PA through programmes such as “active commuting” (Petrunoff et al., 2016), team sports (Brinkley et al., 2016), assisting in the use of stairs (Moloughney et al, 2018), walking at work (Ryde & Brown, 2017) and subsidised gym membership (Hartwell, 2009). Although the effectiveness of these initiatives is still emerging, and is inconclusive, there is some evidence that workplace PA interventions can be effective, most notably the promotion of active travel and increased PA within the workplace setting (Malik et al., 2014). Cities across the world are investing in ‘green infrastructure’ that can promote PA by providing

readily accessible locations that are free (Shanahan et al., 2016). There is some evidence that people who live in areas with greater levels of green space undertake higher levels of PA, including activities such as walking and cycling (Richardson et al., 2013). In urban areas, the London bicycle sharing system has been shown to have positive health benefits overall (Woodcock et al., 2014). Benefits of bike sharing schemes are most evident when they are available for different types of use, at competitive prices and in both rich and poor areas (Goodman & Cheshire, 2014).

Social cognition models have been widely implemented in health behaviour change interventions. A systematic review of interventions designed to promote PA found the inclusion of self-monitoring and four other self-regulatory techniques (i.e., prompt intention formation, prompt specific goal-setting, prompt review of behavioural goals, provide feedback on performance) derived from control theory to be significant in interventions compared to not using these techniques (Michie et al., 2009).

PA has also been viewed to be a suitable target for habit related interventions, given that PA can be performed frequently in response to stable cues. New gym members who exercised regularly for six weeks in a consistent (i.e., stable) context were more likely to form a strong exercise habit (Kaushal & Rhodes, 2015) (as assessed by the Self-Report Behavioural Automaticity Index; Gardner et al., 2012). Those who developed a strong exercise habit also reported more positive affective judgements about PA, exercising in a more positive (i.e., supportive) environment, and engaging in exercise that was easy to do and required little effort (Kaushal & Rhodes, 2015). Strong habits may thus be important for maintaining behaviour given the strong correlation found between PA and measures of habit (Rebar et al., 2016).

To date, there has been little research targeting habit formation on PA. A recent trial found that an 8-week habit formation intervention resulted in a significant increase in PA in a sample of new gym members (Kaushal et al., 2017). The intervention focused on the

importance of preparation cues (e.g., preparing appropriate clothes for PA) and practice consistency (e.g., establishing a particular time for PA and stabilising the preceding events that lead to the preparatory stage of PA) in addition to actions plans to outline when they would engage in PA. The experimental condition had a significant increase in PA after 8 weeks as assessed by both accelerometers (d = 0.39, p =.04) and self-report measures (d = 0.53, p =.01) compared with the control condition when attending a habit related workshop and receiving a follow-up booster call.

The responsibility of increasing PA

Considering PA, guidance from PHE has utilised Sport England's new strategy, *Towards an Active Nation,* which encourages PA providers and non-providers who could promote PA to ensure inactive groups become more active (Sport England, 2016b). As a result, PHE has identified four broad areas where local and national bodies can take action to ensure people are active: 1) Active Society: People are more likely to be active if it is seen as 'normal', and if their friends and peers are also active, 2) Moving professionals: 1 in 4 patients would be more active if advised by a GP or nurse, 3) Active environments: Homes, workplaces and local environments should be designed to encourage physical activity, and 4) Moving at scale: Positive change needs to happen at every level, in every region and be measurable (PHE, 2016a). Within *Moving at scale*, PHE have called on workplaces, local authorities, NHS commissioners and the sport and leisure industry to encourage and increase PA (PHE, 2016a). Given that the sport and leisure industry provides PA as a primary service in itself, it is perhaps unsurprising that it is often first to be identified to help address this public health issue (Varney, 2015). Given PHE's calls for the sport and leisure industry to do more to increase PA, professionals within the industry are well placed to promote active lifestyles (Varney, 2015).

The health and fitness sector and PA

The sport and leisure industry takes the form of several sub-areas including sport and recreation, health and fitness, and outdoor PA (HM Government, 2015). Within this broad industry, it is the health and fitness sector that has gained most attention over the last decade as an area to increase PA levels. Sallis (2009, p.4) argues that "there are many individuals and organisations out there in the fitness world who know how to get people more active and make a living doing it." The European Commission, under its Preparatory Action in the Field of Sport, outlined a report titled *Becoming the Hub - The Health and Fitness Sector and the Future of Health Enhancing Physical Activity* (The European Commission, 2014). This report provided a focus for the health and fitness sector to enhance rates of PA across the European Union. Recommendations from the report include developing targeted and integrated campaigns and policies, offering PA within the community and building partnerships with organisations to increase the credibility and influence of the health and fitness sector (The European Commission, 2014). There have also been calls for PA providers to review their training and professional education to effectively support the inactive population to be more active (De Lyon et al., 2016). In addition, Simon Stevens, NHS England CEO, challenged the health and fitness sector to become involved in the prevention of 'lifestyle diseases' (Health Club Management, 2017). Steven Ward, CEO of UK Active, a not-for-profit industry association with an overarching aim of promoting the interests of commercial fitness gyms and community leisure centres, recently stated: "We need to embrace innovative solutions if we are to overturn the physical inactivity crisis we face today" (Walker, 2018, p.1). Similarly, Peter Roberts, the founder of commercial organisation Pure Gym, noted that there is a recognition that the sector as a whole needs to do more work with PHE to encourage greater PA levels (Cave, 2015).

The sector is typically characterised by the provision of venues whereby people pay a membership fee to have exclusive access to a range of facilities (Hölder & Svensson, 2016). Such venues are typically run for commercial purposes, for not-for-profit or are council run (UK Active, 2016). Venues often include gyms with equipment including treadmills, cycling machines and free weights as well as exercise classes and swimming pools (Statista, 2016). Members typically pay monthly or yearly subscriptions, with the typical annual subscription in the region of between £100 per year for basic facilities, to over £1,000 per year for more luxurious facilities (Statista, 2016). It is a focus for many venue providers to understand how they can attract new members and retain members to each of their venues from a commercial standpoint (Andreasson & Johansson, 2014; Ascarza et al., 2018). Members typically sign up for a health and fitness membership of their own accord and choose as and when to use the venue facilities, as opposed to other populations that use these facilities, such as exercise referral patients who are typically advised to use such facilities by a GP within a prescribed programme. The principal assumption from a revenue generating view is that it is more cost effective to retain members than to attract new members (Kokkonen, 2015). For many health and fitness organisations, it is therefore in their interests to retain their members to meet their revenue targets (Kokkonen, 2015). The competition between vendors is also becoming increasingly intense given the awareness in the industry that membership turnover levels are relatively high compared to other service-oriented industries (Roberts & Davis, 2017). One such response to the high turnover levels is in the types of contracts vendors are starting to offer potential customers, with an increasing number of monthly or rolling contracts being supplied to provide customers with more attractive contract terms (Roberts & Davis, 2017).

The growth of the health and fitness sector

Since the 1970s the sector has grown exponentially in the developed world, and plays a central role in the lifestyle of many people in these regions (Andreasson & Johansson,

2014). The health and fitness sector is the fastest growing sub-area of the sport and leisure industry in the UK (UK Active, 2016). It is estimated that more than 1 in 7 of the UK population have a membership at a health and fitness organisation; that is they pay a subscription fee for the use of one or many health and fitness venues (Leisure DB, 2019). This number is expected to rise in future years with total memberships rising to 10.4 million people, approximately 15.6% of the population (Leisure DB, 2019). Given that approximately 8.4 million adults are estimated to be members of a fitness venue within the UK (The European Commission, 2014), this provides an important opportunity within which to encourage increased PA. Approximately 188,000 people are estimated to be employed in this subsector in a range of roles including coaches and personal trainers as well as other staff who do not provide direct PA provision (Statista, 2016).

Health and fitness attendance

The maintenance of attendance of health and fitness members has followed a similar trend to other users of venues facilities, such as exercise referral schemes. Within exercise referral schemes, although there has been some evidence that factors such as cost and convenience play a role in greater uptake and adherence, there is a general uncertainty as to whether such programmes increase PA (Pavey et al., 2011). Specific barriers include a lack of social support, low self-efficacy, intimidating environments and inconvenient opening hours (Williams et al., 2007). Given that exercise referral schemes only show a small improvement in PA, the cost-effectiveness of such schemes has largely been questioned (Campbell et al., 2015). In a study analysing the attendance decisions at three U.S. health and fitness venues, members were reportedly on average ‘paying not to go to the gym’ (DellaVigna & Malmendier, 2006). Specifically, the mean attendance of 145 members on an annual contract was 4.36 times a year. Analysis of the contracts of paying members demonstrated they paid more than $17 per visit. Low attendance figures have also been

reported in a study analysing the attendances of ex-members of a health and fitness organisation (Middelkamp et al., 2016). Of these ex-members, only 10% were categorised to be regularly attending (i.e., at least four times a month) over the first six months of their membership, and only 2.3% had regular attendance over a 24-month period. These findings therefore indicate that attendances at health and fitness venues are generally low. From a public health perspective there may be scope to increase attendances in venues which, in turn, may lead to increased PA and health benefits.

Summary of this chapter

Of the stakeholders and sectors identified by PHE to increase PA, the sport and leisure industry is the only provider of PA provision as a primary service. It is estimated that approximately 1 in 7 of the UK population are a paying member of a health and fitness club; nevertheless, research in the Netherlands suggests that only 10% of ex-members regularly use the health or fitness venue that they have subscribed to. This implies that the majority of members are not using health and fitness venues to engage in frequent PA. It is not known whether these members are using alternative locations to achieve the recommended PA guidelines; nevertheless, if they are not, they are likely to be inactive despite intentionally subscribing to use a venue.

Chapter 3. Why do new members stop attending health and fitness venues? The importance of developing frequent and stable attendance behaviour

Introduction

Health and fitness venues are ideally placed to help to increase population PA levels. Nevertheless, little is known about the extent to which people actually use these venues. A study of 259,355 ex-members at 267 Dutch health and fitness venues concluded that only 10% of members attended regularly (defined as at least four times a month) for the first six months of their membership (Middelkamp et al., 2016). Similarly, a study in the United States of health and fitness members' attendance concluded that many members were 'paying not to go to the gym' (DellaVigna & Malmendier, 2006). In particular, the mean attendance of 145 members on an annual contract was only 4.36 times a year. Given that many members join a health and fitness venue to improve their health or physical fitness (Crossley, 2006), these findings are concerning from a public health perspective. Moreover, little is known about the factors that are associated with continued (or discontinued) attendance at health and fitness venues.

Several factors have been associated with maintenance of PA participation, more generally, that might also be expected to be associated with continued attendance at health and fitness venues, including younger age, male gender, seasonality, and proximity to a sports facility (Cepeda et al., 2018; Marques et al., 2016; Rich et al., 2012). In addition, past behaviour is one of the strongest correlates of PA, with an average correlation of $r = .54$ across a meta-analysis of 44 studies (McEachan et al., 2011). A key way in which past behaviour may impact on continued PA is through the formation of a habitual response by repeatedly performing the same behaviour in the same context. Habit is a process formed through repetition of behaviour in a specific context (Lally et al., 2010) in which a stimulus generates an impulse to act, resulting in a learned stimulus-response association (Gardner, 2014). Habitual behaviour is therefore proposed to develop through repeated execution of

behaviours in the consistent presence of salient cues or contextual features (Gardner & Lally, 2018; Wood, 2017). Thus, both the frequency with which, and the stability of the context in which, the behaviour is performed are key antecedents for forming a strong habit. Moreover, Ouellette and Wood (1998) have argued that as behaviours are repeated more often in stable contexts, their performance switches from being under the control of intentional (i.e., reflective) to habitual (i.e., automatic) processes. In line with this argument, Norman and Cooper (2011) reported that a measure of habit strength was only associated with subsequent behaviour (breast self-examination) when it had been performed frequently in a stable context (i.e., same time and place) in the past. Similarly, Kaushal and Rhodes (2015) reported that engaging in regular exercise for at least six weeks in a consistent context (i.e., place and time) was predictive of habit formation. Measures of habit strength have, in turn, been found to have a medium-sized average correlation with PA (r = .43) (Gardner et al., 2011). In addition, a systematic review found that 26 of 37 studies included in the review reported a significant positive association between measures of habit and PA (Rebar et al., 2016). The development of habitual behaviours has also been proposed to have an impact on increased attendances in health and fitness venues (Calzolari & Nardotto, 2017; Muller & Habla, 2018).

The aim of the present study was to analyse the pattern of new members' attendance behaviour at a health and fitness organisation's venues and to assess potential correlates of continued attendance, including age, gender, proximity to a venue, seasonality, frequency of early attendance and context stability (i.e., time and location of attendance). In particular, the following research questions were addressed: (1) What are the attendance levels of new members of a UK health and fitness organisation over the first 12 months of their membership? and (2) What are the correlates of continued attendance?

Method

This study reports a secondary data analysis of attendance records of new members at a health and fitness organisation over a 12-month period.

Design

Attendance data of individuals who joined a health and fitness organisation as members between October 2015 and July 2016 were included for analysis. Anonymised data were extracted from the health and fitness organisation's database.

Participants and Study Setting

All included members had purchased a 12-month contract with the health and fitness organisation. Such contracts cannot be cancelled during their duration. The organisation has six venues in a UK city, each offering gym equipment and group exercise classes, with five of the venues providing swimming pool facilities. Individuals who utilised the health and fitness facilities on a 'pay as you go' basis were excluded as were individuals who were part of exercise referral schemes. In total 1,726 new members were included in the sample for data analysis.

Procedure

Ethical approval for the study was obtained from the ScHARR Ethics Committee. Following ethical approval, anonymised attendance data of the health and fitness members were downloaded from the organisations' reporting system. The data were then cleaned to remove members who did not meet the inclusion criteria. Attendance records for each member were then automatically counted and categorised into four-week periods to produce 12 months of attendance data (with each month consisting of four weeks). All statistical analyses were conducted in SPSS (version 25).

Measures

Each time a member uses one of the organisation's health and fitness venues, the location, date and time of the attendance is electronically recorded through their member card or wristband at the venue turnstile. This automatic recording of attendance is saved on a database. This electronic record of attendance was used for the analysis in the current study. Using these data, the frequency of attendance in each month and quarter was analysed. In addition, a measure of context stability was calculated from the number of times a member attended the same venue on the same day of the week and within a three-hour time window more than once during a month. Thus, if members attended the same venue on the same day of the week and within a three-hour time window *twice* during a month they had a context stability score of 1, *three times* they had a score of 2 and *four times* they had a score of 3. If members did not attend the same venue on the same day/time more than once in a month, they received a score of 0. The total of these scores in month 3 was taken as the measure of context stability.

Age, gender and member start date were also recorded in the database and included for analysis. The distance in miles members lived from a venue was calculated from the first part of their postcode and used as a measure of location in the analyses.

Statistical Analysis

Frequency of attendance

Two repeated measures ANOVAs were conducted to assess changes in the mean frequency of monthly and quarterly attendance over the 12-month period. The percentage of members attending at least once a month over the 12-month period was also calculated.

Correlates of attendance

First, associations were examined between each of the independent variables (i.e., age, gender, location, frequency of attendance in the first quarter, season and frequency of attendance in the fourth quarter). Pearson's correlations were conducted to assess how strongly age, location, context stability in months one to three and frequency of attendance in

the first quarter were associated with frequency of attendance in the fourth quarter. Independent t-tests were conducted to assess associations between gender and frequency of attendance in the fourth quarter. An analysis of variance was conducted to assess the effect of the season of members' start date on attendance in the fourth quarter. Second, a multiple regression analysis was conducted to examine how much variance these variables could explain the frequency of attendance in the fourth quarter as well as the unique contribution of each independent variable.

Power analysis

A power analysis indicated that with a sample of 1,726, it would be possible to detect small-sized correlations (r = .07), according to Cohen's (1992) effect size indexes, between the potential correlates of continued attendance and frequency of attendance in the fourth quarter; at 80% power and alpha set at .05.

Results

Participant characteristics

Of the 1,726 members, 845 (49%) were female and 881 (51%) were male. Members ranged in age from 19 to 70, with a mean age of 35.30 (SD = 10.21). There was missing data on age for 20 members. Members resided in 52 different postcode areas, with members living on average 3.4 miles from the nearest health and fitness venue. There was missing data on location for 15 members.

Frequency of attendance

The mean attendance for each month is reported in Table 3.1. In total across the 12 months, members attended the venues 59,762 times. Over the 12 months there was a significant effect of time on attendance, $F(11, 1715) = 260.61$, $p < .001$. Post-hoc comparisons using Bonferroni post-hoc tests indicated there were significant differences ($p < .05$) between each of the months apart from between months eight and nine ($p = .418$). As

shown in Figure 3.1, each month had a drop in attendance from the previous month. The largest drop in mean attendance was between months one and two, $t(1725) = 63.68$, $p < .001$. There was also a significant effect of time on attendance over the four quarters, $F(3, 1723) = 688.66$, $p < .001$ (see Table 3.2). Post-hoc comparisons using Bonferroni post-hoc tests indicated that each quarter was significantly different from each other ($p < .01$). The drop in attendance can also be seen in the percentage of members who attended at least once each month over the first 12 months of their membership. As shown in Table 3.1, 100% of members attended at least once in the first month of their membership; this figure fell to 50% and 22% at six and 12 months.

Correlates of attendance in quarter four

Considering the correlates of attendance frequency in quarter four, there was a small but significant correlation between age and attendance in quarter four, $r(1724) = .11$, $p < .001$, such that older members attended more frequently. Neither gender, $t(1724) = 1.52$, $p = .13$ $d = 0.07$, or distance to the nearest venue (i.e., location), $r(1724) = .009$, p = .71, were significantly associated with attendance in quarter four. Season had a significant effect on attendance frequency in quarter four, $F(2, 1722) = 508.43$, $p < .001$, $\eta_p^2 = .016$. Post hoc analyses indicated members who started their membership in autumn ($M = 4.52$, $SD = 8.54$) or spring ($M = 4.55$, $SD = 8.84$) attended more frequently in quarter for than those who started in summer ($M = 2.35$, $SD = 6.13$) or winter ($M = 2.88$, $SD = 6.26$). There was a significant medium-sized correlation between frequency of attendance in quarter one and attendance in quarter four, $r(1724) = .36$, $p < .001$, indicating that increased attendance in quarter one was associated with increased attendance in quarter four. Context stability in month one, $r(1724) = .19$, $p < .001$, month two, $r(1724) = .28$, $p < .001$, and month three, $r(1724) = .36$, $p < .001$, were significantly correlated with attendance in quarter four, such that increasing levels of context stability in each of the first three months were associated with increased attendance in quarter four. The strongest (medium-sized) correlation was

between context stability in month three and attendance in quarter four. The attendance means by age, gender, location and season are in Figures 3.2, 3.3, 3.4 and 3.5.

Regression analysis to predict attendance in quarter four

A regression analysis was conducted with age, gender, location, season (autumn/spring versus summer/winter), frequency of attendance in quarter one and context stability in month three as the independent variables and frequency of attendance in quarter four as the dependent variable. The regression model was significant, $F(6, 1684) = 59.20$, $p < .001$, $f^2 = 20$, and explained 17% of the variance of attendance behaviour in quarter four; a medium-sized effect according to Cohen's (1992) indexes. Table 3.3 displays the results of the regression analysis. Inspection of the beta weights reveal that age, season, attendance in quarter one, and context stability in month three made significant unique contributions to the prediction of attendance in quarter four. Thus, increased frequency of attendance in quarter four was associated with older age, starting membership in autumn or spring, increased quarter one attendance, and increased context stability (i.e., attending at the same place and time) in month three.

Table 3.1 Means and standard deviation of monthly attendance, and number and percentage of members attending each month, in the first 12 months of membership

Month	*Mean*	*SD*	*N*	*%*
1	7.48	4.88	1726	100
2	4.99	5.01	1371	79
3	4.19	4.79	1207	70
4	3.38	4.42	1065	62
5	2.88	4.16	941	55
6	2.44	3.93	863	50
7	2.14	3.73	766	44
8	1.90	3.52	702	41
9	1.76	3.40	656	38
10	1.39	3.08	540	31
11	1.15	2.81	449	26
12	0.92	2.46	379	22
Overall	2.89	1.90		

Table 3.2. Means and standard deviations of quarterly attendance in the first 12 months of membership

Quarter	*Mean*	*SD*
Q1	16.66	12.73
Q2	8.70	11.32
Q3	5.80	9.68
Q4	3.46	7.45

Table 3.3. Summary of regression analysis predicting attendance in quarter four

Variable	*B*	*SE*	*β*
Age	0.06	0.02	.08**
Gender	0.29	0.33	.02
Location	0.01	0.30	.01
Season	1.90	0.34	.13***
Quarter 1 attendance	0.13	0.02	.22***
Context stability in month 3	0.69	0.12	.20***

Note. ** $p < .01$, *** $p < .001$.

Figure 3.1. Mean attendance over time (with 95% CIs)

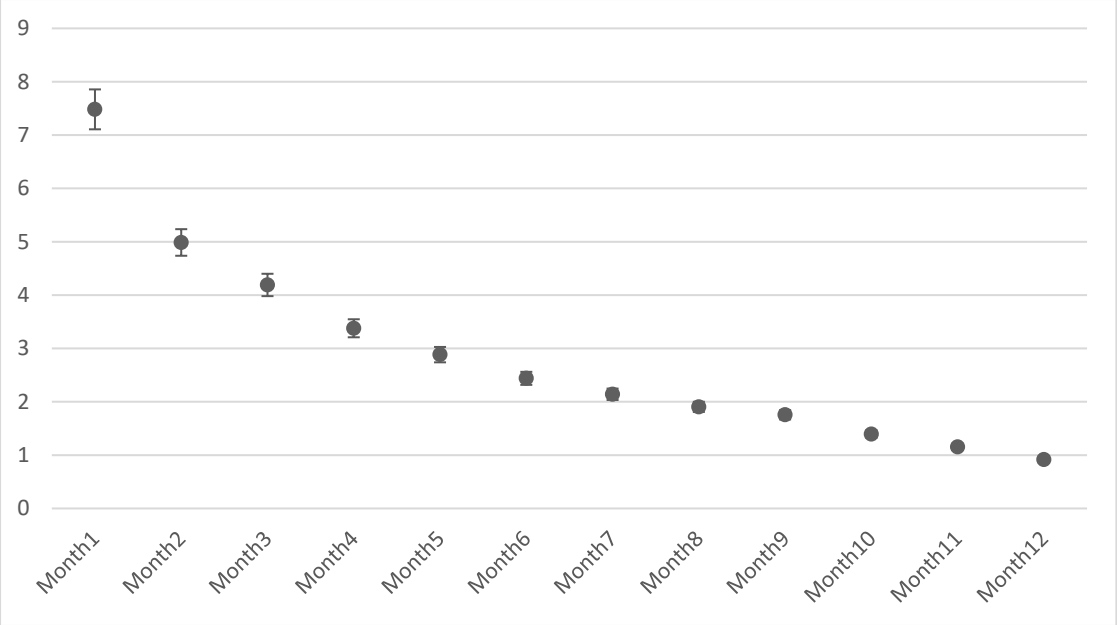


Figure 3.2. Mean attendance over time by age

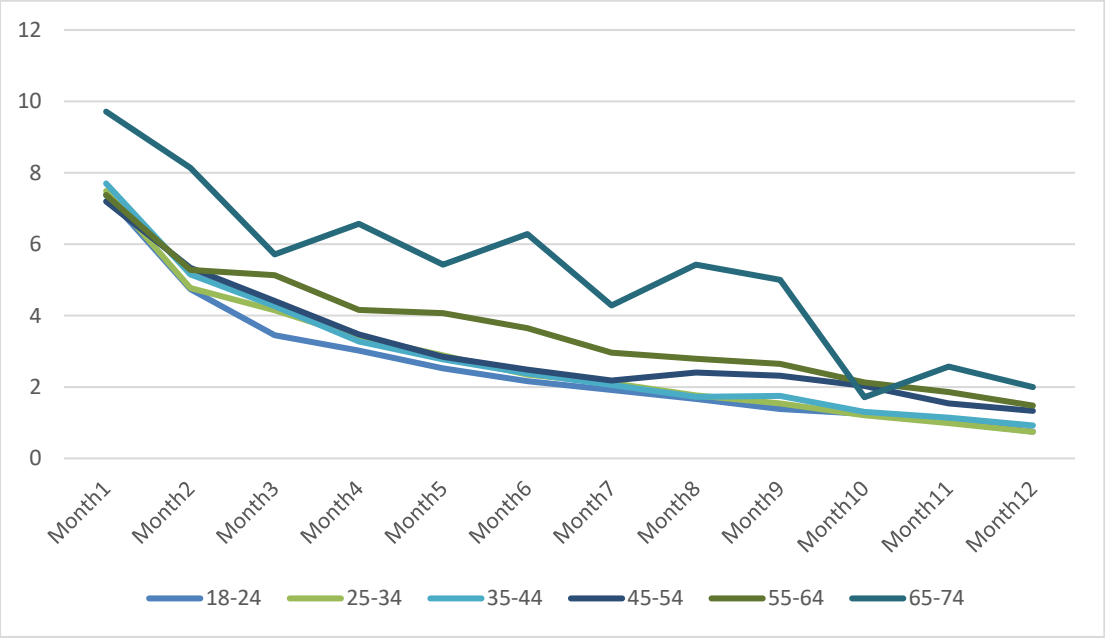


Figure 3.3. Mean attendance over time by gender

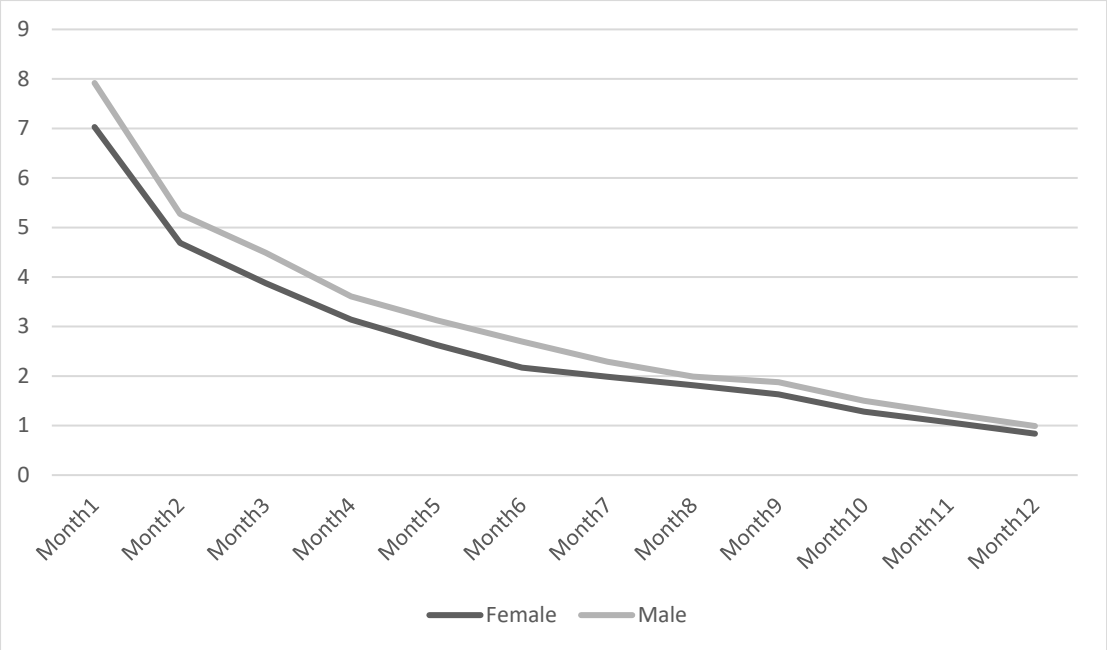


Figure 3.4. Mean attendance over time by location

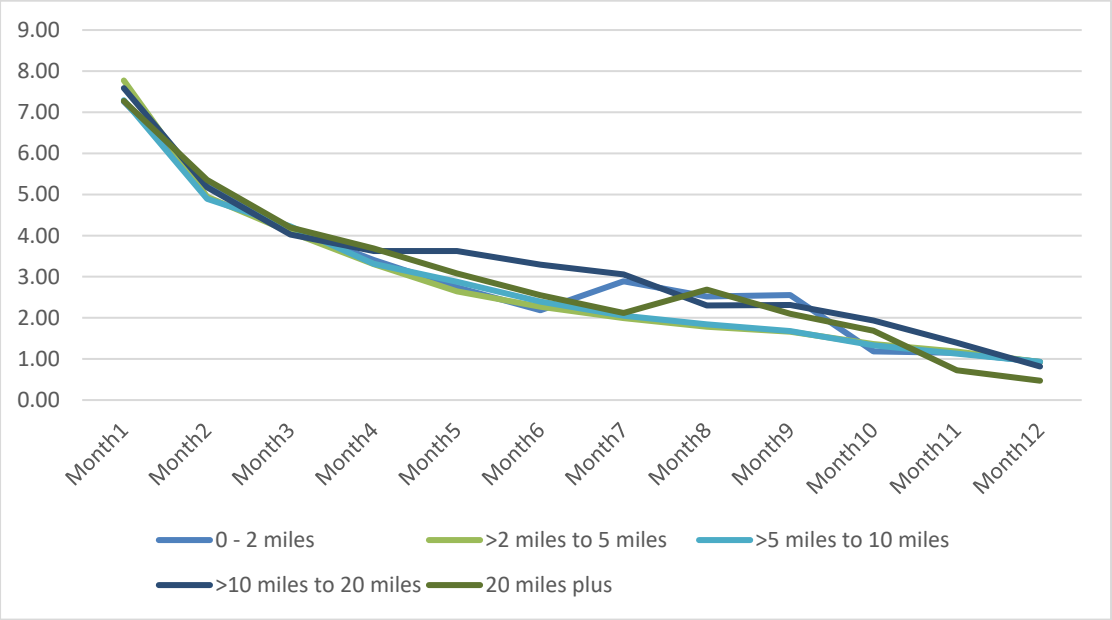
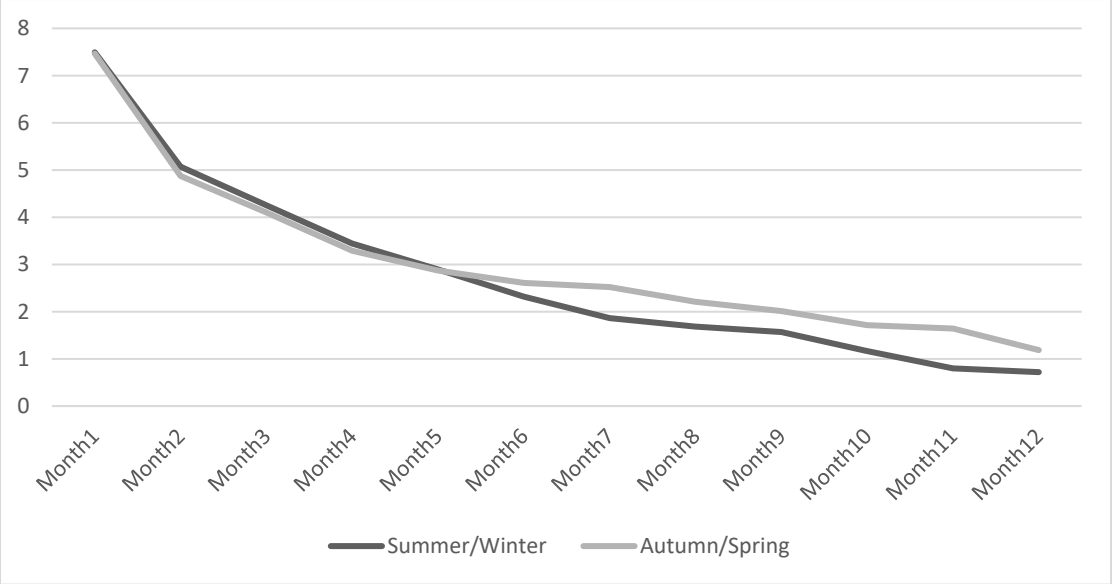


Figure 3.5. Mean attendance over time by season



Discussion

This study analysed the attendance data of new members of a health and fitness organisation in the UK over the first 12 months of their membership. Substantial and significant reductions were found in attendance over time, with the mean frequency of attendance falling from 7.48 in month one, to 2.44 in month six and 0.92 in month 12.

Similarly, the percentage of new members who attended at least once fell from 100% in month one, to 50% in month six and 22% in month 12. The levels of attendance in the current study suggest that by the end of the first year of membership, many members do not attend health and fitness venues often. This finding is in line with previous studies in the Netherlands and USA (Middelkamp et al., 2016; DellaVigna & Malmendier, 2006). Given that many members decide to join a health and fitness venue in order to increase their levels of PA to address concerns about physical health or fitness (Crossley, 2006), it is unlikely that the low level of attendance is due to members engaging in PA in locations outside of the health and fitness venue. As a result, it is likely that most of the members who stop attending remain physically inactive.

Considering the correlates of attendance, older members were found to attend more often in quarter four than younger members, although the size of the effect of age on attendance was small according to Cohen's (1992) criteria. The significant positive correlation is in contrast to the majority of previous research on PA which has found that activity decreases with age (Rhodes et al., 1999). Nevertheless, the mean age of the members in the current study was only 35.30 and only 1.3% of the sample was aged over 60. It is possible that younger members in the present sample may have faced increased barriers in terms of other commitments or competing priorities (Nikolaou et al., 2005; Strong et al., 2008) which may have reduced attendance. In addition, the significant correlation between attendance and age might also be explained by the important social factors for engaging in PA in older people (Franco et al., 2015); these factors are likely to be present in health and fitness venues (e.g., interaction with peers or dependence on professional instruction).

The finding that males and females had similar levels of attendance is in contrast to previous research on PA which has identified males to have higher PA rates than females (Althoff et al., 2017). The current finding is somewhat surprising given that various factors,

such as self-efficacy, social support, and motivation have been previously identified to impact on differences in PA participation between males and females (Edwards & Sackett, 2016). In addition, barriers such as time expenditure or childcare responsibilities have also been identified to be factors in non-exercising adult females (El Ansari & Lovell, 2009). It is possible that membership of a health and fitness venue may help to overcome some of these barriers. For example, venues may provide personal support and encouragement to exercise and members may be able to fit attendance in and around other commitments (e.g., before/after work or during a lunch break).

The finding that those living closer to a health and fitness venue were no more or less likely to attend a health and fitness venue in quarter four also contrasts with previous research outlining the importance of accessibility and proximity as a correlate of PA (Sallis et al., 2016). One possible reason for the current finding may be the small number of members (3.4%) living in the same postcode location as the most frequently attended venue which is located in the city centre. It is possible that many members attend this venue when they are already near the venue location (e.g., for work). Unfortunately, in the current dataset there was no record of the location where members worked; future research could seek to assess accessibility and proximity in relation to both members' home and workplace.

The finding that members who joined the health and fitness organisation in autumn or spring attended more often in quarter four than those who joined in winter or summer is consistent with previous research that has reported seasonal variations in PA (e.g., Cepeda et al., 2018; Rich et al., 2012). There are two possible explanations for why members who joined in the summer or winter were less likely to maintain their attendance. First, the reasons associated with joining in winter (e.g., New Year's resolutions) and summer (e.g., wanting a 'summer body') may not be strong enough to maintain continued attendance, especially if the expected outcomes are not obtained (Rothman, 2000). Second, there may be more disruptions to people's normal routines in winter (e.g., bad weather) and summer (e.g., extended

holidays) that prevent the formation of strong habits than help to maintain new behaviours (Kwasnicka et al., 2016).

Frequency of attendance in the first quarter was associated with frequency of attendance in the fourth quarter. This finding is in line with previous research that has shown that past behaviour is a strong correlate of future PA behaviour (McEachan et al., 2011). There are two main ways in which past behaviour is hypothesised to influence future behaviour (Ajzen, 2011). First, past behaviour may influence people's beliefs about the behaviour which, in turn, influences their decisions. For example, members may find attending rewarding or enjoyable and make a conscious choice to keep attending as a result. Accordingly, in a study of 94 health and fitness members, cognitions from the theory of planned behaviour predicted maintenance of PA behaviour over a 12-week period (Armitage, 2005). Second, when a behaviour is performed frequently in a consistent context it can then be performed relatively automatically with little conscious deliberation (Ouellette & Wood, 1998). For example, members may attend venues to do a particular class at the same time each week.

In the current study, measures of both the frequency of attendance and the extent to which to which members attended at the same venue/time (i.e., context stability) were found to have significant, and medium-sized, effects on attendance in the fourth quarter. These findings are consistent with the idea that frequent and stable attendance behaviour in the first few months of membership may have led to the formation of strong habits which ensure continued attendance. For example, Kaushal and Rhodes (2015) reported that new gym members who exercised regularly for six weeks in consistent (i.e., stable) context were more likely to form a strong exercise habit (as assessed by the Self-Report Behavioural Automaticity Index; Gardner et al., 2012). Kaushal and Rhodes (2015) further found that those who developed a strong exercise habit also reported more positive affective judgements about exercise, exercising in a more positive (i.e., supportive) environment, and engaging in

exercise that was easy to do and required little effort. Encouraging strong habits may be crucial for maintaining behaviour given the typically strong correlation found between measures of habit and PA (Rebar et al., 2016).

The current study has a number of strengths. In particular, the study comprised the analysis of the attendance patterns of a large sample of all new members of a health and fitness organisation, rather than a subset of members recruited into a research study. As a result, the sample should be free of any participation biases and the results more generalizable to other health and fitness venues. In addition, the study employed objective measures of the frequency and stability of attendance behaviour that was recorded electronically through the member's card or wristband at the venue turnstile. In contrast, previous research focusing on the frequency and stability of exercise behaviour has relied on self-report data (e.g., Kaushal & Rhodes, 2015) which might be open to presentational and consistency biases.

Nevertheless, there are a number of study limitations that should also be noted. First, attendance data was calculated from the time members entered a health and fitness venue. Although this provides objective and accurate data detailing the location, date and time of the attendance, the data output does not detail how long each member spent at the venue. Assessing the length of time members spend at a venue could help to explore the amount of PA members undertake instead of merely the day and time they attended. Second, the attendance data did not include a record of the type of activity members undertook. This would have provided some information on the likely intensity of PA members were undertaking. Both the amount and intensity of PA is likely to impact on health outcomes. Understanding the type of activity undertaken could also have been used as an additional marker of context stability to assess whether members attended the same activity, in addition to attending the same venue on the same day and the same time. Additionally, it could be that certain activities, such as exercise classes which have a pre-defined time, are more likely to

be associated with consistent attendance behaviour. Although members were recorded as either attending or not attending the venue, an assumption has been made that PA was undertaken for those that attended. Understanding whether a member attended is a useful proxy measure of whether a member is likely to undertake PA; nevertheless, future research should also aim to assess PA more directly. Third, the study only considered a limited range of variables that were available in the dataset. There may be other variables that are important for attendance such as goals, motivations or beliefs, which are factors identified in models of health behaviour (Conner & Norman, 2015). In addition, factors such as the length of contract bought or the price of the membership may also influence members' attendance behaviour. Future research could therefore assess the impact of non-renewal or shorter-term contracts and different price points on the maintenance of attendance. Fourth, it was not possible to assess any activities members were undertaking outside of the health and fitness venue. It could be that some members decided to switch to undertaking PA outside of the venues during the course of their membership. Fifth, it was not possible to assess whether the members had any prior experience of using health and fitness venues and the extent to which this has an impact on the maintenance of attendance. For example, some members may already have been frequent attenders at other venues, but had taken out a new membership (e.g., due to moving to a new city). Finally, the study was conducted within a single health and fitness organisation with six venues based in a large city in England. Further studies in other health and fitness organisations across, and beyond, the UK are needed to establish the generalisability of these findings in a range of organisations with different facilities and attendees.

Notwithstanding these limitations, the current findings have a number of implications for policy makers and organisations providing health and fitness facilities. Most importantly, the current findings highlight that attendance in new members declines over time. In particular, attendance dropped from a mean of 7.48 times in month one to 0.92 times in

month 12. In addition, whereas all new members attended at least once in month one, only 22% did so in month 12. Health and fitness organisations therefore face a large challenge to maintain attendance levels in new members, particularly among those who join in the winter or summer. The current findings suggest that interventions should encourage more frequent attendance in the early part of an individual's membership. Thus, health and fitness venues should also seek to provide members with a positive experience in the early part of their membership to ensure that they want to return to a venue. Nevertheless, it is also important for health and fitness venues to put in place mechanisms that not only encourage increased attendance, but establish habitual behaviour in new members by encouraging them to attend the same venue at the same day and time each week. One way through which this could be achieved is by instructing members to form action plans detailing which venue and time they will attend (as well as which activity they will engage in). Correlational (Fleig et al., 2013) and experimental evidence (Orbell & Verplanken, 2010) indicates that engaging in action planning leads to the formation of stronger habits. Encouragingly, a recent trial has shown that an 8-week habit formation intervention resulted in a significant increase in PA in a sample of new gym members (Kaushal et al., 2017). The intervention focused on preparation cues (e.g., preparing appropriate clothes for PA) and practice consistency (e.g., establishing a particular time for PA and stabilising the preceding events that lead to the preparatory stage of PA) as well as the use of actions plans to identify when they would undertake PA.

Conclusion

The current study examined levels of attendances and correlates of attendance behaviour in new members at UK based health and fitness venues over a 12-month period. New members' early attendance behaviour, specifically the frequency and consistency of attendance, was found to be important for supporting continued attendance at health and

fitness venues. The findings identify a need to develop effective interventions with the potential to increase sustained attendance levels at health and fitness venues.

Chapter 4. A qualitative investigation of continued member attendance at health and fitness venues

Introduction

As outlined in Chapter 1, approximately 15% of the UK population are members of a health and fitness venue in the UK. Inactivity has become a public health issue in recent decades, and evidence from Study 1 indicates that only 22% of members are utilising these venues at the end of 12 months. There is therefore a potential disparity between the commitment of a member to undertake PA at a venue having signed up for a membership, and the reality of subsequent low levels of attendance behaviour.

To understand why some members attend more often than others, a large amount of research has addressed the factors that motivate people to use health and fitness venues (e.g. Crossley, 2006; Frew & McGillivray, 2005). Research has also focused on a variety of other factors that may influence the attendance of members at venues. Most notably Stewart and Smith (2014) identified consequent epiphanies and turning points as key critical incidents that transition people from non-users to frequent users of gyms. In relation to specific exercise programmes, upward social comparisons, habit and culture were factors that explained adherence to these programmes (Pridgeon, & Grogan, 2012). Nevertheless, these studies have only focused on why members may transition from non-use to frequent use within gyms, and not health and fitness venues as a whole, and only studied adherence to specific exercise programmes than attendance at health and fitness venues. As such, there has been little research investigating the enablers or facilitators of attendance at health and fitness venues; such research can help to identify which factors may enable attendances at health and fitness venues. This information can be utilised by health and fitness organisations and policy makers to encourage increased attendance at these venues.

One of the most relevant studies addressing the enabling of attendance was conducted with older adults using outdoor gyms, where the main enablers to outdoor gym use were reported by participants to be having shade (n = 40; 22.6%), increasing the amount of shade (n = 25; 14.1%) and various equipment types (n = 28; 15.8%) (Stride et al., 2017). Seeing physical changes, feeling in control and the qualities of the fitness club have also been reported to be key factors for sustained participation in fitness club membership from the results of a web-based survey (Mullen & Whaley, 2010). Macintosh and Law (2015) investigated factors that influence the decision to stay in a health and fitness membership concluding that service quality and organisational culture are important. Organisational culture included front desk employees being upbeat and approachable. A sense of community also helped establish the importance of feeling welcomed. Service quality included the types of exercise class available, having access to different types of equipment (e.g., free weights or aerobic equipment) and the health and fitness venue having a swimming pool. Nevertheless, to date, research has not yet undertaken a study of the key enablers that may promote *continued attendance*, rather than increased PA or commitment to membership contracts at health and fitness venues. It is proposed that the current study will help close this gap to understand the enablers of continued attendance.

Research question:

What are the enablers of the maintenance of member attendance at health and fitness venues?

Method

Design

In light of the research gap outlined, qualitative methods were employed, primarily due to their ability to provide descriptions about how people view a research issue (Silverman, 2006). Qualitative methods seek to arrive at an understanding of a topic from the perspective of individuals experiencing it through an explorative approach (Kahlke, 2014).

Given the relatively sparse knowledge available to describe participation at health and fitness venues, qualitative methodologies have been commonplace within much of the relevant literature to date (e.g., Stewart & Smith, 2014; Pridgeon & Grogan, 2012).

Epistemology

The research epistemology guides what the researcher says about the data collected, and informs how the researcher theorises meaning within the data (Braun & Clarke, 2016). The current study took a realist approach, where motivations, experience, and meaning are interpreted in a straight-forward manner, which is in contrast to a constructionist perspective where meaning and experience do not inhere within individuals; rather they are socially produced and then reproduced (Burr, 1995; Burr, 2003).

Participants

It was assumed that by recruiting a specific group of participants into the study, a unique and important perspective on the research question would be obtained (Robinson, 2014). Thus, this study recruited a purposeful sample to ensure that participants who were considered as 'experts', as evidenced from own attendance records, were included. When sampling participants, it is necessary to reduce systematic bias in the data by recruiting participants that are representative of the target population (Kline, 2017). This judgement was made using the sample obtained in Study 1, which had a relatively equal split of males and females, a broad range of ages (19 to 70) and had members attending six different venues. Thus, the recruitment of participants in this study aimed to reflect the sample in Study 1 to avoid bias.

Participants in the study were paying members who had a contract to use Sheffield City Trust health and fitness facilities. All participants paid a monthly or yearly subscription for the use of venue facilities including a gym, fitness classes and swimming pool. Participants comprised 7 females and 6 males, ranging in age from 24-72 years old. Given the

aim of recruiting a sample that were ‘experts’, participants had been members of the organisation for between 2 and over 20 years. To this end, the key inclusion criterion was that participants had attended on average at least once a week over the previous year.

The criterion that was used to judge when to stop sampling was theoretical saturation in the data. Theoretical saturation is when no additional data is identified in relation to the research question (Saunders et al., 2015). Thus, the researcher becomes empirically confident that no new data can be sought for the developed framework (Saunders et al., 2015). In the current study, the researcher probed specific areas related to the perceived saturated data, to be certain that this initial perception could be confirmed. Data saturation was reached in the study when new data tended to be redundant compared to data already collected. In interviews, when the researcher begins to hear the same comments repeatedly, data saturation is being reached. It was at 13 interviews that this point had been reached in the current study and the analysis process began. Similarly, prior research has suggested that saturation typically emerges within approximately the first 12 interviews of purposeful samples (Guest et al., 2006).

Following university ethics committee approval, potential participants were identified from the health and fitness organisations’ digital attendance record. Potential participants were initially contacted by telephone, informed about the purpose of the study and asked whether they were interested in taking part in the study. Of the 20 individuals contacted, two had recently ended their membership with the organisation. Of the remaining 18 individuals, 13 agreed to participate in the study, representing 72% of the individuals contacted.

A qualitative methodology was adopted to obtain an in-depth understanding of individuals’ experiences about the enablers of continued attendance at the health and fitness venue. An initial interview schedule was pilot tested with two senior individuals at the health and fitness organisation where the participants were being recruited. This allowed minor

alterations to the interview schedule to be made. Convenient times for the interviews were agreed and an information sheet was sent via e-mail to each participant. All interviews were face-to-face and took place at the location of a health and fitness venue. Written informed consent was obtained from each participant prior to the interview.

Interview Guide

A semi-structured interview guide was designed to prompt open-ended responses. The interviews commenced with the gathering of factual information about their background as a member; including their membership duration and why they decided to sign up as a member. The main body of the guide contained questions about what they thought helped them to attend regularly (e.g., "Is there anything you do that you think helps you to attend as often as you do? Describe what you do here") and also what they did before, during and after they attended that supported their attendance (e.g., "Talk me through a typical visit to the venue. Describe what happens or what you do. This should include the preparation you do before you go and the journey you take leading up to the time you arrive at the venue"). Probes were used throughout to prompt participants to elaborate on information and ensure participants had discussed everything they felt was relevant before moving onto the next question. The average length of the interviews was 48 minutes (range 32 to 63 minutes). All interviews were digitally recorded.

Data Analysis

As the research of Study 3 sought to explore the phenomenon of the enablers of attendance at health and fitness venues, an inductive approach to the data was taken. In induction, themes and patterns are identified in the data and a conceptual framework of the data is subsequently obtained (Saunders et al., 2015). *Induction* contrasts with *deduction* which uses data to evaluate a proposition or hypothesis that relates to an existing theory or *abduction* which subsequently tests the data collected with a conceptual framework

(Saunders et al., 2015). Given that there was no relevant hypothesis or theory developed within this relevant area, *induction* was deemed the most appropriate approach to analysing the data.

A thematic analysis was adopted to analyse the data. Thematic analysis is a rigorous method to identify, analyse and report themes in the data (Fereday & Muir-Cochrane, 2006). The aim of the analysis was to generate a set of themes which best explained the enablers of continued attendance at health and fitness venues. In their original research, Braun and Clarke (2006) outline a number of steps researchers can apply in the thematic analysis process. To maintain rigour in the present study, the current analysis followed these steps. First, the primary researcher collected the data and transcribed the interviews verbatim, to aid familiarisation with the content and to note similarities and differences. Second, general codes were created following the generation of interesting features within the data in line with the research question. These initial features were analytical interpretations of the data as opposed to mere descriptions of what the participant had said (Gibbs, 2007). Third, once the codes had been generated, they were reviewed and grouped into subthemes. Specifically, raw-data themes that related to a topic were combined into groups, which resulted in the development of lower-order (e.g., Setting goals related to the activity undertaken) and higher-order (e.g., Goal-setting) themes. Fourth, the themes were refined and higher-order themes that incorporated relevant lower-order themes were produced (e.g Motivations for attendance). Fifth, the higher-order themes were defined. The researcher took a continual process of reflection and thoughtful engagement of the data once initial themes were defined to generate the final themes that described the enablers of attendance at health and fitness venues. This was a continual process of reflective and thoughtful engagement with the data and the analytic process (Braun and Clarke, 2019).

Trustworthiness

To be a trusted qualitative researcher, data analysis must be conducted in a consistent and exhaustive manner through recording and disclosing the methods of analysis (Nowell et al., 2017). To ensure validity and credibility of the data a number of stages were undertaken. First, the primary researcher ensured they were well versed and knowledgeable about the health and fitness context and the facilities and classes on offer to members. This familiarity and understanding helped to build rapport with participants and facilitated appropriate probes throughout the interviews. Second, regular peer debriefing with two researchers independent of the interviews and employees of the health and fitness organisation took place at each stage of the research study. This process helped the primary researcher to examine their methods and decision-making processes at each stage of the research. Third, credibility and rigour were addressed by interviewing members who had maintained their attendance with varying experiences of varying activities at different venues. Finally, the data was evaluated, analysed and interpreted in a way that was most meaningful to the primary researcher conducting the study (Braun & Clarke, 2019). Thus, to enable the reader to gain the greatest understanding of the enablers of attendance within health and fitness venues, findings were presented in the form of themes (e.g., lower-order and higher-order themes) combined with direct quotations. As outlined by Braun and Clarke (2016), the themes had ‘layers’; the higher-level themes were broader and captured the essence of one specific idea. The lower-order themes added a greater level of texture and nuance to provide a level of granularity to provide more detail to the broader higher-level theme (see Table 4.1).

Results

Of the 13 participants, seven were male and six were female. Participants ranged in age from 20 years old to 72 years old with a mean age of 35. Members had a mean membership length of 2.4 years and attended a health and fitness venue approximately once a week. Participants attended six different health and fitness venues in total, undertaking

activities that included swimming, exercise classes (e.g. spinning and yoga) and gym provision.

A total of 32 general codes emerged from the interview transcripts representing the views of participants regarding the enablers of attendance at health and fitness venues. The general codes were amalgamated into 13 lower-order themes split across five higher-order themes. First, *routine* was defined as the habitual scheduling, preparation and execution of attendance. Second, *motivations for attendance* was defined as the motivational factors to attend and the clear knowledge of the specific activities that could support this. Third, *accomplishment* was defined as the measurement and interpretation of PA activity undertaken that indicates the accomplishment of attending. Fourth, *venue experience* was defined as the key experiences within a health and fitness venue that ensured members wanted to attend. Fifth, *convenience* was defined as the factors that are required for attendance to occur with ease. A list of these themes is in Table 4.1 and full details of these themes can be identified in the appendices.

Table 4.1. *List of higher-order themes and lower-order themes*

Higher-order themes	Lower-order themes
Routine	Consistency
	Lifestyle Integration
	Habitual Preparation
Motivations for attendance	Underlying Motivators
	Appropriate Activity
	Goal-setting
Accomplishment	Tracking Activity

	Progress
Venue Experience	Familiarity
	Social
	Specific Preferences
Convenience	Accessibility
	Timing

Higher-order themes

1. Routine

Routine consisted of three related lower-order themes: Consistency, Lifestyle Integration and Habitual Preparation. In terms of Consistency, participants outlined the importance of establishing a specific day and time in the week to undertake an activity at the same venue, striving to continue with a consistent routine over the longer term and being encouraged by others to continue a consistent routine. Establishing a consistent day and time was described by 12 participants, and many of their similar views are summarised by the following quote:

> "Well, generally, I stick to the certain times that I visit over a long period. For example, I've only just switched on to what you might call the evening mode. Last summer and towards winter I was finishing work and just going swimming straight after work. I was getting to the pool somewhere around 4:45pm, doing my session and then going home. But now I've readjusted my routine and now I aim to be in the pool for a little before 8pm. My session lasts for about an hour and several minutes." (Participant 8)

Within the Lifestyle Integration lower-order theme participants described identifying times to attend that fitted in with other lifestyle commitments and treating attending as a priority in the context of all lifestyle decisions. The below quote exemplifies this management of time, to ensure that attendance does not interfere with commitments during the day:

> "It suits me to come in the mornings rather than [other times], and then you've got all the afternoon then. But I do other things as well, and I'm committed to other things. So, it's got to fit in with when I can do it." (Participant 13)

Participants also spoke about habitually preparing their attendance and instigating a habitual commitment to attend (Habitual Preparation lower-order theme). Participants often did activities such as packing their bag in advance of attending, preparing food or drink or built up a habit of booking a class at the same time of day:

> "Usually I get my kit ready the night before. So then all I have to do is get up, leave the house, come here, go in the changing rooms, put my stuff in the locker, and then go into the pool, really… If I didn't do that, I'd be whooshing around trying to get it all ready. I don't know, I think I've just been doing it for so long, that's what I do now. It's just like, the night before, get everything ready. So, what I've got to do is get my bag and that's that." (Participant 1)

2. Motivations for attendance

Motivations for attendance consisted of three related lower-order themes: Underlying Motivators, Appropriate Activity and Goal-setting. Within Underlying Motivators, all participants had an important identifiable reason for attending, with many participants using this reason as a motivation to keep returning:

> "There are people who are fanatical about it, and I think that to me is what I never understood because I don't class myself as being fanatical. I just come along to do it to keep my joints going because I know when I haven't been because my leg hurts, and I just want to keep myself mobile basically." (Participant 5)

The Appropriate Activity lower-order theme included being clear about which activity(s) will help them to progress, in line with their underlying motivators, and switching activity, if necessary, if underlying motivators or goals change. The following quote summaries how sure participants were about why they choose to do particular activities, in this example it was to relax or unwind:

> "I think the things I do, it's more for relaxation. I know it's keeping fit as well, but I'm not really one for going to the gym and lifting weights or anything. But swimming, I usually go first thing in the morning. And it's just relaxing swimming up and down, you don't have to think about anything else. And then, the classes. I've been coming to Janet's yoga class for probably as long as I've been a Fitness Unlimited Member. And again, it's just an hour and a half just to relax and unwind." (Participant 1)

Participants either set goals that were activity related or goals that were related to their underlying motivator. The following quote describes one participant who had goals related to their underlying motivator to lose weight:

> "I think having the holiday in April 2018 definitely helped this time around because it gave me a, I guess you call it a short-term goal. So, you had four months to get started in January. And I did all of the planning before Christmas. Right, this is what you are going to eat, this is how many calories you're allowed, this is how you are going track it… I hadn't thought about the gym to begin with. But I had the Couch to 5K app

> downloaded. I had my membership here so I could come swimming. And I was like okay, you've got a goal, 2lbs a week, that's sort of what people recommend. Two stone by April. I was quite regimented when I came back. And I think that's definitely what pushed me to start coming in January. I had those real clear goals for myself." (Participant 6)

3. Accomplishment

Accomplishment consisted of two related lower-order themes: Tracking Activity and Progress. Tracking Activity involved using tracking devices to track the amount of PA undertaken, manually calculating the amount of PA undertaken or attendance records and reflecting on tracking quantities. Using accelerometer devices increased the motivation to do more PA for some participants which, in turn, encouraged them to attend a health and fitness venue more often:

> "I do like my Myzone thing here… I like technology, I like the heart belt and that helps, that really motivates me, makes me come... that's another reason I can't not turn up... and now I've achieved what I wanted, which is Hall of Fame, which is three years of 1300 MEPs per month. I'm a Hall of Famer. Not many of us around." (Participant 10)

The most frequently cited theme within Progress was identifying progress or a lack of progress in line with underlying motivators or goals for attending (e.g., identifies PA in the gym can help reduce leg pain). Participants also described a sense of feeling good as a result of attending and believing attending was 'worth it'. One participant spoke about the change they had seen physically as a result of attending which, in turn, encouraged them to attend more often:

> "Now several months, four, six weeks of doing the same thing, it gets repetitive but if you enjoy it and you actually see visible transformations it just makes you feel better inside, especially mentally. I believe it's a really good feeling… it's that sense of accomplishment when you look in the mirror and you see yourself staring back at what you've earned." (Participant 7)

4. Venue Experience

Three related lower-order themes contributed to the higher-order theme of Venue Experience: Familiarity, Social and Specific Preferences. Participants enjoyed the consistency of seeing familiar staff within the venue, desired a familiar activity and expected a reliable experience at the venue. One participant described their experience of doing a new activity, where it was important to have the familiarity of an instructor they knew, if they were to attend:

> "When this Pilates one came up, it was the trainer who said, I'm thinking of doing a new class, would you be interested in it, and I think because it was her, we've given it a go… it was because she was doing it, so if someone else had been doing it then… [we would not be sure of attending]" (Participant 4)

The opportunity to meet with fellow members socially at the venue and seeing recognisable members during the activity were important facilitators of attendance for many members. One participant said it was the recognisable factor of knowing many of their fellow attendees that had an impact on attendance, as described by the following quote:

> "If I don't come I feel like I'm being lazy. Plus everybody's here, so even if I struggle at home and think I'm too tired, I don't want to go today, I know there's going to be people there that I know. So they help motivate you as well. Plus, you get grief if you don't turn up. Where were you tonight?" (Participant 12)

Many participants could draw upon specific attributes of an activity or the venue that encouraged their attendance. For one participant, one of the key reasons they attended and did the activity of swimming was because of the quality of water in the pool:

> "There's another aspect, as well [to my attendance], which probably doesn't get recognition. And that's the water. The sanitisation of the water, it's sanitised using alternative methods and it's not quite as corrosive on your skin, and I've actually got sensitive skin." (Participant 8)

5. Convenience

Two related lower-order themes contributed to the higher-order theme of Convenience: Accessibility and Timing. In terms of Accessibility, participants outlined a number of enablers of attendance: living or working close to a venue, the opportunity to park easily at a venue, having access to transport or living on a transport route that enables access to a venue and low traffic levels. Participants often described accessibility as a key enabler over other potential factors, such as good facilities, as described by one participant:

> "There's better facilities. This is run down, it's run down, a bit old. Maybe if they just refurbish the gym [that would be good]. This is convenient. We can be here in five minutes. We live five minutes away from the venue. You can come for half an hour." (Participant 3)

Timing referred to convenient venue opening times or class, gym or swim times that suit members' lifestyle. One member described how the class timetable needed to suit her own individual needs:

> "The class times, the Monday, Tuesday, Wednesday class times are really good. Because they have the Aqua and Bodyattack at 8:00, 8:15 starts. It's just a shame they

> don't have those classes on a Thursday or a Friday. That is good that they have those class times. Because the children are fed between 7:00 and 7:30pm, so I can do my mum duties and then still get down here, without having any guilt." (Participant 2)

Discussion

Drawing upon the perspectives of current members of a health and fitness organisation, the current study represents an insight into the enablers of sustained attendance at health and fitness venues. On the whole, the findings support many of the associations derived from prior PA literature. First, the finding that having a routine is a key enabler of attendance aligns with the recent literature focusing on the relationship between habit and PA (Gardner et al., 2019; Hagger, 2019) and with Study 1 which found stability of context was related to sustained attendance behaviour. In the current study, members described a consistency to their attendance behaviour, most notably undertaking the same activity on the same day of the week, at the same time and at the same venue. Frequent performance of a behaviour in the same (stable) context has been theorised to lead to the development of strong habitual responses (Ouellette & Wood, 1998), meaning that performance of the behaviour does not require repeated conscious decision making (Danner et al., 2008). Previous research has found that adhering to a programme had become habitual for many members, which ensured doing the gym programme became an easier task (Pridgeon & Grogan, 2012). Research has also reported an increase of PA at health and fitness venues by focusing on preparation cues and practice consistency (Kaushal et al., 2017). Given that several studies have highlighted the importance of developing a routine for attendance at health and fitness venues, future research would therefore benefit from investigating how this behaviour is formed and influences member attendances. The finding that participants habitually prepared their attendance indicates that routine behaviour not only influences the execution of attendance behaviour, but also how it is instigated. Thus, Kaushal and Rhodes (2015)

described the term *preparatory habits,* denoting the habitual cuing of actions that support PA at later time points. The current findings highlight similar cueing of behaviour, with actions such as preparing food, packing a bag or booking a class in a consistent way helping to prompt future attendance at a venue.

It is notable from the current research that participants treated attending as a priority and actively managed the times they attended a venue around other lifestyle commitments. Growing research suggests that society is becoming increasingly sedentary and that people, particularly those in full time jobs, find it difficult to find time for recreational PA (Smith et al., 2014). It could be that attending members of health and fitness venues, such as those in the sample of the current study, differ in the management of their own time compared to the wider population and have found a way to prioritise it.

Building on the second higher-order theme of Motivations for attendance, physical health has been reported to be an important enabler of general PA (Ashton et al., 2015). Physical and psychological motivators have also been found previously to be key in the long-term use of venues (Riseth et al., 2019). Goal-setting was also prominent in the motivations of continuing gym members (Crossley, 2006). In the current study members had clarity about which activities would aid them in achieving their underlying motivator. As a result, there was little ambiguity about which activity they should do at a venue. This finding has implications for future research, not least investigating how members arrived at the point of knowing which activity was the most appropriate for them and their motivators.

The third higher-order theme of Accomplishment has been cited in previous research outlining the enablers of PA in various populations (Kosteli et al., 2017; Bethancourt et al., 2014) and as an important source of self-efficacy (Bandura, 1997). The current study highlighted the importance of tracking the amount of activity health and fitness members complete; nevertheless, it is unclear from the current study whether the digital tracking of

activity or the manual tracking of activity has a greater prominence in enabling attendance. Self-monitoring has previously been cited as a key behaviour change technique (BCT) to encourage greater PA (Michie, et al., 2009) and thus future research within health and fitness venues could explore whether the same association is found between self-monitoring and health and fitness venue attendance. It is also not known how members use these data points, aside from reflecting on them. For example, it could be that specific methods of evaluating accomplishments influence this enabler; an understanding of such methods or techniques need further exploration.

The higher-order themes of Motivations for attendance, Venue Experience and Convenience are similar to those found in previous research exploring the decision to join, maintain, or cancel a health and fitness membership. In particular, MacIntosh and Law (2015) followed 26 new members of a Canadian health and fitness organisation over one year, interviewing them at the purchase of a new membership, six-month follow-up and at the one-year renewal decision stage. Three of their study's five overall themes; Health-Related Goals (e.g., personal goals or belief in the benefits of PA), Organisational Culture (e.g. sense of community and feeling welcomed) and Inconvenience of Travel (e.g. the journey to the venue too long) align closely with themes identified in the current study; namely, Motivations for attendance, Venue Experience and Convenience, respectively. Although further research is needed to understand the relationship between member retention and member attendance more generally, it is likely that attendance and retention may be inherently linked (Watts & Francis-Smythe, 2008) and have similar determinants.

Within the fifth higher-order theme of Convenience, proximity and accessibility have been cited as important factors for the general use of PA facilities (Corti et al., 1996; Riseth et al., 2019), whilst recent research has suggested that the majority of gym users used one venue over another because it was more convenient. Social factors such as the ability to

exercise with a partner have previously been reported to be important in helping users stay focused on reaching their health-related goals (Macintosh & Law, 2015), which has similarities with the Venue Experience theme in the current study.

Although the knowledge gained in the current study largely aligns with prior research related to PA and/or health and fitness venues, some possible enablers that have been identified in other research were not reflected in the interviewees' accounts. First, there was very little focus on the facilities or equipment provided in venues. Although participants spoke about specific preferences for certain activities, attributes of that activity (e.g., upbeat music in a class) or the overall venue experience, participants rarely spoke about the quality of service on offer. This is in contrast to research into the maintenance of a health of fitness contract (MacIntosh & Law, 2015) that reported service quality as key whilst *Qualities of a fitness club or exercise facility* was also a key component in the survey measurement of the factors related to initial involvement at venues (Mullen & Waley, 2010). Participants in the current study focused more on factors such as convenience. It is possible that once a regular attendance routine or habit is established, the influence of service quality becomes less important, unless it falls below a certain level. Similarly, there was minimal comment by participants on the need to make deliberate commitments to enable attendance. Although a commitment to attend could be implied when participants described booking classes for a future day, this behaviour was interpreted to be habitual and an automatic preparatory action that pre-empted attendance due to the day and time of the week it occurred (e.g., always 8am on a weekday). This is in contrast to previous research that has highlighted the importance of deliberately making a commitment to somebody else to relieve the effort of relying on only self-motivation (Pridgeon & Grogan, 2012) and utilising commitment devices and contracts (Milkman et al., 2012; Muller & Habla, 2018; Royer et al., 2015). It is possible that that the

routine behaviour formed by participants in the current study served to override the need to make conscious commitments to attend a venue.

The current findings offer a number of practical implications for both public health policy makers such as PHE and WHO and providers of health and fitness venues. At a policy level, the findings suggest how the public health benefits of access to PA facilities can be maximised. For health and fitness organisations there are applied implications. The findings provide a starting point to which organisations can test strategies to encourage greater attendances in their venues. The findings also provide direction about where to focus resources or implement initiatives or interventions to increase attendances, such as designing the member induction, or to encourage routine attendance in the early stages of an individuals' membership. Instructors or general venue staff could also incorporate the 'Accomplishment' higher-order theme in their work, such as promoting the use of tracking devices that may help members to identify their accomplishments. More broadly, the findings could be part of a curriculum of training for venue staff that has the aim of encouraging continued attendance amongst members. This may also include keeping the same schedule of class times over the long term to ensure that members maintain consistency of their attendance or encouraging staff to provide opportunities for members to socialise before or after an activity.

One of the main strengths of this study is that it represents the first investigation of the enablers of continued attendance of members in health and fitness venues. By focusing on the factors that can support sustained attendance, the findings serve to address the issue of decreasing attendances that occurs during an individuals' membership The current study also utilised interviews to provide in-depth, rich and context relevant information from individuals who were identified to be attending a health and fitness venue over long periods of time (e.g., two years) and would likely have knowledge about the mechanisms that are required to attend

regularly. The participants included also undertook a wide range of activities at different venues, attended on different days at different times (when compared to each other) and attended for varying reasons. This heterogeneity in the sample gives confidence that the commonality of themes across many of the sample are not due to certain types of members or behaviours within the member population.

The present study also had some limitations that need to be addressed. First, the current research was only conducted in one health organisation based in a large city in England. Caution generalising the current findings should therefore be made and further research sought in additional locations, to confirm the current findings. Second, as the current study identified enablers of continued attendance that incorporate lifestyle decisions for members, including members family or friends in the sample may have provided additional and richer context about how these decisions are conducted by members. For example, members may involve family members into their attendance planning or activities that result from attending (e.g., childcare). Future research may therefore want to include these additional samples. Third, although the study has been successful in identifying what the key enablers of attendance are, it does not report any potential relationships between these factors. For example, it could be that routine behaviour is linked to accomplishment, as members could form routines partly due to the outcomes of attending. Quantitative research may therefore be needed to confirm, or establish the strength of, relationships between some of the factors identified in the present study and sustained attendance behaviour. Finally, as the members included in the study were identified to have sustained attendance and had thus been members of the health and fitness organisation for long periods of time, some of them found it difficult to describe the enablers of their attendance in the earlier parts of their membership. From research described in Study 1, it is notable that member attendances decline from the beginning of their membership. Understanding any additional enablers of

attendance during this period could be beneficial to subsequently increasing attendances. Future research would therefore benefit from longitudinal studies that chart these factors and attendance over extended periods of time.

Conclusion

The current study represents an initial step in investigating the enablers of sustained attendance in members of health and fitness organisations. The findings suggest five key enablers (Routine, Motivators for attendance, Accomplishment, Venue Experience and Convenience) are important for attendance at venues. The current study should therefore be of value to health and fitness organisations, and provide a framework and basis which they can utilise. Future research in a wider range of locations could explore the relationships and mechanisms that explain the importance of these themes and confirm the relevance of these findings to health and fitness organisations and members in other locations.

Chapter 5. A systematic review of interventions to increase attendance at health and fitness venues: Identifying key behaviour change techniques

Introduction

Given that health and fitness organisations provide venues and activities that have the potential to increase PA levels in the population, and that many individuals primarily subscribe to use health and fitness facilities for health reasons (e.g., to lose weight, for increased fitness) (Crossley, 2006), they provide an ideal context in which to study initiatives to increase PA levels.

Despite the level of health and fitness membership, as identified in Study 1, attendances at health and fitness venues generally decline from the start of an individuals' membership. Moreover, many members do not use their membership (DellaVigna & Malmendier, 2006). Study 1 found that only 22% of new members attended a health and fitness venue 12 months after the start of their membership. A study in the United States also reported a mean attendance of approximately four times a year for members on an annual contract (DellaVigna & Malmendier, 2006). It is likely that many of these members are not meeting recommended PA guidelines, given that most members join for health reasons (Crossley, 2006). Therefore, interventions that increase attendance at health and fitness venues are also likely to have a positive impact on public health.

To identify the most effective interventions to increase attendances at health and fitness venues, it is important to understand which interventions have previously been tried, the extent to which they have influenced attendance behaviour, and the intervention components that were key to behaviour change. Such research can provide useful information for health and fitness organisations about where to place their resources to increase member attendances at their venues. Such information would also be useful for national policy makers and global organisations such as the WHO to help inform future recommendations for

promoting PA (WHO, 2018) (e.g., 'What Works' guidance). To date, very little is known about the effectiveness of interventions to increase attendance at health and fitness venues; the current review aims to fill this gap.

Coding a behaviour change technique (BCT), defined as an observable and replicable component of an intervention designed to alter processes that regulate behaviour within an intervention (Michie et al., 2013), can help to identify the key techniques, or "active ingredients", of an intervention. Understanding interventions that are effective in promoting behaviour change requires clear reporting and a standard for outlining the content and descriptions of interventions (Michie & Johnston, 2012). Thus, the current review utilised the 93 BCT taxonomy (v1) (Michie et al., 2013) to code interventions that have attempted to increase attendances at health and fitness venues. Effective BCTs have been identified for promoting PA in general, notably 'self-monitoring' which was significantly more effective than other techniques when combined with at least one other technique from control theory (Michie et al., 2009). Nevertheless, to date, there has been no research investigating the BCTs used in interventions aimed to increase attendance at health and fitness venues. The BCTs that help to increase PA may or may not be the same as those that are important in increasing attendance at health and fitness venues.

This systematic review therefore aimed to: 1) assess the effectiveness of interventions designed to increase attendance at health and fitness venues; 2) identify the BCTs that have been used in interventions to increase attendance at health and fitness venues; and 3) assess the relative effectiveness of different BCTs used to increase attendance at health and fitness venues.

Method

Search strategy, selection criteria and data extraction

Relevant health, psychological and exercise related electronic databases were selected: Business Source Premier, Cochrane Controlled Trials Register, Google Scholar, MEDLINE, Physical Education Index, PsychINFO and Scopus. Searches were carried out in June 2019. Only English language reports were included. There was no restriction on publication date. Reference lists and citations of identified studies were also scanned. Grey literature, including conference proceedings and abstracts were searched to identify research that may have been presented ahead of full publication. Only studies that tested interventions to increase attendance behaviour in a health and fitness venue using a randomised controlled experimental design were included in the review. Randomised controlled trials (RCTs) are considered to be the 'gold standard' design to provide evidence of effectiveness of an intervention and minimise the risk of bias (Bothwell et al., 2016). Other designs such as nonrandomised or observational studies were excluded. Studies located in a health and fitness venue with adult members of the venue were included. Studies involving non-members or volunteers were excluded, as were studies involving participants who were suffering with a clinical condition or were part of an exercise referral scheme. Studies which only measured attendance at specific exercise sessions or programmes were excluded. The lead researcher retrieved data, which was checked by a second coder, from the included studies and recorded these on a standardised data extraction form. The following details were retrieved: author and country; sample; setting; conditions; BCTs; attendance measure; main findings; and effect size as assessed by Cohen's *d* (Cohen, 1988). In line with Cohen's guidelines (Cohen, 1988), $d < 0.20$ was interpreted as trivial, $d \geq 0.20$ was interpreted as a small effect size, $d \geq 0.50$ as a medium effect size, and $d \geq 0.80$ as a large effect size. The conditions were coded such that a positive effect size would indicate a positive effect of the intervention on attendance relative to the control condition.

Protocol development

The study protocol developed for this study is in Appendix F. This protocol was outlined prior to the research process was undertaken. Registering a systematic review is not mandatory and thus this systematic review was not formally registered, which is in line with approximately half of systematic review authors (Tawfik et al., 2020).

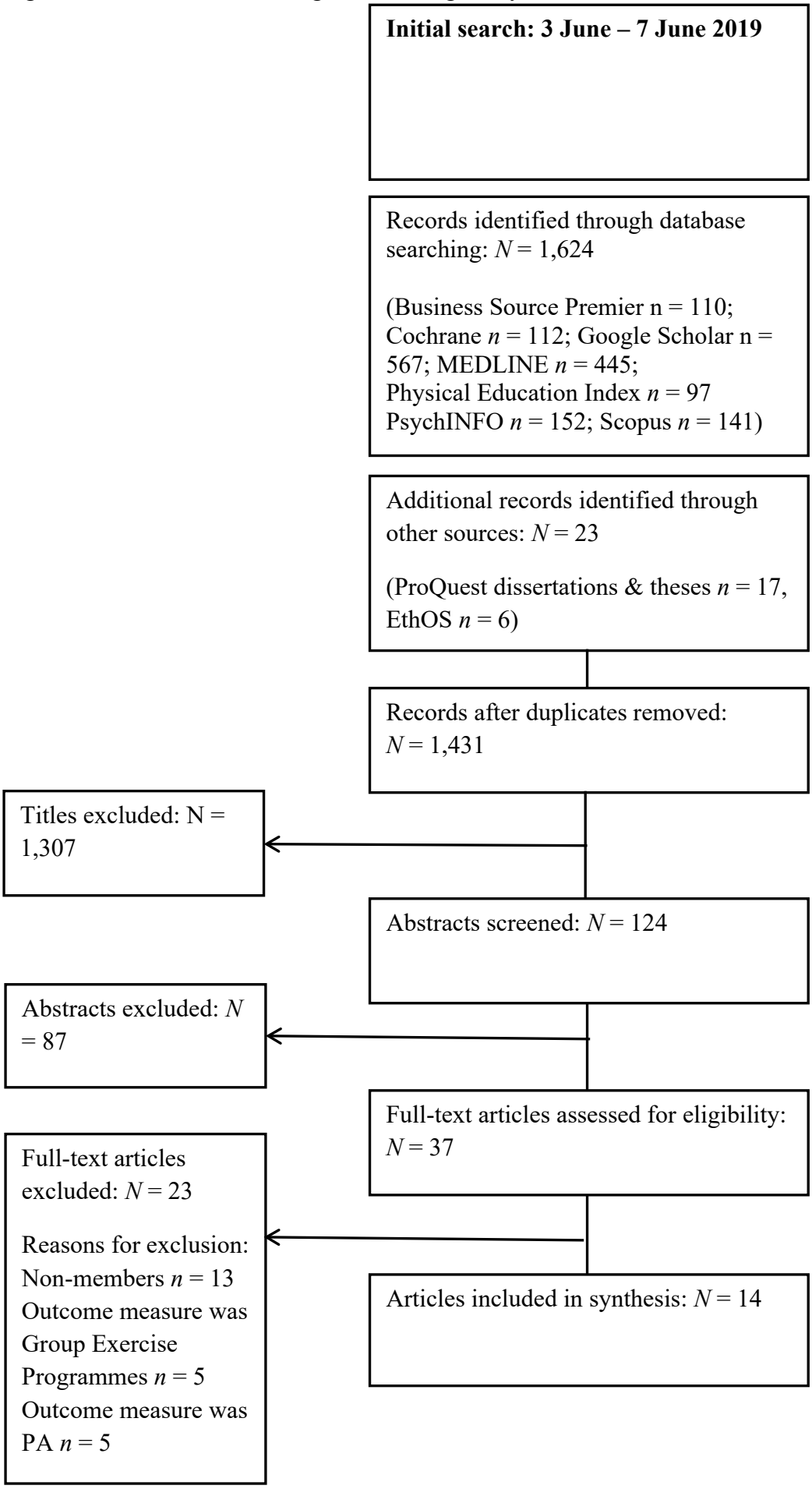
Quality of the included studies

As this review was an exploratory synthesis to investigate the BCTs used and their relationship with intervention effectiveness, formal quality assessment of included studies was not conducted. The Cochrane tool to assess risk of bias in RCTs (Higgins et al., 2011) was used to assess the quality of the included studies. Bias in the Cochrane tool is considered in terms of *selection, performance, detection, attrition, reporting* and *other biases* and studies are rated as high, low or unclear in the risk of bias for each area. These criteria were used to rate each of the included studies.

Behaviour change techniques (BCTs)

The BCTs used in each study were identified from intervention descriptions and coded from the BCT taxonomy (v1) according to the instructions provided. BCTs in the intervention condition were coded. Where it was not possible to code an intervention component to one of the 93 BCTs as described in the taxonomy, additional techniques were coded and named as appropriate.

Figure 5.1. PRISMA Flow Diagram Showing Study Selection Process



Results

Included studies

Fourteen studies, including 20 interventions, were identified that met the inclusion criteria (see Figure 5.1). The studies' publication dates ranged from 1977 (Wankel & Thompson, 1977) to 2018 (Carrera et al., 2018; Muller & Habla, 2018). A description of the included studies is presented in Table 5.1.

Participants

A total of 6,788 participants were included in the 14 studies, with 3,406 randomised to receive an intervention and 3,382 to a control condition. The number of participants completing the studies (intervention and control) ranged from 36 (Thompson & Wankel, 1980) to 2,463 (Muller & Habla, 2018). The mean age of the participants ranged from 28 (Thompson & Wankel, 1980) to 41 (Annesi, 2002) years old, with half of the studies reporting a mean age within the thirties. Twelve of the 14 studies included both females and males in their interventions. The remaining two studies only included females (Wankel & Thompson, 1977; Thompson & Wankel, 1980). Other demographics such as education, ethnicity and employment status were inconsistently reported.

Mode of delivery

The mode of delivery varied in the studies. There were two main modes of delivery; one study included multiple meetings with participants and was primarily face-to-face (Annesi, 2002), the remaining studies used methods which were not face-to-face (e.g., email reminders, telephone calls, letters).

Length of intervention and monitoring periods

Seven interventions were one-off interventions (e.g., a letter in the post) (Wankel & Thompson, 1977; Carrera et al., 2018; Annesi, 2002; Estabrooks et al., 1996; Nigg et al., 1997a; Nigg et al., 1997b; Spangenberg, 1977) and the remaining seven interventions (Muller

& Habla 2018; Carrera et al., 2018; Annesi, 2002; Calzolari & Nardotto, 2017; Carrera et al., 2017; Marz, 2017; Rohde & Verbeke, 2017) varied between two weeks (Carrera et al., 2018) and two years (Annesi, 2002) in length. The median length was 12 weeks. All of the studies measured attendance either during the intervention and/or for a period of time after the intervention had taken place. The monitoring period of attendance ranged from two weeks (Carrera et al., 2018) to two years (Calzolari & Nardotto, 2017). The median monitoring period was 8 weeks.

Outcome measures

All 14 studies reported objective, electronically recorded attendance at the health and fitness venue.

Quality of the included studies

Overall, the included studies reported a low level of bias within the assessment. Bias was reported to be high once each in "random sequence generation" (Calzolari & Nardotto, 2017), "allocation concealment" (Calzolari & Nardotto, 2017), "selective reporting" (Calzolari & Nardotto, 2017) and "incomplete outcome data" (Marz, 2017). A summary table of the level of bias in each of the included studies is presented in Table 5.3.

Effectiveness

Since it was not appropriate to combine the results of the included studies into a meta-analysis due to the heterogeneity of the interventions, exploratory analyses were performed to assess the effects of each of the interventions. Effect sizes were calculated to analyse which of the interventions had the largest effect on attendance over the control group and are reported in Table 5.1. Only two studies, reporting four interventions, reported a large (d = 1.00, d = 1.37, d = 1.45) or medium effect size (d = 0.60) (Wankel & Thompson, 1977; Annesi, 2002). All of the remaining studies reported small or trivial effect sizes. Of the

remaining studies, the largest was an effect size of $d = 0.38$ (Courneya et al., 1997) and the smallest was $d = 0.004$ (Rohde, 2017).

Behaviour change techniques

None of the studies explicitly reported the BCTs included in the interventions. Each intervention was therefore coded to identify BCTs in line with the BCT taxonomy (v1). Overall, 13 BCTs were coded across the 20 interventions. Four interventions included "Prompts/cues" (BCT 7.1) (Muller & Habla, 2018; Carrera et al., 2018; Estabrooks et al., 1996; Calzolari & Nardotto, 2017). Three studies reported "Incentive (outcome)" (BCT 10.8) (Courneya et al., 1997; Carrera et al., 2017; Rohde & Verbeke, 2017). "Pros and cons" (BCT 9.2) (Wankel & Thompson, 1997; Nigg et al., 1997b) was reported by two studies. Each of the following BCTs were reported once: "Goal setting (behaviour)" (BCT 1.1) (Annesi, 2002), "Problem solving" (BCT 1.2), (Wankel & Thompson, 1997), "Action planning" (BCT 1.4) (Carrera et al., 2018) "Review behaviour goal(s)" (BCT 1.5) (Annesi, 2002), "Feedback on behaviour" (BCT 2.2) (Rohde & Verbeke, 2017), "Self-monitoring of behaviour" (BCT 2.3) (Nigg et al., 1997a), "Material incentive (behaviour)" (BCT 10.1) (Marz, 2017) and "Future punishment" (BCT 10.11) (Marz, 2017). Two additional BCTs were included as additional codes as these were not identified within the Behaviour Change Taxonomy. These additional codes were identified once each: "Perceived choice" (Thompson & Wankel 1980) and "Self-prophecy" (Spangenberg, 1997).

Effectiveness of the BCTs

The study reporting the intervention with the largest effect size ($d = 1.45$) used "Pros/cons" and "Problem solving" (Wankel & Thompson, 1977). This study also reported two additional interventions using "Pros/cons" and "Problem solving"; one with a large effect size ($d = 1.00$) and one with a medium effect size ($d = 0.60$). One other intervention had a large effect size ($d = 1.37$; Annesi, 2002) using "Goal setting (behaviour)" and "Review behaviour goals". These BCTs were not used in any of the other interventions. The BCTs

used in interventions associated with small or trivial effect sizes were as follows: “Incentive (outcome)” (d = 0.004, d = 0.03, d = 0.08, d = 0.14, d = 0.29, d = 0.38); “Material incentive (behaviour)” (d = 0.04, d = 0.23, d = 0.33); Future punishment” (d = 0.04, d = 0.23, d = 0.33); “Pros and cons” (d = 0.31); “Perceived choice” (d = 0.29); “Self-prophecy” (d = 0.10, d = 0.18); “Prompts/cues” (d = 0.01, d = 0.05, d = 0.06, d = 0.10, d = 0.16); “Action Planning” (d = 0.10); “Self-monitoring of behaviour” (d = 0.08); and “Feedback on behaviour” (d = 0.004, d = 0.03).

Table 5.1 *Study Characteristics*

Author and country	Participant Characteristics	Intervention length, content and groups	Measures	Recorded Results [actual p values reported where identified by authors]	Effect Size *d*
Annesi (2002) **Italy**	*N* = 100 [gym members] Intervention condition *N* = 50 Control condition *N* = 50	All participants were told that completing three sessions (or more) of vigorous exercise per week was recommended for fitness progress. All participants were provided individual appointments of 40 min with the same exercise professional every 6 weeks Control condition's meetings focused on the transfer of physiological knowledge, the need to continue exercise having positive effects on health and personalised modification of exercise plans on progress Intervention condition had an additional focus which was the implementation of a goal-setting protocol	Attendance was calculated for the 52 weeks of the intervention	Over the study period there was greater attendance in the intervention condition than the control condition ($p < .0001$)	1.37

Calzolari et al. (2017) **Italy**	*N* = 247 [university students] Intervention condition *N* = 89 Control condition *N* = 158	Intervention condition received weekly emails reminding them of the opportunity to attend the gym (during a maximum period September 1, 2009 to March 16, 2010). Control condition did not receive reminders	Attendance was monitored during and two years after the treatment period	The intervention condition had 0.6 more visits per month than the control condition during the treatment period but this was not significant [$p > 0.05$] There was no significant difference in the number of visits per month between the intervention and control conditions at two year follow-up [$p > 0.05$]	0.16 0.08
Carrera et al. (2017) **USA**	*N* = 690 [new gym members] Intervention condition *N* = 514 Control condition *N* = 176	Intervention condition received one of three incentives if they attended the gym at least 9 times over the first 6 weeks of their membership; a 30 dollar payment ("money30"), or a 60 dollar payment ("money60") or an item they had chosen costing 30 dollars ("item") Control condition received 30 dollars payment	Attendance was monitored for the first 12 weeks of the members' gym membership (including the six-week intervention period at the beginning of	For the intervention condition as a whole, incentives did not have a statistically significant impact on attendance during the first six weeks [$p > 0.05$ 0.10]	0.08

		unconditionally during the same period	their membership)		
Carrera et al. (2018) **USA**	*N* = 877 [members of a private gym] Intervention condition *N* = 438 Control condition *N* = 439	Intervention condition were asked to check off the time they planned to work out that day each day in a two-week period [participants were told that the information would be used to create calendar invitations for each day/time they planned to visit] Control condition were asked to check off a time that they worked out in the preceding two weeks	Attendance was monitored between the two conditions during the experimental period	There was no significant difference between the intervention and control conditions during the experimental period [$p > 0.05$]	0.10
Courneya et al. (1997) **Canada**	*N* = 300 [alumni, support staff, academic staff, and the general public. University students were excluded]	Intervention condition participants received a letter by mail, containing a friendly message and pamphlet outlining the possible activities available at the fitness facility. The letter included an additional paragraph instructing them that they could earn one month's free membership if they attended the fitness	Attendance of all participants was monitored for one month following the intervention	The intervention condition had significantly higher attendance than the active control condition over the one month period [$t(198) = 2.76$, $p < 0.05$] The intervention condition did not have significantly higher	0.38 0.14

	Intervention condition *N* = 100 Active control condition *N* = 100 Control condition *N* = 100	facility at least 12 times in the next month Active control condition participants received the same letter by mail as the intervention condition, without the additional paragraph instructing them that they could earn 1 month's free membership if they attended the fitness facility at least 12 times in the next month The control condition participants received no intervention		attendance than the control condition [$p > 0.05$]	
Estabrooks et al. (1996) **Canada**	*N* = 200 [Alumni, support staff, academic staff, and the general public. University students were excluded]	Intervention condition participants received a letter by mail, which contained a friendly message and outlined the possible activities at the fitness facility. They also received a key chain that was to act as a stimulus control and a brief statement about the purpose of the key chain. At the completion of the 8 week observation period, they	Attendance was monitored for eight weeks following the intervention	There was no main effect for the intervention condition [F (197) =.47, $p > 0.05$]	0.05

		received a telephone call as a manipulation check			
	Intervention condition *N* = 100 Active control condition *N* = 50 Control condition *N* = 50	Active control condition received a letter by mail, which contained a friendly message and outlined the possible activities at the fitness facility. They did not receive the additional stimulus The control condition participants received no intervention			
Marz (2017) **Germany**	*N* = 94 [registered members of the gym] Intervention condition *N* = 60 Control condition *N* = 34	Intervention condition participants were split into a "gain-treatment" or "loss-treatment". In the "gain-treatment", participants were rewarded for frequent attendance at the gym. In the "loss-treatment", incentives were framed in a way that infrequent attendance at the gym was penalized Control condition participants received no financial incentives	Attendance was monitored for the four-week intervention and 12 weeks after the intervention	Participants assigned to the "loss- treatment" had an estimated average of 0.686 additional visits per week in the intervention period compared to the control condition, which was statistically significant [$p < 0.05$] Participants assigned to the "gain-treatment" had an estimated average of 0.344 additional visits per week compared to the	0.33 0.23

				control condition, which was not statistically significant [$p > 0.05$]	
Muller and Habla (2018) **Sweden**	$N = 2463$ [new registered members of the gym] Intervention condition $N = 1231$ Control condition $N = 1232$	Intervention condition received a series of email reminders over the course of a three month period [January 9, 2017 and April 9, 2017] encouraging them to attend the gym. The control condition received no email reminders	Attendance data was analysed during the intervention period	During the intervention period, the intervention condition had a slightly higher attendance than the control condition [total visits increase by 13%] ($p < 0.01$)	0.01
Nigg et al. (1997a) **Canada**	$N = 204$ [Alumni, support staff, academic staff, and the general public]	The three experimental conditions received a letter by mail that contained a friendly message and a calendar month with large squares containing four weeks beginning November 13 and ending December 10. Participants were unaware that the study focused on the motivational effects of self-monitoring or	Attendance was monitored for four weeks post intervention	The "Positive SM" condition showed a significantly higher attendance than the control condition post-intervention ($p < 0.05$) The "Negative SM" condition showed a significantly higher attendance than the	0.08 0.20

	Intervention condition *N* = 154 Control condition *N* = 50	that their attendance was being objectively monitored by the researchers. Participants in the "Positive SM" condition were instructed to place an "X" in each calendar day they attended the fitness facility. Participants in the "Negative SM" condition were asked to place an "X" in each calendar day that they did not attend the fitness facility. Participants in the "Neutral SM" were instructed to place a "tick" in each calendar day that they attended the facility and a "X" in each day they did not attend the facility. The control condition received no intervention		control condition post-intervention ($p < 0.05$) The “Neutral SM” condition showed a non-significant difference in attendance post intervention compared to the control condition ($p > 0.05$)	0.02
Nigg et al. (1997b) **Canada**	*N* = 153 [Alumni, support staff, academic staff, and	Intervention condition participants received a telephone call ‘interview’ in which they were asked to think systematically of and record the expected gains and	Attendance was monitored for four weeks of baseline	Attendance in the relevant DBS condition saw virtually no change from baseline to the end of the intervention [t(50) = .26, $p > 0.05$] while	0.31

	the general public] Intervention condition *N* = 102 Control condition *N* = 51	losses of either exercising at the gym (relevant scenario) or not smoking (irrelevant scenario) Control condition participants received no intervention	and the eight weeks of the intervention The number and importance of pros and cons listed by each individual in the relevant DBS condition was examined	attendance in the control condition saw a significant decrease from baseline to the end of the intervention f(50) = 1.94. $p < .03$.	
Rohde et al. (2017) **Netherlands**	*N* = 1182 [members of the gym] Intervention condition *N* = 258 (Unconditional rebate *n* = 48; Conditional rebate *n* =	Intervention condition participants were randomly split into 'conditional', 'unconditional' or 'choice' conditions. The 'conditional' participants received a rebate of approximately 10% of the average membership fee conditional on attending the gym at least once per week in 11 of the 13 weeks of the first quarter in 2010. This incentive was repeated in the following	Attendance of participants was monitored for 15 months in total; the quarter before the intervention, the two quarters of	The only increase in attendances during the intervention period was for the conditional rebate (CR) and unconditional rebate (UR) conditions in the first quarter of 2010. There was no effect when comparing each of the intervention conditions to the control condition ($p > 0.05$).	[UR: 0.03] [CR: 0.004]

	113; Choice *n* = 97) Control condition *N* = 924	quarter. The 'unconditional' condition participants received the 10% rebate per quarter for staying a member of the gym. The 'choice' participants could choose between the conditional or unconditional rebate. Control condition participants did not receive any incentives	the intervention and the two quarters following the intervention		
Spangenberg (1997) **USA**	*N* = 142 [members of the club] Intervention condition *N* = 73 Control condition *N* = 69	Intervention condition participants received a telephone call asking whether they were a member of a health club and then asked "Do you expect to use the club in the next week?" Control condition participants received the same telephone call as the intervention condition, but were not asked the question "Do you expect to use the club in the next week?"	Attendance was monitored for the ten-day period immediately following telephone contact and for the six-month period following the intervention	Over the ten-day period, 12% of the intervention condition participants and 7% of the control condition participants attended the club once or more during the ten-day period, this was not statistically significant (χ^2= 1.12, *df* = 1, *p* > 0.05) For the six-month period, the average number of visits was 10.25 for the intervention condition which was double the control condition average	0.18 0.10

				of 5.1 visits. This was significant at the 5% confidence level (F(l,93) = 3.78, p = 0.05).	
Thompson et al. (1980) **Canada**	N = 36 [adult female members of the gym] Intervention condition N = 18 Control condition N = 18	All participants were contacted by telephone to arrange a meeting for a new exercise programme offered by the club. Participants at this initial meeting were asked to complete a series of personal inventories and to express their relative preferences for a number of exercises Participants were then randomly assigned to the treatment conditions and returned for a second visit to the club Intervention condition participants were told that their programme was based totally on the choices they had made. At the end of the second visit they were asked to select six additional exercises which they would	Attendance was monitored over a six-week period following the intervention	The intervention condition had a higher average attendance than the control condition over the 6-week period, this was not statistically significant [F(1,34) = 2.88, p > 0.05]	0.29

		add to their programme – one every third visit Control condition participants were told that their programme was based on a standardised exercise format rather than on their expressed preferences. At the end of their second visit they were told that six additional exercises would be added to their programmes by the instructors			
Wankel et al. (1977) **Canada**	*N* = 100 [adult female members of the gym] Intervention condition = 75 [‘Complete decision’ *n* = 25, ‘Positive-only’ *n* = 25, ‘Regular call up’ *n* =	The ‘complete decision-balance-sheet’ treatment received a telephone call where they were asked to complete a decision balance sheet grid concerning attendance of the health club's programmes. The ‘positive-only’ telephone interview condition were only asked to think of and report positive outcomes to be expected.	Attendance was monitored for one month following the intervention	The three treatment conditions had a significantly higher attendance than the control condition ($p < 0.05$) The “Positive only” condition had the highest attendance compared to the control condition. This was followed by the ‘complete decision-balance-sheet’ condition.	 1.45 1.00

	25, Control condition *n* = 25	A further condition (‘Regular call up ‘received a standard telephone call utilised by the club in following up inactive members. This call attempted to establish why members had not been utilising their membership and encouraged them to use it more in the future. This condition served as a "personal attention" control condition for the other two intervention conditions The control condition received no intervention	The regular call up condition had the smallest attendance difference from the control group	0.60

Table 5.2. *List of BCTs and effect sizes*

	Effect Sizes	1.1: Goal Setting (behaviour)	1.2: Problem Solving	1.4: Action planning	1.5: Review behaviour goals(s)	2.2: Feedback on behaviour	2.3: Self-monitoring of behavior	7.1: Prompts/cues	9.2: Pros and cons	10.1: Material incentive (behavior)	10.8: Incentive (outcome)	10.11: Future punishment	Additional BCT: “ Perceived choice”	Additional BCT: “ Self-prophecy”
Annesi (2002)	1.37	x			x									
Calzolari et al. (2017)	0.16, 0.08							x						
Carrera et al. (2017)	0.08										x			
Carrera et al. (2018)	0.10			x				x						
Courneya et al. (1997)	0.38										x			
Estabrooks et al. (1996)	0.05							x						
Marz (2017)	0.33, 0.23									x		x		
Muller et al. (2018)	0.01							x						
Nigg et al. (1997a)	0.08, 0.20. 0.02						x							
Nigg et al. (1997b)	0.31								x					
Rohde et al. (2017)	0.03, 0.004					x					x			

Spangenberg (1997)	0.18, 0.10													x
Thompson et al. (1980)	0.29												x	
Wankel et al. (1997)	1.45, 1.00, 0.60		x						x					

Table 5.3. *Table of bias for each study*

	Random sequence generation (Selection Bias)	Allocation concealment (Selection bias)	Blinding of participants and personnel (Performance bias)	Blinding of outcome assessment (Detection bias)	Incomplete outcome data (Attrition bias)	Selective reporting (Reporting bias)	Other sources of bias (Other bias)
Annesi (2002)	Low	Low	Unclear	Low	Low	Low	Low
Calzolari et al. (2017)	High	High	Unclear	Low	Low	High	Low
Carrera et al. (2017)	Low	Low	Unclear	Low	Low	Low	Low
Carrera et al. (2018)	Low	Low	Unclear	Low	Low	Low	Low
Courneya et al. (1997)	Low	Low	Unclear	Low	Low	Low	Low
Estabrooks et al. (1996)	Low	Low	Unclear	Low	Low	Low	Low
Marz (2017)	Low	Low	Unclear	Low	High	Low	Low
Muller et al. (2018)	Low	Low	Unclear	Low	Low	Low	Low
Nigg et al. (1997a)	Low	Low	Unclear	Low	Low	Low	Low
Nigg et al. (1997b)	Low	Low	Unclear	Low	Low	Low	Low
Rohde et al. (2017)	Low	Low	Unclear	Low	Low	Low	Low
Spangenberg (1997)	Low	Low	Unclear	Low	Low	Low	Low
Thompson et al. (1980)	Low	Low	Unclear	Low	Low	Low	Low
Wankel et al. (1977)	Low	Low	Unclear	Low	Low	Low	Low

Discussion

Main findings

The main aim of this systematic review was to understand the effectiveness of behaviour change interventions that aimed to increase attendance of members in health and fitness venues. Interventions with the largest effects on attendance utilised problem solving, pros/cons, goal setting (behaviour) and reviewing behaviour goals as behaviour change techniques (BCTs). Aside from one other intervention which had a medium effect size and also utilised problem solving and pros/cons, the remaining interventions had small or trivial effects on attendance behaviour. Given that only two studies (with combined sample size of 475) showed a moderate to large effect size, there is a limited evidence base from which to draw extensive conclusions on which BCTs could be effective in increasing attendances at health and fitness venues.

Pros/cons and problem solving showed the strongest evidence of effectiveness thereby demonstrating the potential utility of these techniques to increase attendances at health and fitness venues. The decisional balance of perceived advantages and disadvantages of change, such as pros/cons, is identified as one of three key factors that mediate behaviour change within the transtheoretical model of behaviour change (TTM) (Marshall & Biddle, 2001). Nevertheless, it should be noted that one intervention utilising pros/cons as the only BCT in the current review had a small effect (d = 0.31) (Nigg et al., 1997b). The findings could be influenced by which BCTs pros/cons is paired with. Thus, more research is therefore necessary to understand how this BCT can be most effectively applied to increase attendances at health and fitness venue.

The second highest effect sizes were found for interventions that included the BCTs goal-setting (behaviour) and review behaviour goals. These BCTs have been found to be

effective techniques in a previous meta-analysis of PA interventions which found that interventions that combined goal setting along with self-monitoring (Michie et al., 2009) had the largest effect sizes. The meta-analysis also found that other behaviour change techniques derived from control theory (Carver & Scheier, 1982), such as prompting intention, providing feedback on performance, and prompting review of goals were associated with larger effect sizes (Michie et al., 2009). Interventions derived from control theory have also been found to be associated with greater changes in intention and stages of change in a review of how interventions can increase motivation for PA (Knittle et al., 2018). In the intervention included in the current review (Annesi, 2002), members also met with a health and fitness professional every six weeks which suggests that face-to-face contact could be a good means through which to review behavioural goals.

The most common behaviour change technique, used in four studies, was prompts/cues (Muller & Habla, 2018; Carrera et al., 2018; Estabrooks et al., 1996; Calzolari & Nardotto, 2017) but was associated with small or trivial effects on attendance behaviour. The second most common behaviour change technique, used in three studies, was financial incentives; nevertheless, the effects of financial incentives on attendance were also small or trivial (Courneya et al., 1997; Carrera et al., 2017; Rohde & Verbeke, 2017), although when financial incentives were framed as a 'loss' they had a stronger effect ($d = 0.33$) on attendance (Marz, 2017). The behavioural economics literature has a wealth of research investigating the 'loss aversion' effect on individuals' behaviour, notably that individuals tend to prefer avoiding losses than acquiring equivalent gains (Novemsky & Kahneman, 2005). The majority of this research has been related to monetary gains and losses and how individuals respond to various decisions related to how much they could gain or lose in a specific situation. Further research is needed to understand how the users of health and fitness venues respond to the framing of financial losses and rewards to incentivise attendance.

The mode of delivery might also impact on intervention effectiveness. For example, the intervention with the highest effect size (Wankel & Thompson, 1997) was delivered via telephone and the second largest effect size (Annesi, 2002) was delivered face-to-face such that participants attended a number of pre-arranged 40-minute sessions with a health and fitness professional. These methods of delivery were in contrast to many of the studies that had small or trivial effect sizes. In the two studies that had the smallest effect sizes (Courneya et al., 1997; Estabrooks et al., 1996) participants had minimal face-to-face contact. For example, in both of these studies, the intervention conditions received the intervention in the post with instructions of what they needed to do. It could be that participants had low engagement with these interventions which may partially explain the trivial and non-significant effects. Similarly, trivial effects were reported in other studies which had minimal face-to-face contact (Calzolari & Nardotto, 2017; Carrera et al., 2017). One potential advantage of using methods not requiring personal contact is the high number of participants they can reach. Nevertheless, these delivery methods may have lower effectiveness due to lower levels of participant engagement. Cost-effectiveness studies are therefore required to explore this trade-off between scale and engagement in interventions. Given the current findings it would also appear important to understand how interventions that have minimal direct contact with participants can be effective in increasing attendances.

Implications of the findings

This systematic review identified 14 studies reporting 20 interventions that sought to increase attendance in members at health and fitness venues. Of these, only three interventions showed a large effect. Given the results in the current review, interventions could include pros/cons alongside problem solving techniques and goal setting alongside reviewing behaviour goals to increase attendance in health and fitness venues. It is important to note that these findings were from only two separate studies; these implications should

therefore be treated with caution. The inclusion of other BCTs taken from control theory, such as self-monitoring, should also be considered as they have been associated with large effect sizes in increasing motivation for PA (Knittle et al., 2018). There are also implications for the delivery of interventions. In particular, using a direct contact method of delivery may increase intervention effectiveness as it may lead to greater engagement than methods that do not directly interact with participants. Notably, the BCTs with the highest effect sizes were only reported in two studies. Although these could be effective in increasing attendances, additional research is required to replicate these findings. Apart from the use of four BCTs, other interventions included in the review had only small or trivial effects on attendance. More studies are needed to test a greater range of theory-based BCTs that have been found to be effective in other contexts. Identifying the BCTs that are best able to increase attendances at health and fitness venues may also help to increase PA at a population level given the large numbers of people who are members of such venues, but currently under-utilise them.

Strengths and limitations of this review

The current review had a number of strengths. First, it is the first systematic review to evaluate the effectiveness of interventions to increase attendance in health and fitness venues. Second, the study reviewed studies that had electronically recorded attendance at the health and fitness venue. This measurement provides an objective assessment of attendance at venues and potential change as a result of interventions. Third, the utilisation of the behaviour change taxonomy also enabled a more detailed and systematic analysis of the likely active ingredients of successful interventions. Fourth, although a formal quality assessment did not take place, the systematic review assessed the risk of bias in the included studies, as recommended by the Cochrane tool to assess risk of bias in RCTs (Higgins et al., 2011). A number of general quality issues were able to be identified largely related to limitations inherent in in the study designs and in study reporting.

The current review also had some limitations. First, the conclusions are based on only 14 studies. More studies are therefore needed to identify the BCTs and components of interventions that could increase attendances at health and fitness venues. Second, none of the studies explicitly described the BCTs used within the study. The studies in the current review had to be coded to identify which BCTs had been included, often on the basis of limited information. Third, the studies included different monitoring periods which might have reduced the ability to compare effectiveness between interventions. Nevertheless, there was no evidence that the length of the monitoring period was associated with larger or smaller effect sizes. Fourth, the study did not take a quantitative approach to summarise the results of the studies (i.e., a meta-analysis). Understanding the difference between studies through this statistical approach could have provided the opportunity to critically compare each intervention in a more objective manner. Given the heterogeneity in studies included in the systematic review, for example there were differences in measures to assess attendance, it was decided that a meta-analysis would not provide a consistent comparison across studies (i.e., it would compare 'apples with oranges'). Finally, the behaviour change technique taxonomy did not cover all of the BCTs identified.

Conclusion

Overall, this systematic review has reported on the current evidence base on which BCTs can be effective in increasing attendance at health and fitness venues. Whilst the available evidence suggests utilising pros/cons alongside problem solving and goal-setting (behaviour) alongside reviewing behaviour goals may be effective, there are only a limited number of studies in this field. Small sample sizes and small effect sizes across the majority of interventions make it difficult to draw definitive conclusions and further studies are therefore required to provide greater certainty about which BCTs are likely to increase attendances at health and fitness venues.

Chapter 6. A service evaluation of the impact on attendance of sending a habit planner to new members at a health and fitness organisation

Introduction

In line with previous research in the Netherlands (Middelkamp et al., 2016) and USA (DellaVigna & Malmendier, 2006), Study 1 showed that attendance rates decrease during the first year of membership of a health and fitness organisation. In particular, only 22% of new members attended a health and fitness venue during the 12th month of their membership. As has been highlighted in previous chapters, from a public health standpoint there is a need to increase attendances at health and fitness venues if members are to benefit from PA at these venues. As a result, effective and scalable interventions are required to promote regular attendance at health and fitness venues. Given that further knowledge is needed to understand how attendances can be increased, Study 4 of this thesis utilised a service evaluation to evaluate an intervention to increase attendance within the health and fitness setting. The following chapter outlines the development and evidence base for the intervention and the results of the study, implemented within a health and fitness organisation with new health and fitness members. The intervention was developed on the basis of the research presented in this thesis.

Background

In addition to reporting that attendances decreased from the point of member sign up, Study 1 also found significant associations between two key factors and continued attendance that could be targeted in an intervention; notably the frequency of early attendance and stability of the context (venue, day and time) that members attended. The development of a consistent routine (i.e., attending the same activity on the same day and time each week) was also identified by members who were regular long-term attenders as an important enabler of attendance in Study 2. In Study 3, there were few BCTs that were found to be associated with

medium or large effects on attendance. The most effective interventions in this study were delivered face-to-face, but this is unlikely to be scalable to a large population of health and fitness members. Additionally, none of the interventions included in the review targeted the key factors that were identified in Study 1 or Study 2 that are likely to lead to habitual behaviour (i.e., frequently performing a behaviour in a stable context) that may be key to behaviour maintenance. The current study therefore aimed to build on the initial research developed in this thesis to fill this gap in the literature.

There is some evidence that interventions that seek to encourage habit formation may be effective in changing health behaviour (Wood & Neal, 2017). For example, Lally et al. (2008) gave participants a "top tips for weight loss" leaflet listing everyday eating and exercise behaviours that are linked to successful weight loss (e.g., 10,000 steps a day) alongside tips about how these behaviours can be incorporated into everyday life (e.g., eat at the same time every day). This intervention resulted in increased weight loss at an eight-week follow-up compared with a control condition. Similarly, Carels et al. (2014) focused on promoting healthy habits and disrupting unhealthy habits through didactic instruction, in-class activities, and take-home assignments by encouraging eight behaviours over a 12-week programme in relation to PA and diet. For example, participants were instructed to form implementation intentions to link habit-related cues to behaviours that predicted weight loss (e.g. "If I am craving candy, then I will eat a piece of fruit instead"). This intervention produced significant weight loss by the end of the programme and at six-month follow-up. Within health and fitness, Kaushal et al. (2017) reported that a habit formation intervention delivered in the form of a workshop led to an increase in PA in members of a health and fitness venue. The intervention focused on the importance of preparation cues and practice consistency as well as the use of actions plans to specify when they would engage in PA. Nevertheless, this study focused on PA as an outcome variable rather than health and

fitness attendance behaviour. The study also only included 94 participants, delivered via a workshop and follow-up booster call and would therefore be difficult to scale-up to a large number of participants. Thus, no studies to date have specifically reported an intervention targeting habit formation to specifically increase attendance rates at health and fitness venues.

Experimental (Orbell & Verplanken, 2010) and correlational (Fleig et al., 2013) research has shown that action planning (i.e., forming implementation intentions) can lead to the formation of stronger habits and overcome a potential intention-behaviour gap. In turn, stronger habits have been found to correlate with PA (Gardner et al., 2011; Rebar et al., 2016). Action planning is required to identify relevant contextual cues for 'behavioural enactment' (De Brujin et al., 2012) and has been associated with increased levels of both self-efficacy and PA (Williams & French, 2011). In this meta-analysis, action planning was associated with changes in PA behaviour (d = 0.38) by helping to translate intentions into behaviour (Williams & French, 2011). Thus, given the strong evidence of action planning on habit formation and PA behaviour, this study included action planning as a BCT to support habit formation to increase attendance behaviour. To date, no previous research has tested action planning as a BCT to increase attendance at health and fitness venues.

As identified in Chapter 2, traditional social cognition models of behaviour focus on (1) the adoption rather than the maintenance of behaviour; (2) variables that predict intention rather than variables that help translate intentions into action; and (3) deliberative and conscious rather than automatic and sub-conscious processes. Chapter 2 also recognised the importance of linking the determinants of behaviour with specific intervention components for successful behaviour change (e.g., the systematic approach in the COM-B model). The current study therefore aimed to overcome the limitations identified in Chapter 2 to focus on the maintenance of behaviour in health and fitness contexts (a six month time period), target 'mechanisms of action' that overcome the potential intention-behaviour gap (i.e., focus on

action planning) and focus on automatic processes (i.e., habit). Thus, given the relationship between the factors that are likely to lead to habit formation (i.e., behaviour frequency and context stability) and the maintenance of attendance, the intervention sought to encourage the development of strong habits through encouraging members to attend the same venue at the same time (i.e., frequently in a stable context) in order to promote maintenance of attendance behaviour.

The present study

This study tested the effect of a 'habit planner' given to a randomised sample of new members at Sheffield City Trust. Their attendance was compared to a randomised control sample of new members over the first six months of membership. In addition to assessing the impact of the intervention on attendance behaviour, this study also assessed whether any effect of the intervention on attendance behaviour was due to participants forming strong habits (evidenced by consistently attending at the same venue and time). Understanding how and why interventions are effective, through identifying the links between BCTs and the mechanisms of action they target is important for understanding why effective interventions work (Carey et al., 2019). It was hypothesised that (i) the intervention will increase attendance behaviour and (ii) the effect of the intervention on attendance behaviour will be mediated by context stability (i.e., consistent attendance at the same venue and time).

Method

Intervention development

A ‘habit planner’ was developed in collaboration with Sheffield City Trust. Initially, once the aims of the intervention had been clarified, discussions were held to discuss the BCTs that could be included within the intervention. The results and implications of Studies 1, 2 and 3 of this research project guided this discussion and it was agreed that action

planning should be used as a BCT to support habit formation in order to promote sustained attendance behaviour. Next, there were discussions between the researcher and Sheffield City Trust about how the intervention would be delivered. It was decided that the habit planner would include a space for members to form implementation intentions detailing when, where and what they would do at a health and fitness venue in order to develop a consistent routine (i.e., at the same time and venue each week). The organisation felt that if they were to scale the intervention to all of their members at a point in the future, the intervention would need to be cheap and scalable to implement in order to reach a large number of members. As a result, it was decided to send a paper 'habit planner' to members through the post as it would only incur a small amount of design, printing and postage costs. The intervention was approved by Sheffield City Trust to be implemented within their six of health and fitness venues. The study design was approved by ScHARR's Research Ethics Committee.

Design

This study was a service evaluation that tested the effects of the intervention on a randomised group of new members compared to 'usual practice'. Attendance and context stability (i.e., the same day, time and venue) at six months were measured.

Participants and procedure

Participants were new members who signed up for a health and fitness membership at Sheffield City Trust. Adults aged 18 and over were eligible for inclusion. All participants had a 12-month health and fitness membership with the organisation. Any individuals who used the health and fitness venues on a pay as you go basis or who were on a monthly contract were not included in the study. Members' details (i.e., name and address) were obtained from the Sheffield City Trust sales team who provided data on which individuals had signed up for a membership over a four-week period in September and October 2019. All eligible members

were then assigned to either the intervention or control condition using a randomisation formula in Microsoft Excel. The habit planner (see Figure 6.1) along with a cover letter (see Figure 6.2) was then sent by post to members on four separate days over the four-week period, all within the first seven days of an individual's membership. In total, 438 members were included, with 219 randomly allocated to the intervention condition and 219 randomly allocated to the control condition. All participants were included in the follow-up analysis.

Informed consent

As this was planned as a service evaluation of the impact on attendance of sending a habit planner to all new members, individual informed consent was not sought. As the organisation's intention was to ultimately send the habit planner to all new members, not just on those who had given prior consent for the possible receipt of a planner, it was determined from the outset that they needed to evaluate the overall impact of sending the planner to new members.

Pragmatic studies of low risk interventions, which can be conducted ethically without individual informed consent are not common in health and healthcare research, where the need for informed consent is most commonly waived for emergency medicine/urgent care trials where prior patient consent is not feasible. Nevertheless, there are other examples of pragmatic randomised studies of low risk interventions in healthcare settings without informed consent when the outcome is based on routinely collected data (e.g., Hampton et al., 2017).

Pragmatic individually and cluster randomised evaluations without individual consent are more common in other settings and a strong case has been made for more evaluations to employ RCT methodologies in order to generate more robust findings. For example, the Behavioural Insights team made a strong case for public policy to be subject to much more

randomised evaluation and their 2012 report also identified examples of private industry randomising customers or website users to different interventions to identify which are the most effective in fields such as communication or sales (Haynes et al., 2012).

Intervention

Two BCTs, identified in the v1 93 BCT taxonomy (Michie et al., 2013), were deployed in the intervention condition: 1.4 Action planning; 8.3 Habit formation. No BCTs were deployed in the control condition. Descriptions of the BCT codes and examples described in the Behaviour Change Taxonomy are presented in Table 6.1.

Table 6.1. *BCTs used in intervention condition*

BCT code	**Example**
1.4 Action planning Prompt detailed planning of performance of the behavior (must include at least one of context, frequency, duration and intensity). Context may be environmental (physical or social) or internal (physical, emotional or cognitive) (includes *'***Implementation Intentions***'*)	Prompt planning the performance of a particular physical activity (e.g. running) at a particular time (e.g. before work) on certain days of the week
8.3 Habit formation Prompt rehearsal and repetition of the behavior in the same context repeatedly so that the context elicits the behavior	Prompt patients to take their statin tablet before brushing their teeth every evening

In the intervention condition, all members were sent a habit planner in the post within the first seven days of their membership to the address they had registered on the health and fitness organisation database. The habit planner was A5 in size and included the following text:

"*GET THE MOST OUT OF YOUR MEMBERSHIP*

With so many activities available to you, it can be a bit daunting. Here's our top tip: Keep it simple to start with. The majority of members who come regularly have one thing in common: they tend to do the same activity at the same time in the same venue, each week.

Create your 'healthy habit' Use the planner to choose an activity that you like at a time and venue that suits you."

Below this text was a space for participants to identify an activity, time and venue that could help them to form their habit. The habit planner was accompanied by a cover letter which explained what they were receiving. The control condition did not receive the habit planner and were treated in the usual way of a new member. Thus, both groups received all other welcome information and inductions that all members would typically receive as part of a new membership. Following delivery of the intervention, participants' attendance was then analysed at the six-month point following the start date of their membership. The habit planner and covering letter that was sent to participants are displayed in Figures 5.1 and 5.2.

Figure 6.1. Copy of the habit planner sent to intervention participants.

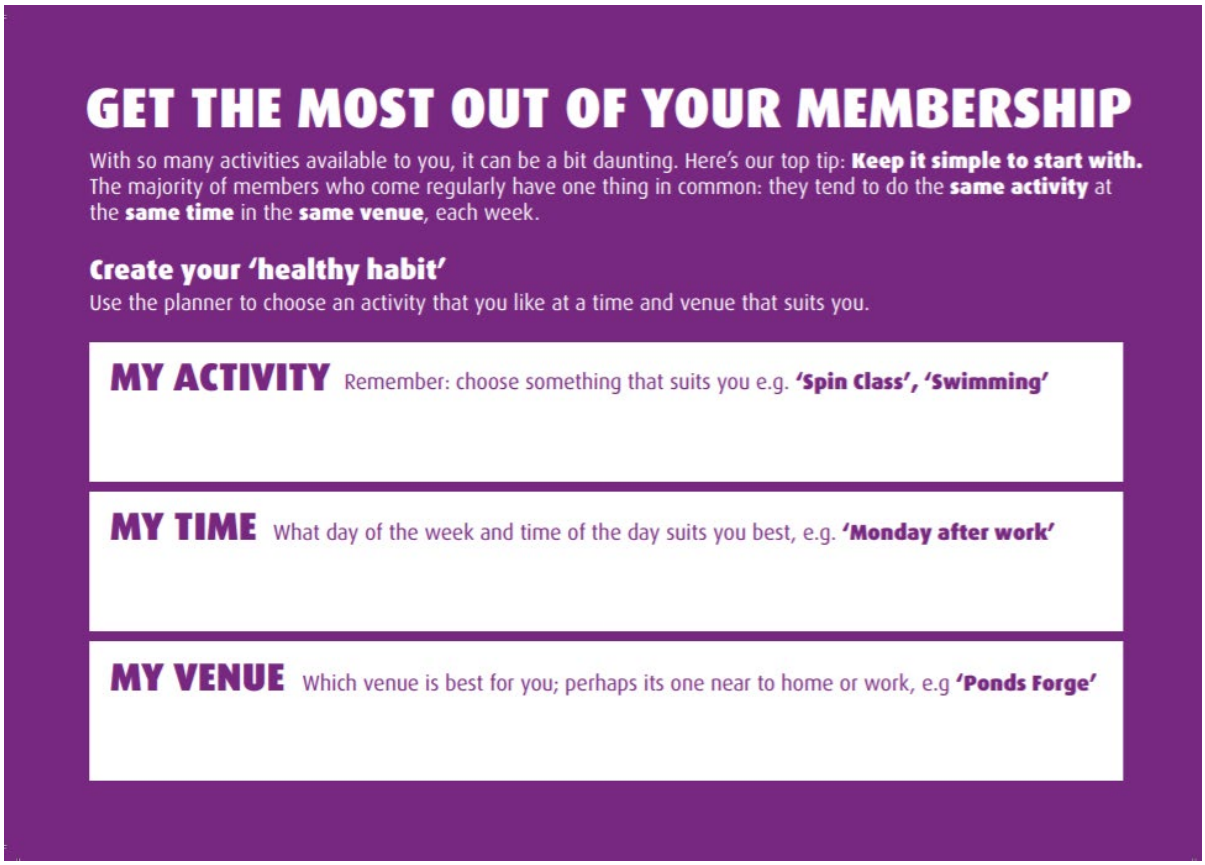


Figure 6.2. Copy of the cover letter sent to intervention participants

«AddressBlock»

«AddressBlock»

Dear «FirstName»

Thank you for joining Fitness Unlimited.

We're passionate about making sure you get the most out of you membership and are always looking to find ways to help.

We know that the majority of members who get the best results come along regularly and tend to have a consistent habit. They do the same thing at the same time each week.

To help you get off to the best start, we have included a **habit planner** that you can use to identify an activity, time and venue that suits you best. Finding something that you can fit into your routine every week will help you get the most from your membership.

You can find out about venue opening times, pool and class timetables at each venue on our website and app (search for 'SIV Lifecard').

We look forward to seeing you at one of our venues again soon!

Matt Rand
The Fitness Unlimited Team

Data preparation

Attendance data for all participants was obtained from the Sheffield City Trust reporting system. The data was then cleaned and only participants (identified through their membership ID) who were included in the four-week period were included in the dataset. Attendance records for each member were then automatically counted and categorised into four-week periods to produce 6 months of attendance data (with each month consisting of four weeks).

Outcome measures

Frequency of attendance

Each time a member uses one of the organisations' health and fitness venues, the date and time of the attendance is electronically recorded through their member card or wristband at the venue turnstile. The automatic recording of attendance is saved on a database. This electronic record of attendance was used for the analysis in the current study. Using these data, participants' attendance in month 6 after starting their membership was analysed.

Context Stability

A measure of context stability was calculated from the number of times a member attended the same venue on the same day of the week and within a 3-hour time window more than once in month 6. Thus, if members attended the same venue on the same day of the week and within a 3-hour time window *twice* during the month they had a context stability score of 1, *three times* they had a score of 2 and *four times* they had a score of 3. If members did not attend the same venue on the same day/time more than once in the month, they received a score of 0. The total of these scores in month 6 was taken as the measure of context stability.

Statistical analysis

Randomisation checks were conducted between the two conditions on gender, age and distance in miles to the nearest venue.

An ANCOVA was conducted to test whether the habit planner had an effect on attendance behaviour at six months follow-up. The independent variable was condition (habit planner vs. control) and the covariate was age (given that Study 1 found that age was associated with continued attendance behaviour). The dependent variable was frequency of attendance at the organisation's health and fitness venues in month 6 after joining.

Mediation analyses were conducted to test whether context stability mediated the effect of condition on attendance, in line with guidelines provided by Preacher and Hayes (2008). This analysis tested the total effect of condition on attendance behaviour in month 6 as well as the direct and indirect effect (via context stability). The independent variable was condition, the potential mediator variable was context stability in month 6, and the dependent variable was frequency of attendance in month 6. Given that Study 1 found that age was a significant correlate of attendance 12 months after a member had joined, this variable was therefore included as a covariate. All statistical analyses were conducted in SPSS (version 25).

Power analysis

The study aimed to recruit at least 434 participants (approximately one month of new members). The sample size calculation was determined by a priori power analysis to detect an effect size of $d = 0.27$ at 80% power with alpha set at 0.05. Rhodes et al. (2017) reported $d = 0.27$ as the average effect size of interventions to increase PA.

Results

Sample Characteristics

The sample characteristics are presented in Table 6.2. The sample consisted of 438 participants (Intervention n = 219; Control n = 219), including 220 (50%) females and 218 (50%) males with a mean age of 37.42 (SD = 13.98) and a mean distance of 3.41 (SD = 5.69) miles to the nearest venue. As the current study was a service evaluation, all participants who were sent (or not sent) the habit planner and cover letter were included in the final analysis and thus there was no dropout. Randomisation checks revealed that there were no significant differences between the two conditions in terms of gender, $\chi 2$ (1) = 0.037, p = .85 age, t(436) = 1.25, p = .34, or distance to the nearest venue, t(430) = 0.75, p = .35. There was missing data of 6 (3 = intervention condition, 3 = control condition) for location.

Frequency of attendance in month 6

An ANCOVA indicated that the habit planner had a significant effect on attendance in month 6, after controlling for age, F(1, 437) = 4.22, p = .04, such that the intervention condition had a higher attendance (M = 3.77, SE = 0.31) than the control condition (M = 2.88, SE = 0.31). Using Cohen's d, the effect size between the two conditions was estimated to be d = 0.20.

Mediation analysis

Further analyses were conducted to test whether context stability mediated the effect of condition on attendance in month 6. The independent variable was condition, the potential mediator variable was context stability in month 6, and the dependent variable was frequency of attendance in month 6. Age was also included as a covariate. The effect of condition on month 6 attendance, B = 0.89, SE = 0.43, p = .04, was reduced to non-significance when the effect of context stability in month 6 was controlled, B = 0.11, SE = 0.19, p = .56. The path from condition to context stability in month 6 was significant, B = 0.44, SE = 0.22, p =. 046, as was the path from context stability to attendance in month 6, B = 1.75, SE = 0.41, p < .001.

Using bootstrapping procedures, the indirect (i.e., mediated) effect was found to be significant, $B = 0.77$, $SE = 0.38$, $CI = 0.03$ to 1.51.

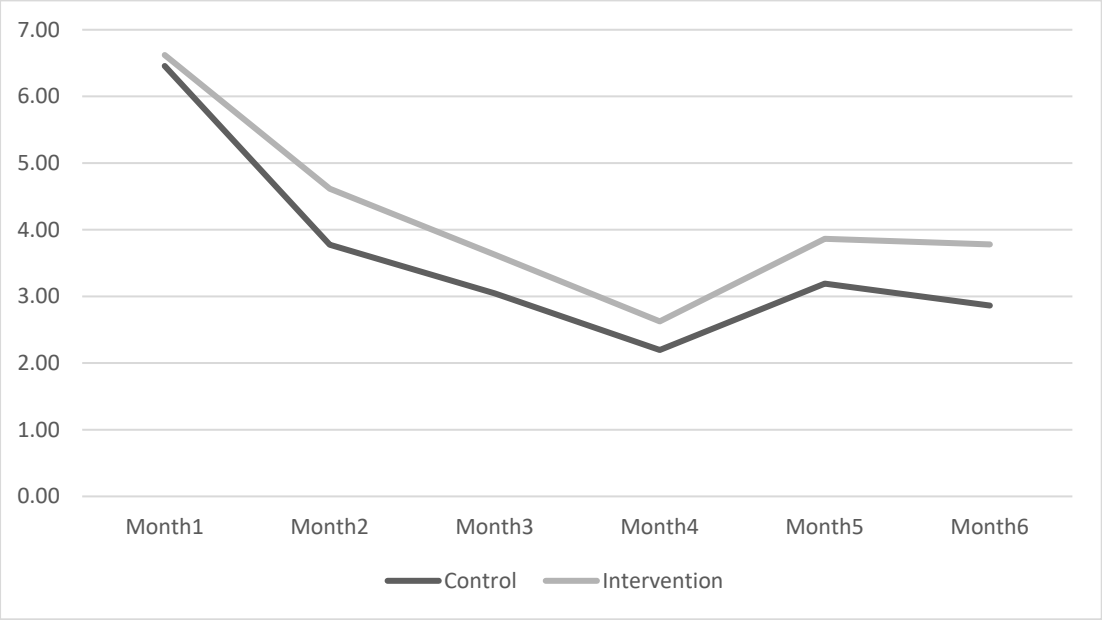
Table 6.2 Participant characteristics for the intervention and control conditions

	Intervention Condition	*Control Condition*
Characteristic		
Gender		
Male	$N = 108$ (49%)	$N = 110$ (50%)
Female	$N = 111$ (51%)	$N = 109$ (50%)
Age	$M = 38.26$ ($SD = 14.24$)	$M = 36.58$ ($SD = 13.70$)
Location (distance in miles from nearest venue)	$M = 3.61$ ($SD = 7.25$)	$M = 3.20$ ($SD = 3.51$)

Table 6.3 Mean attendance (control and intervention) for the intervention period

	Intervention		*Control*	
Month	*Mean*	*SD*	*Mean*	*SD*
1	6.62	4.88	6.46	5.21
2	4.62	4.90	3.78	4.57
3	3.63	4.58	3.05	4.56
4	2.63	3.12	2.20	3.01
5	3.86	4.55	3.19	4.66
6	3.78	4.85	2.86	4.15
Overall	4.19	4.49	3.59	4.36

Figure 6.3 Mean attendance chart (control and intervention) for the intervention period



Discussion

This study comprised an RCT implemented within a health and fitness organisation to test a novel intervention to encourage increased member attendance. The RCT involved sending a habit planner to randomly allocated new members at the beginning of their health and fitness membership and then compared their attendance with a group of members who did not receive the habit planner. The intervention condition significantly differed from the control condition in their attendance frequency in month 6, such that attendance in the intervention condition was greater (3.78 times) than in the control condition (2.86 times). The intervention therefore boosted attendance in month 6 by 32% (i.e., by almost an extra visit). Interestingly, the mean attendance in the control condition (2.86) is broadly in line with the findings from Study 1, which found a mean attendance of 2.44 in month 6. In contrast, the mean attendance in the intervention condition in month 6 was 3.78, which was significantly higher than the control condition.

Condition was also found to have a significant effect on context stability, such that participants in the intervention condition had higher context stability scores (i.e., they

attended the same venue at the same day and time each week) in month 6 than those in the control condition. Further analyses indicated that this difference in context stability mediated the effect of the habit planner on frequency of attendance. This finding indicates that the reason members who were sent a habit planner attended more frequently was because they had a more stable pattern of attendance (i.e., they were more likely to attend the same venue at the same day and time each week). This finding is in line with a review of 100 theories of maintenance of behaviour change which identified habit formation, i.e., repeating the behaviour frequently in a stable context, as one of five key themes that are important for the maintenance of behaviour (Kwasnicka et al., 2016). The finding is also in line with a previous study in the health and fitness context (Kaushal et al., 2017) which utilised habit formation strategies to increase PA behaviour amongst members. Nevertheless, this previous study did not investigate any mediators of the effect of the intervention on behaviour. The current study demonstrated the importance of linking specific BCTs (i.e., action planning and habit formation) with an associated mechanism of action (i.e., context stability). Making links between BCTs and mechanisms of action can help to inform the development of theory-based interventions (Carey et al., 2019). The current study therefore represents an exemplar of this approach in a health and fitness setting to increase attendance behaviour.

The current study is also the first study to use action planning to support habit formation to increase member attendance. Action planning has been found to promote habit formation for other health behaviours when repetitions in the same contexts are required such as walking in pedestrian friendly environments (Wood & Neal, 2016). Similarly, a meta-analysis reported that action planning supported attention bias modification (d = 0.51) which targets the cognitive mechanisms underlying habit, resulting in reduced unhealthy food intake (Turton et al., 2016). The current findings therefore add to this literature by demonstrating that sending a habit planner in the post to new members within the first week of their

membership has a small, but significant, effect on longer-term attendance behaviour through encouraging attendance in a consistent context (i.e., time and place). This finding reinforces the importance of context stability in encouraging the maintenance of PA behaviour (Hagger et al., 2019). Previous studies have utilised face-to-face delivery of interventions to encourage habit formation within the health and fitness context (Kaushal et al., 2017), for example through the use of workshops with small groups of members. Such a method of delivery is very reliant on health and fitness staff and time. In contrast, the current study encouraged habit formation through a simple habit planner (based on implementation intentions) that was posted to members. This approach has greater scalability and is therefore likely to have a wider reach and subsequent greater public health impact.

The current findings have a number of implications for policy makers and organisations providing health and fitness facilities. Most importantly, the findings highlight the importance of encouraging habit formation, and specifically context stability, to increase attendances at health and fitness venues. As outlined earlier in this thesis, habit is a cognitive representation of a cue and action response within procedural memory (Fleetwood, 2019); this representation strengthens when it is repeated in a consistent context (Lally et al., 2010). In line with previous work on habitual behaviour, the results of the present study demonstrate that it is not only important for health and fitness venues to put in place mechanisms that encourage increased attendance, but to also establish habitual attendance behaviour in new members by encouraging them to return to a venue at the same day and time each week.

The current study encouraged this behaviour through the form of a habit planner, and thus recommendations should be made to health and fitness organisations to take a similar approach to increase attendance. The intervention included two BCTs, action planning and habit formation, that could be incorporated into other attempts to increase attendances at health and fitness venues. In the current study, this was done in the form of a habit planner

that was posted to new members; nevertheless, these BCTs could also be implemented through a face-to-face medium with small groups of new members (e.g., a workshop) or in an individual induction meeting. This approach is likely to be more resource intensive but may increase the effectiveness of the habit planner, given that the systematic review (Study 3) suggested that face-to-face interventions had larger effects on attendance behaviour than those delivered remotely. Given the significance of the results, policymakers and health and fitness organisations should build on the findings to find opportunities, such as in the member induction period, to introduce interventions to encourage the consistent attendance behaviour (i.e., same day, time and venue) to increase attendance at health and fitness venues. The study also provides an important test of theory; thus, the results have important implications for habit formation and, in particular, highlight the key role of context stability for maintaining behaviour. This study supplements research linking BCTs with mechanisms of action which aims to identify which interventions work and the reason why they may work (Carey et al., 2019).

This study has a number of strengths. First, it is the only study to date that has used the BCTs of action planning and habit formation to significantly increase attendances at health and fitness venues, thereby demonstrating the potential of using these BCTs. Second, this study was conducted in a real-world setting (i.e., with new members of a health and fitness organisation). Thus, this study has strong ecological validity and is therefore likely to be generalisable to other health and fitness organisations. Third, the design of the study was an RCT which is considered to be the gold standard for understanding the effect of an intervention. Through the use of an RCT, it was possible to control for the influence of factors that may predict attendance behaviour, such as age. Fourth, this study built upon evidence generated in the previous studies within this thesis and therefore had a strong evidence, as well as theory base. The mediation analysis showed that context stability

mediated the effect of the intervention on attendance behaviour, i.e., new members attended more often because they were more likely to do so in a stable context (at the same time and place). This provides strong support for theoretical accounts for the processes through which behaviour becomes habitual and therefore more likely to be sustained. Fifth, this study had a large sample of 438 participants, as determined by a priori power analysis informed by previous research on interventions to increase PA (Rhodes et al., 2017).

The current study also has a number of limitations. First, although the habit planner was found to influence attendance behaviour in month 6, it is unclear how much engagement members had with the habit planner. In the current study, the habit planner was sent by post to members. Nevertheless, no data was available about which members in the intervention condition received the habit planner. Further, for those members that did receive it, it is not known whether it was opened, read or completed. It would therefore have been useful to have conducted a process evaluation by interviewing a sample of intervention participants to ask them about the habit planner. For example, understanding whether they received it, read it and completed it and whether it helped them to attend would have been useful to understand what it was about the intervention that encouraged increased attendance. Second, one of the health and fitness venues was closed for maintenance for 30 days during the study. This venue was the primary venue for 28% of participants (i.e., the venue they used the most). This may have served to reduce the effectiveness of the habit planner as some members would have had reduced opportunity to attend their preferred venue and therefore would have been unable to develop a consistent pattern of attendance behaviour across all six months of the study. Future research may thus replicate the findings with health and fitness venues that are open throughout this period. Third, this study was only implemented within a health and fitness organisation within Sheffield. Caution should therefore be made when generalising these results to other health and fitness venues in the UK and beyond. Ideally, future

interventions should build on this study within health and fitness venues throughout the UK, as well as other countries, to test the impact of the habit planner outside of the South Yorkshire region. Fourth, this study was intended to run for 12 months, but the follow-up period had to be curtailed because of the coronavirus pandemic when venues were closed shortly before the national lockdown. As identified in Study 1, attendances decline during the first 12 months of membership. As a result, it is possible that the effect of the habit planner may have actually increased over time given that Study 1 reported that early attendance behaviour, both in the form of frequency and stability of context, was predictive of continued attendance behaviour.

Conclusion

The current study utilised an RCT design to examine the effect of a habit planner in the first week of an individuals' membership to increase subsequent attendance at health and fitness venues. Members who received the habit planner in the post had significantly higher attendances six months later than those members who did not receive the habit planner. The mediation analysis indicated that the effect of the habit planner on attendance behaviour was via context stability. Additional research could include a process evaluation to investigate engagement with the habit planner among members in the intervention condition who were frequent attendees at a 6-month follow-up. Further larger scale interventions, outside of Sheffield, are also warranted to determine the effectiveness of the intervention in the UK and other countries. Future interventions could also include cost effective studies comparing different modes of delivery to determine which mode has the largest impact and is the most cost effective.

Chapter 7. Discussion

Introduction

The preceding chapters of this thesis presented the findings from a series of studies that culminated in a theory-based intervention implemented within a health and fitness organisation to increase attendance at health and fitness venues. The four main objectives of the work presented in this thesis were to: (i) describe attendance levels and correlates of attendance of members in health and fitness venues, (ii) explore the enablers of attendance that might explain why members of health and fitness venues continue to use these venues, (iii) synthesise evidence for the effectiveness of interventions designed to increase attendance at health and fitness venues, and (iv) develop and test a behavioural intervention to increase attendance at health and fitness venues. To address these objectives, four studies were undertaken: (1) a quantitative analysis of member attendance at health and fitness venues, (2) a qualitative analysis of the enablers of sustained member attendance at health and fitness venues, (3) a systematic review of the effectiveness of studies aimed to increase member attendance at health and fitness venues, and (4) a service evaluation to test the effectiveness of a habit planner on attendance.

This chapter: (i) outlines the principal findings from the overall research project and the contribution to existing literature, (ii) provides a discussion of the contributions to methodology, (iii) discusses the implications for future research and policy and practice, (iv) outlines both the strengths and limitations of the overall project and (v) summarises the main conclusions from the project.

Summary of principal findings

In Study 1 attendance rates were analysed over the course of a 12-month period. It was found that attendance rates dropped significantly from the point of member sign up until 12 months later. This study also found that the frequency of attendance in the first quarter of

membership, age and context stability at month 3 were significantly associated with attendance in quarter four. The findings indicated that more research needed to be conducted to understand how attendances could be increased. Study 2 outlined a set of factors that were identified to support sustained attendance among members. This study identified five enablers of sustained attendance: 1. *Routine*, which was the habitual scheduling, preparation and execution of attendance; 2. *Motivations for attendance*, which was the motivational factors to attend and the clear knowledge of the specific activities that could support this; 3. *Accomplishment*, which was the measurement and interpretation of PA activity undertaken that indicates the accomplishment of attending; 4. *Venue experience*, which was the key experiences within a health and fitness venue that ensured members wanted to attend; and 5. *Convenience*, which was the factors that were required for attendance to occur with ease. The Routine theme identified in Study 2 was closely related to the context stability measure in Study 1, in that members identified consistent days and times of attendance as an important factor that enabled their attendance. Nevertheless, understanding the question about how to increase attendance had not been answered in previous research. Study 3 comprised of a systematic review that attempted to fill this gap, by systematically reviewing the BCTs within interventions to increase attendance at venues that had been tested using RCTs. Only 14 studies reporting 20 interventions were identified, with only two studies identifying large effect sizes. Most of the intervention effects were small or trivial and there was little evidence to link specific BCTs with sustained attendance. The final study built on this gap in the literature, finding that the BCTs of prompting *habit formation* combined with *action planning* increased attendance at health and fitness venues, given the significant difference in attendance between the intervention and control conditions in month 6. The key findings are discussed in greater detail below.

Frequency of attendance

It is apparent from the quantitative analysis of attendance in Study 1 that members attend health and fitness venues most often at the beginning of their membership, and that attendance declines during the course of their membership. This core finding indicates that if members are to have the health benefits that can be gained from attending a health and fitness venue, more work will be required to increase attendance rates. Previous research has concluded that many health and fitness members sign up for a membership because of the potential physical health benefits (Crossley, 2006) and thus may see a venue as a key location in which they intend to undertake PA. As a result, there is a potential gap between a member's intention to undertake PA and their actual PA behaviour within a health and fitness venue. Study 1 therefore highlights the importance of finding strategies to increase attendances. This is the first study to report on attendance rates within the UK and therefore also builds upon previous studies conducted in the Netherlands (e.g., Middelkamp et al., 2016) and the USA (e.g., DellaVigna & Malmendier, 2006) that also reported declining attendance rates. Together, the findings suggest that many members could be classified as inactive if they are not undertaking PA in other contexts, which may be unlikely given that a key motivation for joining a gym for many people is the desire to get fit and/or be healthy (Crossley, 2006).

Correlates of attendance

Given the pressing need to understand how attendances could be increased within health and fitness venues, it is important to identify those factors that are associated with continued attendance. As has been discussed in the opening chapter of this thesis, there is a large amount of literature analysing the correlates of PA behaviour. Nevertheless, in the context of health and fitness venues, Study 1 was the first study to assess why some members might attend more than others, through the analysis of quantitative attendance records. Previous PA research has found that PA levels generally decline as adults become older (e.g.,

Rhodes et al., 1999); nevertheless, the opposite was found in Study 1 as older members attended more frequently. Many health and fitness members are in younger adult age categories (e.g., aged 20-40s) and thus the restricted age range in Study 1 might help to explain these findings. In particular, the younger adults in the current study may have faced more barriers to attending than slightly older members such as competing priorities or other commitments (Nikolaou et al., 2015; Strong et al., 2008) which may have reduced attendance. Some previous studies have concluded that PA levels in younger age groups could be influenced by community or environmental factors, and have drawn upon ecological models and specifically factors such as family and peers (Fitzgerald & Spaccarotella, 2009; Pender et al., 2006). Health and fitness venues are also locations that provide opportunities for members to interact socially such as cafe areas. Previous research has highlighted the association between older age and social factors (e.g., Franco et al., 2015) and thus the health and fitness venue may be a location that serves the purpose of social interaction for older members in addition to the physical health benefits that can be gained from attending. Study 2 also identified that social factors within the venue experience can be key enablers of attendance. Future research is needed to investigate the link between age and attendance, and specifically the role of social factors, in more detail.

Existing literature on PA has reported that males tend to undertake greater amounts of PA than females (Althoff et al., 2017). Nevertheless, this finding was not reflected in Study 1 when analysing the attendance data. Various barriers have been associated with females within PA research, such as childcare responsibilities (El Ansari & Lovell, 2009) and it could be that females can overcome these barriers when attending a health and fitness venues (e.g., fitting attendance around other commitments). The current research also contrasts with previous research that suggests proximity is a key correlate of PA (Sallis et al., 2016) as distance to the nearest venue had a non-significant association with attendance frequency in

Study 1. Nevertheless, Sheffield City Trust, the organisation within which the analysis took place, have a 'flagship' venue in the city centre where the highest proportion of members attend. Many members are likely to travel to this venue even though it is the not the closest venue to their home. There are a number of factors that could be influencing attendance to use this venue such as the venue facilities, the proximity to workplaces or the accessibility by public transport. These factors might also explain the non-significant effect of gender. Future research within the health and fitness would benefit from exploring these factors for both gender and proximity to a venue.

Past behaviour has consistently been found to be associated with future PA behaviour (McEachan et al., 2011); a finding also found in the current research. There are two routes through which past behaviour has been theorised to impact on future behaviour (Ajzen, 2011). First, past behaviour may influence members' beliefs about the behaviour which could, in turn, influence their decision to attend (Ajzen, 2011). These beliefs may be influenced by a positive attitude towards the behaviour (Ajzen, 2011), such as the feeling of accomplishment identified in Study 2. Second, the influence of past behaviour may reflect automaticity in members' attendance behaviour. For example, previous research has suggested that when frequent behaviour is performed in consistent contexts, it can be performed with minimal conscious deliberation (Ouellette & Wood, 1998). One example could be that members attend an exercise class at the same time each week and this then forms part of their routine. The development of a stable pattern of attendance at month 3 was found to be associated with the maintenance of attendance in the fourth quarter of attendance. This research suggests that it can take some time (e.g., up to 3 months) to form routine behaviour that is strong enough to ensure attendance is maintained. In Study 2, having a routine was identified as a key enabler of attendance, with members describing a consistency to their attendance; most notably undertaking the same activity on the same day of the week, at the same time and at the same

venue. This frequent performance of behaviour in the same (stable) context is in line with previous research on the development of strong habitual responses (Ouellette & Wood, 1998), meaning that performance of the behaviour does not require repeated conscious decision making (Danner et al., 2008).

Enablers of attendance

Study 2 identified five main enablers of attendance that are important for continued attendance at health and fitness venues: Routine, Motivations for attendance, Accomplishment, Venue experience and Convenience. These findings support many of the associations reported in research on PA. Most notably, the Routine factor was closely related to the context stability association identified in Study 1. This factor described the development of attendance behaviour that was consistent; i.e., that it took place on the same day of the week and at the same time each week. Members found it useful to have this consistency as it helped them to organise their time and ensure that attendance took place each week. Habit formation has been identified as a key factor for increasing PA at health and fitness venues through cues and practice consistency (Kaushal & Rhodes, 2017) and thus the current finding supports the hypothesis that behaviour performed in a stable context can enable the maintenance of attendance behaviour.

Physical and psychological motivations for attendance were also identified to be key enablers of attendance at health and fitness venues; these factors have also been highlighted to be important in the long-term use of health and fitness venues (Riseth et al., 2019). Goal-setting, which was cited by some members to be essential to how they were motivated to attend, has similarly been discussed as an important element for attendance at the gym (Crossley, 2006). This factor has also been identified as one of the three BCTs from control theory together with self-monitoring (Michie et al., 2009) that have been found to increase PA. Interestingly, the convenience factor identified in Study 2 was not similarly reflected in

Study 1 when analysing the correlates of attendance at health and fitness venues. Nevertheless, it could have been that the city centre venue was the most convenient venue for many members even though it was not the closest. For example, two members spoke about attending this venue prior to going to work and thus this could have been a reason for the non-significant location finding in Study 1. Nevertheless, in previous research both proximity (e.g., a close distance) and accessibility (e.g., good transport links) have both been linked to the general use of PA facilities (Corti et al., 1996; Riseth et al., 2019) and it could be that both of these factors play a role in the facilitation of attendance.

Previous research has outlined that social factors such as the ability to exercise with a partner or join an exercise class with others are important when analysing whether members remain to be members of a health and fitness organisation (Macintosh & Law, 2015). Accomplishment is an important source of self-efficacy (Bandura, 1997) and has been used to explain PA in different sub-groups of the population (Bernard et al., 2018; Bethancourt et al., 2014; Kosteli et al., 2017). Many members also spoke about self-monitoring as a means to record their accomplishment. Self-monitoring has also been identified as a key BCT for increased PA (Michie et al., 2009). Overall, the enablers of attendance identified in Study 2 have been found to be linked to the maintenance of PA in other studies, including those conducted within the context of a health and fitness venue.

Interventions to increase attendance

Previous interventions to increase attendances at health and fitness venues have not examined the effectiveness of specific BCTs. Study 3 sought to fill this gap. Moreover, the BCTs included in previous interventions to increase attendance at venues have mainly yielded small or trivial effect sizes. Nevertheless, of the small number of interventions that reported medium or large effects, the BCTs of pros/cons and problem solving yielded the highest effect sizes. Pros/cons has previously been linked to the contemplation stage of the

TTM (Marshall & Biddle, 2001) as one of three key factors that mediate behaviour change within this model. Nevertheless, pros/cons was also found to have a small effect in one other intervention (Nigg et al., 1997b) and thus it could be that because it was paired with problem solving that high effect sizes were found. Goal-setting (behaviour) and reviewing behavioural goals were also BCTs that had large effect sizes on attendance at health and fitness venues. This finding aligns with meta-analytic results that has identified goal-setting and self-monitoring as important factors to increase PA (Knittle et al., 2008). Goal-setting was also identified as a key enabler of continued attendance in Study 2.

Nevertheless, those interventions that reported medium or large effect sizes were also all delivered face-to-face. It is therefore possible the larger effects sizes for BCTs in these interventions were due to the fact that they were delivered face-to-face. In addition, delivering face-to-face interventions may not be scalable for many organisations due to the large resource costs. Given the: i) lack of evidence in the systematic review about which BCTs could be used to reliably increase attendances at health and fitness venues, ii) the existing literature linking habit formation and PA and the results from studies 1 and 2, and iii) the lack of previous research on habit formation as an intervention to increase, there was scope to investigate the role of habit formation on attendance at health and fitness venues. Study 4 sought to investigate action planning and habit formation to encourage new members to attend frequently in a stable context in order to promote increased longer-term attendance.

The role of context stability to increase attendance

The findings of Study 4 indicated that the BCTs of action planning and habit formation can be used to significantly increase the attendance behaviour of members by month 6 of their membership. The effect of the habit planner on attendance behaviour was mediated by context stability, such that members attended more frequently as a result of having more stable attendance patterns. This finding builds on existing literature that habit

formation can be an effective mechanism of action to target when attempting to increase PA at health and fitness venues (Kaushal et al., 2017). The current study is the first to test whether prompting action planning and habit formation through the use of a habit planner can increase member attendance. The findings of Study 4 are consistent with those of Study 1, which identified context stability as a significant correlate of continued attendance, and Study 2, which identified routine as a key enabler of attendance. In particular, the findings of all three studies highlight the importance of attending on a consistent day, time and venue for the maintenance of attendance.

Kwasnicka et al. (2016) identified five overarching and interrelated themes that explain how individuals can maintain initial behaviour change over time; maintenance motives, self-regulation, habit, resources and context. In relation to habit, it is hypothesised that to maintain behaviour individuals need to be 'conditioned' to specific behavioural responses that happen within particular contexts (Kwasnicka et al., 2016). After repetition of a cue on this behavioural response, maintenance of the behaviour then starts to develop. Within the health and fitness context, this cue could be a specific time of day (e.g., before work), which then results in a situational response (e.g., leave home and travel to the gym). It is necessary for health and fitness members to repeat the same association over time to ensure it becomes 'learnt' and is thus hard to break. It could also be important for members to not change the venue that they attend (even if they continue to attend on the same day and time). If they switch the context (e.g., a specific venue), they could be more likely to generate behaviour that is non-habitual (Verplanken et al., 2008) and thus not maintain their attendance behaviour. The current research therefore adds to the literatures on habit theory and behaviour maintenance.

To summarise, the current findings provide a new body of knowledge for researchers investigating attendance behaviour at health and fitness venues. The current research

highlights the issue of low attendances at health and fitness within the UK and related public health concerns, and the factors that explain why some members attend more often than others through the identification of the correlates and enablers of attendance. It is thus important to identify how attendances can be increased. Two behaviour change techniques, action planning and habit formation, were trialled within a health and fitness organisation in Sheffield and shown to increase attendances after 6 months.

Contribution to methodology within the health and fitness sector

From a methodological perspective, the research presented in this thesis has added to the literature on increasing attendance in health and fitness venues by providing: (i) a comprehensive approach to understanding health and fitness behaviour, (ii) a novel application of context stability and (iii) a theory-based intervention within a health and fitness organisation. A description of these contributions is outlined below.

A comprehensive approach to understanding health and fitness behaviour

As outlined in Chapter 1, to change behaviour, it is essential to first understand the determinants and correlates of the behaviour in question. The current thesis is consistent with this approach. Studies 1 and 2 investigated many of the behavioural factors that may inform why some members attend health and fitness venues more often, and more consistently, than others. These findings thus informed the design of the intervention in Study 4. Such an approach is advocated in public health research (Kelly & Barker, 2017). Thus, many errors have been cited in public health research when attempting to change behaviour, notably that (1) it is just common sense, (2) it is about getting the message across, (3) knowledge and information drive behaviour, (4) people act rationally, (5) people act irrationally, and (6) it is possible to predict accurately (Kelly & Barker, 2017). Research therefore needs to understand the preceding conditions which lead to the behaviour (e.g., context stability) instead of trying to change the behaviour with insufficient knowledge about the behaviour (Kelly & Barker,

2017). Accordingly, the intervention was developed by utilising the outcomes of the research reported in the earlier studies to understand attendance behaviour to inform how attendance behaviour could be changed.

Previous research has reported that attendances at health and fitness venues decline from the point that members sign up (e.g., Middelkamp et al., 2016; DellaVigna & Malmendier, 2006) but has not focused on the determinants of attendance behaviour. These studies have focused on *what* is happening with attendance, rather than *why* it is happening. The current thesis sought to answer both of these questions within the context of UK health and fitness venues and thus outline the potential reasons why health and fitness members are attending or not attending venues.

Previous research has also highlighted the need for a greater focus on the maintenance of health behaviour, as public health outcomes are generally associated with behaviour maintenance over long periods time (Conner & Norman, 2017). Previous research investigating the determinants of PA have largely been focused over the short-term and not sustained behaviour over the long-term (Conner & Norman, 2017). The current research project overcomes this issue by analysing the correlates and predictors of attendances at health and fitness venues over a period of 12 months in Study 1, with participants who attended venues for a number of years in Study 2 and over a period of 6 months in Study 4. These studies have helped further knowledge about the maintenance of health behaviour, specifically within the context of the health and fitness environment. This research has thus provided a deeper understanding about the maintenance of attendance behaviour at health and fitness venues.

Novel application of context stability

As discussed in Chapter 1, measuring habitual behaviour has largely been undertaken through self-reports. Self-report measures of habit have been found to have medium sized

associations with PA (Gardner & Lally, 2011; Rebar et al., 2016); nevertheless, there have been criticisms that self-report measures, such as the SRHI, can fail to capture key components of habitual behaviour such as context stability. The current thesis utilised an objective measurement of context stability, to accurately capture the day, time and venue that health and fitness members were attending. This measurement of context stability was used to analyse the association and predictions of the maintenance of attendance in Study 1 and to measure the effect of an intervention on context stability and subsequent attendance at health and fitness venues in Study 4. This objective measurement relied on the digital recording of attendance that takes place when members arrive at a venue and thus provides an accurate measure of when members attended venues.

A theory-based intervention

The intervention reported in Chapter 5 built upon the context stability measure reported in Study 1. This approach is in line with methodological recommendations for understanding behaviour change and maintenance (Michie, 2014), which state it is important to: (1) have a systematic method for analysing the target behaviours in their context as a starting point for designing an intervention, (2) select interventions that are most likely to be effective given this analysis, (3) specify the intervention in sufficient detail in trial protocols and published reports to allow accurate replication and evidence syntheses, and (4) draw on relevant theory. Building on point four, this thesis is the first that has reported a study that has used habit theory, and specifically context stability, to increase attendances at health and fitness venues. The systematic review (Study 3) highlighted a need to design further interventions that could be effective at increasing attendance rates at health and fitness venues, given the paucity of knowledge within the existing literature. As a result, an intervention was developed to encourage habit formation through action planning, and was

trialled in Study 4. The present research therefore adds to the methodological literature describing trials to increase attendances at health and fitness venues.

A collaborative method to increase attendance

This research project was a collaboration between the University of Sheffield and Sheffield City Trust; the entire approach to the research was highly collaborative including the development of the proposal to obtain funding for the work, the relationship with the organisation to obtain data, the sharing of findings, the informing of future research studies and exploring the implications of the findings for future research, policy and practice. To build trust with the organisation, the researcher met with health and fitness organisation regularly to discuss the project plan, discuss how each study could be practically implemented within the organisation and discuss how the organisation could benefit from the work. Ethical and compliance aspects such as how the data would be stored (e.g., only on Sheffield City Trust networks) were also outlined in detail within these discussions to ensure clear roles and responsibilities were established. Thus, the ability to design each of the studies and collect real world data was helped by these relationships and the trust that had been established. This benefit was particularly highlighted in Study 4, with the service evaluation delivered across all Sheffield City venues to all new members. The relationship established with Sheffield City Trust ensured that the organisation could see the benefits this intervention could have in their organisation, which may have not been possible without a strong relationship between the researcher and the organisation. The researcher also met regularly with the senior team at Sheffield City Trust to discuss the proposal for each of the studies, the results obtained and the implications of the results for the organisation. This provided a two-way feedback that not only benefited the ongoing research but also helped the organisation too, such as designing future processes in their induction programme that aimed to encourage frequent and stable behaviour in their members. Industry-university collaborations have a

long tradition in many countries (Ankrah & Al-Tabbaa, 2015) with access to industry data and equipment that would not have otherwise been accessible (Barnes et al., 2002). This research project thus benefited from the collaboration and to further develop knowledge about health and fitness venue attendances. Future research projects would benefit from this method and approach to applied research given the advantages it had in the current research.

Ethics and Governance

Although ethics and governance are important in all forms of research, they were of particular importance in the collaboration with Sheffield City Trust. This research project obtained both "procedural ethics", which Guillemin and Gillam (2004) define as obtaining approval from an ethics committee, and "ethics in practice", which are the ongoing, ‘everyday’ issues that arise in the process of doing research (Guillemin & Gillam, 2004). The distinction between these two types of ethics highlight that ethical considerations in this type of collaboration do not finish once approval is granted by a research ethics committee. Within this research project, the researcher adopted reflexivity, which involves consideration of the ethical issues that might arise (Guillemin & Gillam, 2004). Such ethical considerations included how Sheffield City Trust data would be accessed, stored and reported, the methods through which Sheffield Trust members would be contacted (e.g., for participation in Study 2 and Study 4) and where the location of the studies (e.g., the interviews in Study 2) should take place. In relation to data management, it was agreed at the start of the research project that the researcher would be given a Sheffield City Trust computer with relevant software (e.g., SPSS 25) and that all data analysis and reporting would be conducted on this device and saved on the Sheffield City Trust network. As such, the researcher had rights equivalent to a Sheffield City Trust employee. This agreement also enabled the access and saving of data to be in line with General Data Protection Regulation (GDPR). The researcher was also given a Sheffield City Trust mobile phone, and all Sheffield City members were contacted for Study

2 through this device on behalf of Sheffield City Trust. All members could then report any concerns experienced through the process back to Sheffield City Trust as if they had been contacted by a Sheffield City Trust employee. It was also agreed that all interviews in Study 2 would take place at a Sheffield City Trust venue, with appropriate informed consent, equivalent to if the organisation was conducting the interview themselves. This step was also taken to create a safe and minimally distressing interview environment that was familiar to all participants. Given the relationship between the researcher and the organisation and the employee rights obtained at the beginning of the research project, informed consent was not taken individually for participants in Studies 1 and 4. In Study 1, the analysis undertaken was on routine data that was stored within Sheffield City Trust's database, and the researcher analysed the data on behalf of the organisation (aligned to other data analysis projects undertaken within the organisation). In Study 4, all communication with members was from Sheffield City Trust, as if they were conducting the intervention as part of their general communication with new members. This step was also taken to minimise any stress to participants, as it was seen to be a 'business as usual' approach taken for those who received the intervention. Given the unknown effectiveness of the habit planner prior to this study being conducted, it was deemed ethical to send the habit planner to a randomised sample of members instead of the whole sample.

Implications

Based on the principal findings outlined above, the following section outlines a number of implications for research, for policy and practice and for collaborations between industry and academia.

Implications for research

This overall research project has highlighted that there is a limited amount of research investigating attendances at health and fitness venues. This is particularly evident for research

based in the UK. The current research has therefore provided a starting point to understand attendance behaviour through objective measurements. Nevertheless, it is clear that more research is needed to investigate the correlates of attendances to understand the factors that explain attendance and also the effectiveness of interventions that attempt to change behaviour. For example, Study 1 only examined variables such as age, location and gender to analyse the correlates of attendance. Nevertheless, there are many factors that were not investigated, and which could be routinely collected, that might influence attendance such as the type of exercise people undertake (e.g., exercise classes) or their PA beliefs and motives. Such research could be beneficial for furthering knowledge about context stability, where day, time and venue were the measures of this variable. It could be that factors such as a pre-defined exercise class could influence context stability; thus, future research could benefit from sourcing data that identifies the type of activity members undertake to explain the maintenance of attendance.

The qualitative research conducted in Study 3 identified a number of environmental factors that could explain the factors that enable and facilitate attendance such as convenience and the venue experience. As identified in Chapter 1, ecological models have been applied to general PA (e.g., Humpel et al., 2002) and therefore ecological approaches could also be used to explain attendance rates at health and fitness venues beyond the factors identified in Study 2 to enable attendance. Thus, future research should look at the impact that environmental factors (e.g., accessibility of facilities) have on attendance rates in greater detail than have been investigated in the current research project, given their significance in general PA.

The systematic review (Study 3) included a small number of studies that have tested interventions to increase attendances at health and fitness venues through RCT designs. First, it demonstrates that more research is required to develop knowledge about the BCTs that can be used to increase attendances at venues. This is of significance given the rate of decline in

attendances outlined in Study 1 and the focus by PHE (2016) on the role the sport and leisure industry can play to improve population wide PA. Second, despite the importance of habit strength as a key predictor of PA maintenance as outlined in Chapter 1 (e.g., Gardner, 2015), the systematic review did not report any studies that had utilised habit formation as a mechanism to increase attendance. Given the findings of Study 4, which found that the habit planner had a significant effect on attendance by month 6 of an individuals' membership, future research could examine other ways (e.g., attentional bias training), in addition to forming implementation intentions, that could be used to prompt habit formation. In addition, future research could also explore different modes of delivery, to understand whether different delivery mechanisms such as digital modes of delivery or face-to-face during the member induction process (e.g., to deliver to a large sample size) results in an even greater effect than found in the current study.

Implications for policy and practice

As highlighted in Chapter 1, PHE (2016) have identified the sport and leisure industry as a sector that can do more to reduce the levels of inactivity in the UK for improved public health outcomes. The health and fitness sector, which is a large subsector of the sport and leisure industry, has scope to increase attendance levels. If many individuals are choosing to pay for a health and fitness membership for health and fitness reasons (Crossley, 2006) but are not attending, then it likely that they are physically inactive. The implications of this for health and fitness organisations to increase attendances at their venues would appear to be large. PHE, as a public health body, can arguably go further than they are currently to encourage the sector to do more given these findings. Not only can PHE outline the pressing need to increase attendances, they can recommend how health and fitness organisations could increase attendances as a result of the findings in this research project. Outlining the importance of context stability, as found in Study 4, in addition to the BCTs of goal setting

(behaviour) alongside reviewing behavioural goals and pros/cons alongside problem solving, as highlighted in Study 3, could be practical recommendations they give to health and fitness organisations to increase attendances. Such recommendations may incorporate these BCTs whilst experimenting with different modes of delivery to gain further knowledge about how these BCTs can increase attendance within health and fitness venues.

Sheffield has been identified as the second most physically active of the eight English core cities (Burton & Brewins, 2017). This is despite the low attendances of new members at venues of the major health and fitness organisation in the city. Nevertheless, the levels of PA are below the national average in the inner city (Burton & Brewins, 2017), where the majority of the health and fitness venues are located. This finding indicates that there is more scope for the health and fitness sector in Sheffield to increase levels of PA through increasing attendances at their venues. For health and fitness organisations throughout the UK, the current findings can be applied within their organisations to increase attendances. For example, organisations could utilise the findings within Study 1 to promote greater attendances to younger adults and they could use the findings from Study 2 to apply the key enablers of attendance to improve attendance rates. Health and fitness organisations would also benefit from developing mechanisms that help members to develop strong attendance habits in the early stage of their membership, such as through promoting context stability, as tested in Study 4.

Due to the COVID-19 pandemic and associated public health measures, health and fitness organisations face uncertainty about whether their members will be able to return to their venues in the same way that they were able to do before the pandemic. Governmental guidelines during the pandemic have restricted the use of indoor venues such as those within the health and fitness sector, and thus members have had a period of time when they have not been able to attend a venue. These restrictions have had a number of implications for health

and fitness organisations. First, for those members who have developed behaviour that is consistent and stable (e.g., they attend on the same day and time each week), there will have been disruption to this routine. From a public health perspective, this disruption to the automatic nature of this behaviour is likely to have led to a reduction in PA if members have been unable to replace this routine with a PA routine in other locations (e.g., in a local park). Second, when health and fitness venues re-open, members may have difficulty forming their original routines given the original nature of how they were formed. In Study 1, it was noticeable that some members do not attend a venue that is closest to their home and may attend a venue due to other commitments in their day (e.g., the venue nearest to their work). If members are unable to commit to these other activities, such as going to the workplace, they may find it difficult to return to the consistent and stable behaviour they had prior to the coronavirus pandemic. Third, it is likely that health and fitness organisations will put in place increased restrictions such as social distancing measures, restricting numbers of people at one time within a venue and booking a set time slot to use a venue. These experiences are different to the venue experience members originally had when they signed up for a membership. Thus, members may decide that attending is not as attractive a proposition as it was given the increased restrictions in place. Study 3 found that social interaction was a key enabler of attendance for many members and thus the inability to interact with other members may inhibit future attendance for these members. Health and fitness organisations may therefore need to work out how to help members form habits in a different context than they were previously formed, until restrictions are eased and attending a venue returns to a more 'normal' experience.

Collaborations between industry and academia

Collaboration between industry and academia is critical to improve industry outcomes and create scientific knowledge (Sannö et al., 2019). This research project has demonstrated

the positive collaboration that can be achieved within practice and academia and thus has some implications for policy and practice. Three key and broad areas have been identified as essential in managing the research process between practice and academia: (1) problem formulation, (2) methodology, and (3) result (Sannö et al., 2018). *Problem formulation* refers to stakeholders identifying a knowledge gap to fill. In the current research, the knowledge gap related to health and fitness attendance was apparent, with a pressing need to understand more about the attendance behaviour of new members within health and fitness venues. *Methodology* refers to the fundamental strategy that outlines the research, using the organisational experience in the process. In the current research, the overall aim of the project was thus made clear from an early stage in the project as well as how these could be achieved through the most appropriate research methods. During this process, results were shared with the collaborating organisation and their organisational experience was utilised to enhance how the best outcomes of the research could be achieved (e.g., sharing the results from Studies 1 and 2 to help inform how Study 4 could be designed). Finally, the *result* perspective involves setting realistic expectations about the outcome of the project. Such expectations were made clear throughout the research process and regular communication took place with the collaborating organisation to ensure an awareness within the organisation about what to expect from the research. As a result, by achieving these three perspectives, the current research achieved a valuable outcome by not only furthering knowledge within academic research, but providing improvements to the collaborating organisation. The approach also enabled the collaborating organisation access to the research quickly and the organisation has been able to establish a plan about how the results may be implemented within Sheffield City Trust.

Strengths and limitations of the research project

The following section discusses the strengths and limitations of the research project.

Strengths

The overall research project has a number of strengths in addition to those outlined in earlier chapters. First, the majority of the research into understanding health and fitness attendance and increasing health and fitness member attendance has been conducted outside of the UK. This is somewhat surprising, particularly given the low levels of PA in the UK and PHE's identification that the sport and leisure industry can influence these rates. This research project therefore took a comprehensive approach to increasing attendances at UK health and fitness venues, providing a foundation for future research that needs to be conducted within the UK.

Second, this research project was able to access health and fitness member data and samples of members for qualitative and Service Evaluation studies that would not have been possible without a collaboration between academia and industry. As a result, three empirical studies have been reported in addition to a systematic review to provide an in-depth analysis of health and fitness attendance behaviour. This collaboration also enabled the collaborating organisation to provide feedback on the research as it developed which further enhanced the potential usefulness of the research for health and fitness organisations that would not have been possible without the collaboration.

Third, this research project used an objective measure of health and fitness member attendance consistently throughout the research project in Studies 1 and 4. The advantage of using this objective digital measurement is that a reliable data measurement was used to i) assess attendance rates and the factors associated with attendance and to ii) understand how an intervention may influence attendance. Future research projects within this sector should also use this objective measurement of attendance if comparisons between the current findings and future findings are to be reliably made.

Fourth, this research project pursued an evidenced based approach, informed from the findings of Studies 1-3, to design and implement a Service Evaluation within a health and fitness organisation. This was the first study to focus on context stability as a means to increase attendances within a health and fitness organisation and the direction of this study was built upon the results of Studies 1 and 2, ensuring the study was based on prior evidence.

Fifth, many existing interventions are delivered face-to-face by highly trained professionals, as identified in Study 3, and therefore could be expensive and require large amounts of resource (e.g., staff time) to deliver. Nevertheless, the delivery of the habit planner within Study 4 was not face-to-face but was quick to implement within the organisation, cheap to produce and could reach a high number of new members within a short period of time, despite being completely novel in its application. This approach therefore had a number of unique strengths that have not been identified in previous interventions aimed to increase attendances at health and fitness venues.

Limitations

The overall research also has a number of limitations. First, as it has been described above, the overall research project has been conducted in collaboration with Sheffield City Trust, a not for profit health and fitness organisation providing facilities in and around the city of Sheffield. Although this collaboration has had many benefits, the generalisability of the findings to organisations that provide health and fitness facilities in other cities or countries can be questioned. Many of the venues at Sheffield City Trust are based in the centre of local communities and thus how members form habits to attend these venues could be different to how members interact with venues where the venue is not at the centre of the community (e.g., the centre of London).

Second, attendance data in Studies 1 and 4 were calculated from the time members entered a health and fitness venue. Although this has many benefits as it provides

objective and accurate data detailing the location, date and time of the attendance, the data output does not detail how long each member spent at the venue. Assessing the amount of time spent at a venue could have helped in explaining the amount of PA members undertook instead of merely the day and time they attended.

Third, the attendance data collected did not include a record of the type of activity members undertook. This would have provided information on the likely intensity of PA members were undertaking. Both the amount and intensity of PA is likely to impact on health outcomes and provide a stronger indication of the type of PA members were undertaking. It could therefore be beneficial for health and fitness organisations to collect this type of data in the future to understand the implications of attendance on health outcomes.

Fourth, the quantitative data that was collected in this thesis only considered a limited range of variables that were available in the dataset. As discussed in Chapter 3, there may be other variables that are important for attendance such as goals or motivations. In addition, factors such as the length of contract bought or the price of the membership may also influence members' attendance behaviour. Future research could therefore collect additional data on these variables and combine data sets to provide a broader perspective on members than specifically their attendance.

Fifth, although the measure of context stability in the current research was well defined and found to be associated with continued attendance in Studies 1 and 4, it may have some limitations. For example, the measure may not capture members who have context stable behaviour but cannot attend at the same time. For example, shift workers may have a stable and consistent attendance (e.g., they always attend a venue after they finish their shift work); nevertheless, the absolute time that they attend may change frequently and thus is not captured within the measurement of context stability in this research project. In addition, the

current research may have not captured all of the other aspects of context stability, such as the type of PA (e.g., exercise classes or swimming sessions) that the member was engaged in.

Sixth, in Study 3, interventions that included pros/cons alongside problem solving and goal setting (behaviour) alongside review behaviour goals were identified as having large effect sizes when used to increase attendances within RCTs. The evidence for these BCTs came from face-to-face modes of delivery and it is possible that the large effects could be due to the mode of delivery as much as the BCT delivered. These BCTs were not explored further in the current research due to the challenge of scaling them to a large sample of members but could be incorporated into future studies that aim to increase attendances at health and fitness venues given the significance of their results.

Finally, the present research project did not capture the other activities that members are undertaking outside of the health and fitness venue that relate to PA. For example, it was concluded in Study 1 that many members were not attending health and fitness venues and therefore could be classified as inactive given that many individuals sign up to a membership for physical health benefits (Crossley, 2006). Nevertheless, this is clearly an assumption. It is possible that some members who were not attending the venues had decided to exercise in other ways, for example by cycling or joining park runs. Research is therefore needed to examine members' PA behaviour both within and outside health and fitness venues.

Conclusion

This thesis has shown that a habit planner, delivered within a health and fitness organisation to new members, can reduce the decline of attendance in these members six months later. Given that most intervention effects aimed to increase attendance at health and fitness venues have been identified to be either trivial or small, future research to inform how attendances could be increased was therefore important. Frequent, early and stable attendance was identified to be important for long term attendance in Study 1; the identification of

factors such as a consistent routine were also identified to be important in the facilitation of attendance in Study 2; Study 4 utilised these findings to deliver an intervention with significant effects on attendance behaviour. The research presented in this thesis has therefore gone some way to determining how the development of context stability can influence increased attendances at health and fitness venues.

References

Adams, S., Matthews, C., Ebbeling, C., Moore, C., Cunningham, J., Fulton J. and Herbert J. (2005). The effect of social desirability and social approval on self-reports of physical activity. *American Journal of Epidemiology*, 161(4), 389-398.

Ainsworth, B. E., Haskell, W. L., Whitt, M. C., Irwin, A., Swartz, S., Strath, W., O'Brian W. L., Bassett, D. R., Schmitz, K. H., Emplaincourt, P. O., Jacobs, D. R., & Leon, A. S. (2000). Compendium of physical activities: An update of activity codes and MET intensities. *Medicine & Science in Sports & Exercise*, *32*(Suppl), S498–S516.

Ajzen, I. (1985). From intention to actions: A theory of planned behavior. In J. Kuhl & J. Bechmann (Eds.), *Action control: From cognitions to behavior* (pp. 11–39). Springer International.

Ajzen, I. (2011) The theory of planned behavior: Reactions and reflections. *Psychology and Health*, *26*(9), 1113–1127.

Albright, A., Franz, M., Hornsby, G., Kriska, A., Marrero, D., Ullrich, I., & Verity, L. S. (2000). American College of Sports Medicine position stand: Exercise and type 2 diabetes. *Medicine & Science in Sports & Exercise, 32*(7),1345–1360.

Althoff, T., Sosic, R., Hicks, J., King, A., Delp, S., & Leskovec, J. (2017). Large-Scale Physical Activity Reveals Worldwide Activity Inequality. *Nature*, *547*(7663), 336–339.

Anderson, L., Oldridge, N., Thompson, D. R., Zwisler, A.-D., Rees, K., Martin, N., & Taylor, R. (2016). Exercise-based cardiac rehabilitation for coronary heart disease: Cochrane systematic review and meta-analysis. *Journal of the American College of Cardiology*, *67*(1), 5–12.

Andreasson, J., & Johansson, T. (2014). The fitness revolution: Historical transformations in the global gym and fitness culture. *Sport Science Review*, *XXIII*(3–4), 91–10.

Ankrah, S., & Al-Tabbaa, O. (2015). Universities–industry collaboration: A systematic review. *Scandinavian Journal of Management*, *31*(3), 387–408.

Annesi, J. J. (2002). Goal-setting protocol in adherence to exercise by Italian adults. *Perceptual and Motor Skills*, *94*(2), 453–458.

Arem, H., Moore, S. C., Patel, A., Hartge, P., Berrington de Gonzalez, A., Visvanathan, K., … Matthews, C. E. (2015). Leisure time physical activity and mortality: A detailed pooled analysis of the dose-response relationship. JAMA Internal Medicine, 175, 959–967.

Armitage, C. J. (2005). Can the theory of planned behavior predict the maintenance of physical activity. *Health Psychology*, 24, 235-245.

Armitage, C.J., & Conner, M. (2001). Efficacy of the theory of planned behaviour: a meta-analytic review. *British Journal of Social Psychology*. 40, 471–499.Ascarza, E., Neslin, S., Netzer, O., Anderson, Z., Fader, P., Gupta, S., Hardie, B., Lemmers, A., Libai, B., Provost, F., & Schrift, R. (2018). In Pursuit of Enhanced Customer Retention Management: Review, Key Issues, and Future Directions. *Customer Needs and Solutions*, *5*(2), 65–81.

Ashford, S., Edmunds, J., & French, D. P. (2010). What is the best way to change self-efficacy to promote lifestyle and recreational physical activity? A systematic review with metaanalysis. *British Journal of Health Psychology*, *15*(2), 265–288.

Ashton, L. M., Hutchesson, M. J., Rollo, M. E., Morgan, P. J., Thompson, D. I., Collins, C. E. (2015). Young adult males' motivators and perceived barriers towards eating healthily and being active: a qualitative study. *International Journal of Behavioral Nutrition and Physical Activity*. 12(1), 93.

Bandura, A. (1997). *Self-efficacy: The exercise of control*. Freeman.

Bandura, A. (2004). Health promotion by social cognitive means. *Health Education and Behavior*, 31(2), 143-164.

Barnes, T., Pashby, I., & Gibbons, A. (2002). Effective university–industry interaction: A multi-case evaluation of collaborative R&D projects. *European Management Journal*, *20*(3), 272–285.

Bauman, A. E., Reis, R. S., Sallis, J. F., Wells, J. C., Loos, R. J. F., & Martin, B. W. (2012). Correlates of physical activity: Why are some people physically active and others not? *The Lancet*, *380*(9838), 258–271.

Bauman, A., Ford, I., & Armstrong, T. (2001). *Trends in population levels of reported physical activity in Australia 1997, 1999 and 2000.* Australian Sports Commission.

Bethancourt, H. J., Rosenberg, D. E., Beatty, T., & Arterburn, D. E. (2014). Barriers to and facilitators of physical activity program use among older adults. *Clinical Medicine & Research*, 12(1- 2), 10-20.

Borer, K. T. (2005). Physical activity in the prevention and amelioration of osteoporosis in women: Interaction of mechanical, hormonal and dietary factors. *Sports Medicine*, *35*(9), 779–830.

Bothwell, L. E., Greene, J. A., Podolsky, S. H., Jones, D. S., & Malina, D. (2016). Assessing the gold standard - Lessons from the history of RCTs. *New England Journal of Medicine*, *374*(22), 2175–2181.

Bouchard, C., Blair, S. N., & Haskell, W. L. (2007). *Physical activity and health*. Human Kinetics.

Brand, R., and Ekkekakis, P. (2018). Affective-Reflective Theory of physical inactivity and exercise: foundations and preliminary evidence. *German Journal of Exercise and Sport Research.* 48, 48–58.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77–101.

Braun, V., & Clarke, V. (2019). Reflecting on reflexive thematic analysis. Qualitative Research in Sport, Exercise and Health, 11(4), 589–597.

Braun, V., Clarke, V. & Weate, P. (2016). Using thematic analysis in sport and exercise research. In B. Smith & A. C. Sparkes (Eds.), Routledge handbook of qualitative research in sport and exercise (pp. 191-205). London: Routledge.

Brinkley, A., McDermott, H., & Munir, F. (2016). What benefits does team sport hold for the workplace? A systematic review. *Journal of Sports Sciences*, *35*(2), 1–13.

Brown, W. J., Pavey, T., & Bauman, A. E. (2015). Comparing population attributable risks for heart disease across the adult lifespan in women. *British Journal of Sports Medicine*, 49, 1069–1076.

Bryan, S.N., Katzmarzyk, P.T. (2011) The association between meeting physical activity guidelines and chronic diseases among Canadian adults. *Journal of Physical Activity Health.* 8,10–17.

Buchan, D. S., Ollis, S., Thomas, N. E., & Baker, J. S. (2012). Physical activity behaviour: An overview of 6 current and emergent theoretical practices. *Journal of Obesity*, *546459*, 11.

Burr, V. (1995). *An Introduction to Social Constructionism*. Routledge.

Burr, V. (2003). *Social constructionism* (2nd ed.). London: Psychology Press.

Burton, D., & Brewins, L. (2017). *Physical Activity: Sheffield Joint Strategic Needs Assessment*. ARCGIS. https://www.arcgis.com/apps/Cascade/index.html?appid=a8596877c1c342d0a63ab6fc835fa245

Calzolari, G., & Nardotto, M. (2017). Effective Reminders. *Management Science*, *63*(9), 2915–2932.

Campbell, R. (2009). Type 2 diabetes: Where we are today: An overview of disease burden, current treatments, and treatment strategies. *Journal of the American Pharmacists Association*, *49*(1), 3–9.

Campbell, F., Holmes, M., Everson-Hock, E., Davis, S., Buckley Woods, H., Anokye, N., Tappenden, P., & Kaltenthaler, E. (2015). A systematic review and economic evaluation of exercise referral schemes in primary care: a short report. *Health Technology Assessment*, 19 (60).

Carels, R. A., Burmeister, J. M., Koball, A. M., Oehlhof, M. W., Hinman, N., LeRoy, M., Bannon, E., Ashrafioun, L., Strofer-Isser, A., Darby, L. A., & Gumble, A. (2014). A randomized trial comparing two approaches to weight loss: differences in weight loss maintenance. *Journal of Health Psychology, 19*(2), 296–311.

Carey, R. N., Connell, L. E., Johnston, M., Rothman, A. J., de Bruin, M., Kelly, M. P., & Michie, S. (2019). Behavior change techniques and their mechanisms of action: A synthesis of links described in published intervention literature. *Annals of Behavioral Medicine, 53*(8), 693–707.

Carrera, M., Royer, H., Stehr, M., & Syndor, J. (2017). Can Financial Incentives Help People Trying to Establish New Habits? Experimental Evidence with New Gym Members. *IZA Discussion Papers*, No. 10874, 2–65.

Carrera, M., Royer, H., Stehr, M., Sydnor, J., & Taubinsky, D. (2018). The limits of simple implementation intentions: Evidence from a field experiment on making plans to exercise. *Journal of Health Economics*, *62*(11), 95–104.

Carver, C. S., & Scheier, M. F. (1982). Control theory: A useful conceptual framework for personality-social, clinical and health psychology. *Psychological Bulletin*, *92*(1), 111–135.

Caspersen, C. J., Powell, K. E., & Christenson, G. M. (1985). Physical-activity, exercise, and physical-fitness - definitions and distinctions for health-related research. *Public Health Reports*, *100*(2), 126–131.

Cave, A. (2015). *Pure Gym founder on how he built Britain's biggest gym chain*. Telegraph. https://www.telegraph.co.uk/finance/newsbysector/retailandconsumer/11337645/Pure-Gym-founder-on-how-he-built-Britains-biggest-gym-chain.html

Cepeda, M., Koolhaas, C.M., van Rooij, F.J.A., Tiemeier, H., Guxens, M., Franco, O.H., Schoufour, J.D. (2018). Seasonality of physical activity, sedentary behavior, and sleep in a middle-aged and elderly population: the Rotterdam study. *Maturitas*. 110, 41–50.

Chatzisarantis, N. L. D., Frederick, C. M., Biddle, S. J. H., Hagger, M. S., & Smith, B. (2007). Influences of volitional and forced intentions on physical activity and effort within the theory of planned behavior. *Journal of Sport Sciences*, *25*(6), 699–709.

Clague, J., & Bernstein, L. (2012). Physical activity and cancer. *Current Oncology Reports*, *14*(6), 550–558.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Lawrence Erlbaum Associates.

Colberg, S., Laan, R., Dassau, E., & Kerr, D. (2015). Physical Activity and Type 1 Diabetes Time for a Rewire? *Journal of Diabetes Science and Technology*, *9*(3), 609–618.

Conroy, D. E., & Berry, T. R. (2017). Automatic Affective Evaluations of Physical Activity. *Exercise and Sport Sciences Reviews*, *45*(4), 230–237.

Corti, B., Donovan, R. J., & Holman, DA. (1996). Factors influencing the use of Physical Activity Facilities: Results from Qualitative Research. *Health Promotion Journal of Australia*, *6*(1), 16-21.

Courneya, K. S., Estabrooks, P. A., & Nigg, C. R. (1997). A simple reinforcement strategy for increasing attendance at a fitness facility. *Health Education & Behavior*, *24*(6), 708–715.

Craig, C., & Bauman, A. (2014). The impact of the Vancouver Winter Olympics on population level physical activity and sport participation among Canadian children and adolescents: Population based study. *International Journal of Behavioral Nutrition and Physical Activity, 11*, 107–117.

Craig, R., Mindell, J., & Hirani, V. (2009). *Health Survey for England 2008*. *Vol. 1: Physical activity and fitness*. The Health and Social Care Information Centre.

Crossley, N. (2006). In the gym: Motives, meaning and moral careers. *Body and Society, 12*(3), 23–50.

Danner, U. N., Aarts, H., & de Vries, N. K. (2008). Habit vs. intention in the prediction of future behaviour: The role of frequency, context stability and mental accessibility of past behaviour. *British Journal of Social Psychology*. 47, 245–265

Davis, R., Campbell, R., Hildon, Z., Hobbs, L., & Michie, S. (2015). Theories of behaviour and behaviour change across the social and behavioural sciences: A scoping review. *Health Psychology Review, 9*(3), 323–344.

De Lyon, A. T. C., Neville, R. D., & Armour, K. M. (2016). The Role of Fitness Professionals in Public Health: A Review of the Literature. *Quest*, *69*(3) 313–330.

Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behaviour.* Plenum.

Deci, E., & Ryan, R. (2008). Facilitating optimal motivation and psychological well-being across life's domains. *Canadian Psychology*, *49*(1), 14–23.

DellaVigna, S., & Malmendier, U. (2006). Paying Not to Go to the Gym. *American Economic Review*, *96*(3), 694–719.

Department of Health Australia. (2013). *Make your move – sit less – be active for life! – Australia's physical activity & sedentary behaviour guidelines for adults*. Department of Health Australia.

Dishman, R. K., Motl, R. W., Saunders, R., Felton, G., Ward, D. S., Dowda, M., & Pate, R. R. (2004). Self-efficacy partially mediates the effect of a school-based physical-activity intervention among adolescent girls. *Preventive Medicine*, *38*(5), 628–636.

Dowd, K. P., Szeklicki, R., Minetto, M. A. , Murphy, M. H., Polito, A., Ghiqo, E., ... Donnelly, A. E. (2018). A systematic literature review of reviews on techniques for physical activity measurement in adults: A DEDIPAC study. *International Journal of Behavioral Nutrition and Physical Activity*, 15(1), 15.

Dumith, S., Hallal, P., Reis, R., & Kohl, H. (2011). Worldwide prevalence of physical inactivity and its association with human development index in 76 countries. *Preventive Medicine*, *53*(1–2), 24–28.

Edwards, E. S., & Sackett, S. C. (2016). Psychosocial Variables Related to Why Women are Less Active than Men and Related Health Implications. Clinical medicine insights. *Women's Health*, *9*(1), 47–56.

Eijkemans, M., Mommers, M., Draaisma, J. M. T., Thijs, C., & Prins, M. H. (2012). Physical activity and asthma: A systematic review and meta-analysis. *Plos One*, *7*(12), 1–11.

El Ansari, W., & Lovell, G. (2009). Barriers to exercise in younger and older non-exercising adult women: A cross sectional study in London, United Kingdom. *International Journal of Environmental Research and Public Health*, 6(4), 1443-1455.

Estabrooks, P., Courneya, K., & Nigg, C. (1996). Effect of a stimulus control intervention on attendance at a university fitness center. *Behavior Modification*, *20*(2), 202–215.

Fereday, J., & Muir-Cochrane, E. (2006). Demonstrating Rigor Using Thematic Analysis: A Hybrid Approach of Inductive and Deductive Coding and Theme Development. *International Journal of Qualitative Methods*, *5*(1), 1–11.

Fitzgerald, N., & Spaccarotella, K. (2009). Barriers to a Health Lifestyle: From Individuals to Public Policy – An Ecological Perspective. *Journal of Extension*, *47*(1), 1–8.

Fleetwood., S. (2019). A definition of habit for socio-economics, *Review of Social Economy*, 1-35,

Fleig, L., Pomp, S., Parschau, L., Barz, M., Lange, D., Schwarzer, R., & Lippke, S. (2013). From intentions via planning and behavior to physical exercise habits. *Psychology of Sport and Exercise, 14*(5), 632–639.

Franco, M. R., Tong, A., Howard, K., Sherrington, C., Ferreira, P. H., Pinto, R. Z., & Ferreira, M.L. (2015). Older people's perspectives on participation in physical activity: A systematic review and thematic synthesis of qualitative literature. *British Journal of Sports Medicine,* 49(19), 1268–1276.

Frew, M., & McGillivray, D. (2005). Health clubs and body politics: aesthetics and the quest for physical capital. *Leisure Studies*, *24*(2), 161–175.

Gardner, B., & Lally, P. (2018). Modelling habit formation and its determinants. In B. Verplanken (Ed.), *The Psychology of Habit* (pp. 207–229). Springer International.

Gardner, B., Abraham, C., Lally, P., & de Bruijn, G. J. (2012). Towards parsimony in habit measurement: Testing the convergent and predictive validity of an automaticity subscale of the self-report habit index. *International Journal of Behavioral Nutrition and Physical Activity*, *9*, 102.

Gardner, B., de Bruijn, G. J., & Lally, P. (2011). A systematic review and meta-analysis of applications of the self-report habit index to nutrition and physical activity behaviours. *Annals of Behavioral Medicine*, *42*(2), 174–187.

Gardner, B., Rebar, A. L., & Lally, P. (2019). A matter of habit: Recognizing the multiple roles of habit in health behaviour. *British Journal of Health Psychology, 24*(2), 241–249.

Gardner, B. (2015). A review and analysis of the use of 'habit' in understanding, predicting and influencing health-related behaviour. *Health Psychology Review, 9*(3), 277–295.

Garriguet, D., & Colley, R. C. (2014). A comparison of self-reported leisure-time physical activity and measured moderate-to-vigorous physical activity in adolescents and adults. *Health Reports*, *25*(7), 3–11.

Gibbs, G. R. (2007). *Thematic Coding and Categorizing, Analyzing Qualitative Data.* Sage Publications.

Gollwitzer, P. M. (1993). Goal achievement: The role of intentions. *European Review of Social Psychology,* 4, 141-185.

Goodman, A., & Cheshire, J. (2014). Inequalities in the London bicycle sharing system revisited: Impacts of extending the scheme to poorer areas but then doubling prices. *Journal of Transport Geography*, *41*, 272–279.

Gov.UK. (2012). *Inspiring a generation: A Taking Part report on the 2012 Olympic and Paralympic Games*. Publishing Service Gov.UK. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/78316/Taking_Part_Olympic_Report.pdf

Gratton, C., & Preuss, H. (2008). Maximizing Olympic impacts by building up legacies. *The International Journal of the History of Sport*, *25*(14), 1922–1938.

Grove, J. R., Zillich, I., & Medic, N. (2014). A process-oriented measure of habit strength for moderate-to-vigorous physical activity. *Health Psychology and Behavioral Medicine*, *2*(1), 379–389.

Guest, G., Bunce, A., & Johnson, L. (2006). How many interviews are enough an experiment with data saturation and variability. *Field Methods*, *18*(1), 59–82.

Guillemin, M., & Gillam, L. (2004). Ethics, reflexivity, and "ethically important moments" in research. *Qualitative Inquiry*, *10*(2), 261–280.

Hagger, M. S. (2019). Habit and physical activity: Theoretical advances, practical implications, and agenda for future research. *Psychology of Sport and Exercise, 42*, 118–129.

Hagger, M., Chatzisarantis, N., & Biddle, S. (2002). A meta-analytic review of the theories of reasoned action and planned behavior in physical activity: Predictive validity and the contribution of additional variables. *Journal of Sport and Exercise Psychology*, *24*(1), 3–32.

Hallal, P. C., Anderson, L., Bull, F., Guthold, R., Haskell, W., & Ekelund, U. (2012). Global physical activity levels: Surveillance progress, pitfalls, and prospects. *The Lancet*, *380*(9838), 247–257.

Hamer, M., Weiler, R., & Stamatakis, E. (2014). Watching sport on television, physical activity, and risk of obesity in older adults. *BMC Public Health*, *14*(1), 10.

Hamilton, M. T., & Owen, N. (2012). Sedentary behavior and inactivity physiology. In C. Bouchard, S. N. Blair, & W. L. Haskell (Eds.), *Physical Activity and Health* (2nd ed., pp. 53-68). Human Kinetics.

Hampton, J., Allen, E., & Edson, C. (2017). Service evaluation of a digital behavioural change programme. *Future Healthcare Journal*, 4, 173–7.

Hartwell, H. (2009). Physical activity – 'you say jump and I will ask how high'. *Perspectives in Public Health*, *129*(3), 98.

Harvey, S. B., Øverland, S., Hatch, S. L., Wessely, S., Mykletun, A., & Hotopf, M. (2018). Exercise and the Prevention of Depression: Results of the HUNT Cohort Study. *American Journal of Psychiatry*, *175*(1), 28–36.

Haskell, W. L., Lee, I. M., Pate, R. R., Powell, K. E., Blair, S. N., Franklin, B. A., & Bauman, A. (2007). Physical activity and public health: updated recommendation for adults from the American College of Sports Medicine and the American Heart Association. *Circulation*, *116*(9), 1081–1093.

Haynes, L., Goldacre, B., & Torgerson, D. (2012). Test, learn, adapt: developing public policy with randomized controlled trials. Cabinet Office-Behavioural Insights Team.

Health Club Management. (2017). *UKactive update: NHS CEO challenges the fitness industry to collaborate on public health*. Health Club Management. http://www.healthclubmanagement.co.uk/health-club-management-features/Ukactive-update-NHS-CEO-challenges-the-fitness-industry-to-collaborate-on-public-health/31479?source=search

Heath, G. W., Parra, D. C., Sarmiento, O. L., Andersen, L. B., Owen, N., Goenka, S., & Brownson, R. C. (2012). Evidence-based intervention in physical activity: lessons from around the world. *Lancet*, *380*(9838), 272–281.

Higgins, P. T. J., Altman, D. G., Gotzsche, P. C., Juni, P., Moher, D., Oxman, A. D., Savovic, J., Schulz, K. F., Sterne, J. A. C. (2011). The Cochrane Collaboration's tool for assessing risk of bias in randomised trials. *British Medical Journal*, *343*, d5928.

HM Government. (2015). *Sporting Future: A new strategy for an active nation.* Publishing Service Gov.UK. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/486622/Sporting_Future_ACCESSIBLE.pdf

Hölder, S., & Svensson, K. (2016). *Subscription services in the fashion industry: A quantitative approach on consumers' perspective* (unpublished master's thesis). The Swedish School of Textiles, University of Boras.

Humpel, N., Owen, N., & Leslie, E. (2002). Environmental factors associated with adults' participation in physical activity. *American Journal of Preventive Medicine, 22*(3), 188–199.

Hunter, R., Tully, M., Donnelly, P., Stevenson, M., & Kee, F. (2014). Knowledge of UK physical activity guidelines: Implications for better targeted health promotion. *Preventive Medicine*, *65*, 33–9.

Jekauc, D., Volkle, M., Wagner, M. O., Mess, F., Reiner, M., & Renner, B. (2015). Prediction of attendance at fitness center: A comparison between the Theory of Planned behavior, the social cognitive Theory and the physical activity maintenance theory. *Frontiers in Psychology*. 6(121), 1-8.

Josefsson, T., Lindwall, M., & Archer, T. (2014). Physical exercise intervention in depressive disorders: meta-analysis and systematic review. *Scandinavian Journal of Medicine & Science in Sports, 24*(2), 259–272.

Kahlke, R. M. (2014). Generic qualitative approaches: Pitfalls and benefits of methodological mixology. *International Journal of Qualitative Methods*, *13*(3), 37–52.

Kaushal, N., & Rhodes, R. E. (2015). Exercise habit formation in new gym members: A longitudinal study. *Journal of Behavioral Medicine*, 38, 652–663.

Kaushal, N., Rhodes, R. E., Spence, J. C., & Meldrum, J. T. (2017). Increasing physical activity through principles of habit formation in new gym members: A randomized controlled trial. *Annals of Behavioral Medicine*, *51*(4), 578–586.

Kelly, M. P., & Barker, M. (2016). Why is changing health related behaviour so difficult? *Public Health*, *136*, 109–116.

Kline, T. B. (2017). Sample issues, methodological implications, and best practices. *Canadian Journal of Behavioral Science,* 49(2), 71–77.

Kokkonen, A. (2015). *The current status of customer retention at Easy Fit, and ways to improve it in the future* (unpublished master's thesis). Arcada University of Applied Sciences.

Konharn, K., Santos, M. P., & Ribeiro, J. C. (2014). Socioeconomic status and objectively measured physical activity in Thai adolescents. *Journal of Physical Activity and Health*, *11*(4), 712–720.

Kosteli, M, C., Heneghan, N. R., Roskell, C., Williams, S. E, Adab, P., Dickens, A. P, et al. (2017). Barriers and enablers of physical activity engagement for patients with COPD in primary care. International Journal of COPD. 12:1019–31.

Krzewska, A., & Ben-Skowronek, I. (2016). Effect of Associated Autoimmune Diseases on Type 1 Diabetes Mellitus Incidence and Metabolic Control in Children and Adolescents. *BioMed Research International*, *11*, 1–12.

Kwasnicka, D., Dombrowski, S. U., White, M., & Sniehotta, F. (2016). Theoretical explanations for maintenance of behaviour change: A systematic review of behaviour theories. *Health Psychology Review*, *10*(3), 277–296.

Lally, P., Chipperfield, A., & Wardle, J. (2008). Healthy habits: efficacy of simple advice on weight control based on a habit-formation model. *International Journal of Obesity, 32*(4), 700–707.

Lally, P., Van Jaarsveld, C. H. M., Potts, H. W. W., & Wardle, J. (2010). How are habits formed: Modelling habit formation in the real world. *European Journal of Social Psychology*, *40*(6), 998–1009.

Landais, L.L., Damman, O.C., Schoonmade, L.J., Timmermans, D.R.M., Verhagen, E.A.L.M., & Jelsma, J.G.M. (2020). Choice architecture interventions to change physical activity and sedentary behavior: A systematic review of effects on intention, behavior and health outcomes during and after intervention. *International Journal of Behavioral Nutrition and Physical Activity,* 14, 47.

Lee, D. C., Brellenthin, A. G., Thompson, P. D., Sui, X., Lee, I. M., & Lavie, C. J. (2017). Running as a Key Lifestyle Medicine for Longevity. *Progress in cardiovascular diseases*, *60*(1), 45–55.

Leisure DB. (2019). *2019 State of the UK Fitness Industry Report*. Leisure DB. https://www.leisuredb.com/2019-fitness-press-release

MacIntosh, E., & Law, B. (2015). Should I stay or should I go? Exploring the decision to join, maintain, or cancel a fitness membership. *Managing Sport and Leisure*, 20(3), 191–210.

Malik, S. H., Blake, H., & Suggs, L. S. (2014). A systematic review of workplace health promotion interventions for increasing physical activity. *British Journal of Health Psychology*, *19*(1), 149–80.

Marcus, B. H., Dubbert, P. M., Forsyth, L. H., McKenzie, T. L., Stone, E. J., Dunn, A. L., & Blair, S. N. (2000). Physical activity behavior change: Issues in adoption and maintenance. *Health Psychology*, *19*(1S), 32–41.

Marques, A., Martins, J., Peralta, M., Catunda, R., & Nunes, L. S. (2016). European adults' physical activity socio-demographic correlates: a cross-sectional study from the European Social Survey. *PeerJ*, 4, e2066.

Marshall, S., & Biddle, S. (2001). The Transtheoretical model of behavior change: A meta-analysis of applications to physical activity and exercise. *Annals of Behavioral Medicine*, *23*(4), 229–246.

Marz, O. (2017). Does Loss Aversion Beat Procrastination? A Behavioral Health Intervention at the Gym. *ECares Working Paper,* No. 2017-33. Université libre de Bruxelles.

McAuley, E., Jerome, G. J., Marquez, D. X., Elavsky, S., & Blissmer, B. (2003). Exercise self-efficacy in older adults: Social, affective, and behavioral influences. *Annals of Behavioral Medicine*, *25*(1), 1–7.

McEachan, R., Conner, M., Taylor, N., & Lawton, R. (2011). Prospective Prediction of Health-Related Behaviours with the Theory of Planned Behaviour: A Meta-Analysis. *Health Psychology Review*, *5*, 97–144.

McGovern, D. (2001). Randomized controlled trials. In D. P. B. McGovern, R. M. Valori, & W. S. M. Summerskill (Eds.), *Key topics in evidence based medicine* (pp. 26–29). BIOS Scientific Publishers.

Meyer, A. L., & Gullotta, T. P. (2012). *Physical Activity Across the Lifespan: Prevention and Treatment for Health and Well-Being*. Springer International.

Michie S. (2014). Implementation science: understanding behaviour change and maintenance. *BMC Health Services Research*, 14 (2), 09. d

Michie, S., & Johnston., M. (2012). Theories and techniques of behaviour change: Developing a cumulative science of behaviour change. *Health Psychology Review*, *6*(1), 1–6.

Michie, S., & Wood, C. E. (2015). Health behaviour change techniques. In M. Conner & P. Norman (Eds.), *Predicting and changing health behaviour. Research and practice with social cognition models* (pp. 358–389). McGraw Hill.

Michie, S., Abraham, C., Whittington, C., McAteer, J., & Gupta, S. (2009). Effective techniques in healthy eating and physical activity interventions: A meta-regression. *Health Psychology*, *28*(6), 690–701.

Michie, S., Fixsen, D., Grimshaw, J., & Eccles, M. (2009). Specifying and reporting complex behaviour change interventions: the need for a scientific method. *Implement Science*, 4, 40.

Michie, S., Richardson, M., Johnston, M., Abraham, C., Francis, J., Hardeman, W., Eccles, M. P., Cane, J., & Wood, C. E. (2013). The Behavior Change Technique Taxonomy (v1) of 93 Hierarchically Clustered Techniques: Building an International Consensus for the Reporting of Behavior Change Interventions. *Annals of Behavioral Medicine*, *46*(1), 81–95.

Middelkamp, J., Van Rooijen, M., & Steenbergen, B. (2016). Attendance behaviour of ex-members in fitness clubs: A retrospective study applying the stages of change. *Perceptual and Motor Skills*, *122*(1), 350–359.

Middelkamp, J., Van Rooijen, M., Wolfhagen, P., & Steenbergen, B. (2017). The effects of a self-efficacy intervention on exercise behavior of fitness club members in 52 weeks and long-term relationships of transtheoretical model constructs. *Journal of Sport Science & Medicine*, *16*(2), 163–171.

Milkman, K., Minson, J., & Volpp, K. (2014). Holding the Hunger Games Hostage at the Gym: An Evaluation of Temptation Bundling. *Management Science*, *60*(2), 283–299.

Moloughney, B., Bursey, G., Fortin, R., Morais, M., & Thi Dang, K. (2018). A Multicomponent Intervention to Encourage Stair Use in Municipal Buildings. *American Journal of Health Promotion*, *33*(1), 57–69.

Mullen, S. P., & Whaley, D. E. (2010). Age, gender, and fitness club membership: Factors related to initial involvement and sustained participation. *International Journal of Sport and Exercise Psychology, 8*(1), 24–35.

Muller, P., & Habla, W. (2018). Experimental and Non-Experimental Evidence on Limited Attention and Present Bias at the Gym. *Centre for European Economic Research Discussion Paper*, No. 18–041, 2–52.

Murphy, N. M., & Bauman, A. (2007). Mass Sporting and Physical Activity Events - Are They "Bread and Circuses" or Public Health Interventions to Increase Population Levels of Physical Activity. *Journal of Physical Activity and Health*, *4*(2), 193–202.

National Health Service. (2016a). *Cardiovascular Disease*. NHS UK. nghttps://www.nhs.uk/conditions/cardiovascular-disease/

National Health Service. (2016b). *High Blood Pressure (Hypertension*). NHS UK. https://www.nhs.uk/conditions/high-blood-pressure-hypertension/

National Institute for Health and Care Excellence. (2011). *Common mental health problems: Identification and pathways to care*. NICE. https://www.nice.org.uk/guidance/cg123/chapter/introduction

National Institute for Health and Care Excellence. (2013). *Physical activity: Brief advice for adults in primary care.* NICE. https://www.nice.org.uk/guidance/ph44/chapter/1-recommendations

National Institute for Health and Care Excellence. (2018). *Physical activity and the environment*. NICE. https://www.nice.org.uk/guidance/ng90/chapter/Glossary

National Institute for Health. (2014). *Coronary Heart Disease Risk Factors.* NHLBI. https://www.nhlbi.nih.gov/health-topics/coronary-heart-disease-risk-factors

National Institute for Health. (2018). *What is Physical Activity?* NHLBI. https://www.nhlbi.nih.gov/health/educational/lose_wt/phy_act.htm

National Institute for Health: National Cancer Institute. (2015). *What is cancer?* Cancer Gov. https://www.cancer.gov/about-cancer/understanding/what-is-cancer.

Neal, D., Wood, W., Labrecque, J., & Lally, P. (2012). How do habits guide behavior? Perceived and actual triggers of habits in daily life. *Journal of Experimental Social Psychology*, *48*(2), 492–498.

Ng, J. Y. Y., Ntoumanis, N., Thogersen-Ntoumani, C., Deci, E. L., Ryan, R. M., Duda, J. L., & Williams, G. C. (2012). Self-Determination Theory Applied to Health Contexts: A Meta-Analysis. *Perspectives on Psychological Science*, *7*(4), 325–340.

Nigg, C. R., Courneya, K. S., & Estabrooks, P. A. (1997a). Maintaining attendance at a fitness center: An application of the decision balance sheet. *Behavioral Medicine*, *23*(3), 130–137.

Nigg, C. R., Courneya, K. S., & Estabrooks. P. A (1997b). Effects of differential self-monitoring onattendance at a fitness center. *Avante*, *3*, 64–79.

Nigg, C., Borrelli, B., Maddock, J., & Dishman, R. (2008). A theory of physical activity maintenance. *Applied Psychology*, *57*(4), 544–560.

Nikolaou*, C.K.,* Hankey*, C.R.,* Lean*, M*.E. *(*2015*)* Weight changes in young adults: A mixed-methods study. *International Journal of Obesity*. 39(3), 508–513.

Novemsky, N., & Kahneman, D. (2005). The Boundaries of Loss Aversion. *Journal of Marketing Research*, *42*(2), 119–128.

Nowell, L. S., Norris, J. M., White, D. E., & Moules, N. J. (2017). Thematic Analysis: Striving to Meet the Trustworthiness Criteria. *International Journal of Qualitative Methods*, 16(1), 160940691773384.

Ouellette, J. A., & Wood, W. (1998). Habit and intention in everyday life: The multiple processes by which past behavior predicts future behavior. *Psychological Bulletin, 124*(1), 54–74.

Pavey, T. G., Anokye, N., Taylor, A. H., Trueman, P., Moxham, T., Fox, K. R., … Taylor, R. S. (2011). The clinical effectiveness and cost-effective-ness of exercise referral schemes: A systematic review and economic evaluation. *Health Technology Assessment*. 15(44), i–xii, 1–254.

Pedisic, Z., & Bauman A. (2015). Accelerometer-based measures in physical activity surveillance: current practices and issues. *British Journal of Sports Medicine*, 49(4), 219-23.

Pender, N., Murdaugh, C., & Parsons, M. (2006). *Health promotion in nursing practice* (5th ed.). Prentice-Hall.

Petrunoff, N., Rissel, C., & Wen, L. M. (2016). The effect of active travel interventions conducted in work settings on driving to work: A systematic review. *Journal of Transport and Health*, *3*, 61–76.

Plotnikoff, R. C., Lippke, S., Courneya, K. S., Birkett, N., and Sigal, R. J. (2008). Physical activity and social cognitive theory: a test in a population sample of adults with type 1 or type 2 diabetes. *Applied Psychology*. 57, 628–643.

Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods, 40*(3)*,* 879–891.

Pridgeon, L., & Grogan, S. (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.

Privitera, G., Antonelli, D., & Szal, A. (2014). An enjoyable distraction during exercise augments the positive effects of exercise on mood. *Journal of Sports Science & Medicine*, *13*(2), 266–270.

Prochaska, J. O., & Diclemente, C. C. (1983). Stages and processes of self-change in smoking: Toward an integrative model of change. *Journal of Consulting and Clinical Psychology*, *51*(3), 390–395.

Prochaska, J. O., & Marcus, B. H. (1994). The transtheoretical model: Applications to exercise. In R. K. Dishman (Ed.), *Advances in exercise adherence* (pp. 161–180). Human Kinetics Publishers.

Prochaska, J. O., Diclemente, C. C., & Norcross, J. C. (1992). In search of how people change: Applications to addictive behaviors. *American Psychologist*, *47*(9), 1102–1114.

Public Health England. (2016). *Health matters: Getting every adult active every day.* Gov.UK. https://www.gov.uk/government/publications/health-matters-getting-every-adult-active-every-day/health-matters-getting-every-adult-active-every-day

Public Health England. (2018). *Physical activity: Applying all our health.* Gov.UK. https://www.gov.uk/government/publications/physical-activity-applying-all-our-health/physical-activity-applying-all-our-health

Rebar, A. L., Dimmock, J. A., Jackson, B., Rhodes, R. E., Kates, A., Starling, J., & Vandelanotte, C. (2016). A systematic review of the effects of non-conscious regulatory processes in physical activity. *Health Psychology Review, 10*(4), 395–407.

Reiner, M., Niermann, C., Jekauc, D., & Woll, A. (2013). Long-term health benefits of physical activity - A systematic review of longitudinal studies. *BMC Public Health*, *13*(1), 813.

Rhodes, R. E., & de Bruijn, G. (2013). How big is the physical activity intention-behaviour gap? A meta-analysis using the action control framework. *British Journal of Health Psychology*. 18(2), 296-309.

Rhodes, R. E., Janssen, I., Bredin, S., Warburton, D., & Bauman, A. (2017). Physical activity: Health impact, prevalence, correlates and interventions. *Psychology & Health*, *32*(8), 942–975.

Rhodes, R. E., Martin, A. D., Taunton, J. E., Rhodes, E. C., Donnelly, M., & Elliot, J. (1999). Factors associated with exercise adherence among older adults. An individual perspective. *Sports Medicine*, *28*(6), 397–411.

Rich, C., Griffiths, L.J., & Dezateux, C. (2012). Seasonal variation in accelerometer-determined sedentary behaviour and physical activity in children: a review. *International Journal of Behavioral Nutrition and Physical Activity.* 9, 49.

Richardson, E. A., Pearce, J., Mitchell, R., & Kingham, S. (2013). Role of physical activity in the relationship between urban green space and health. *Public Health*, *127*(4), 318–324.

Riseth, L., Nøst, T. H., Nilsen, T., & Steinsbekk, A. (2019). Long-term members' use of fitness centers: A qualitative study. *BMC Sports Science, Medicine & Rehabilitation*, *11*, 2.

Roberts, C., & Davis, L. (2017). *Gemba: "Feel the churn": Why the fitness industry can't retain young members.* The Gemba Group. http://thegembagroup.com/news/feel-churn-fitness-industry-cant-retain-young-members/

Robinson, O. C. (2014). Sampling in interview based qualitative research: a theoretical and practical guide. *Qualitative Research in Psychology*, 11, 25–41.

Rohde, K., & Verbeke, W. (2017). We Like to See You in the Gym—A Field Experiment on Financial Incentives for Short and Long Term Gym Attendance. *Journal of Economic Behavior & Organization*, 134, 388–407.

Rothman, A. J. (2000). Toward a theory-based analysis of behavioral maintenance. *Health Psychology*, 19, 64–69.

Royer, B., Stehr, G., & Sydnor, A. (2015). Incentives, Commitments, and Habit Formation in Exercise: Evidence from a Field Experiment with Workers at a Fortune-500 Company. *American Economic Journal: Applied Economics*, *7*(3), 51–84.

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, *55*(1), 68–78.

Ryan, R. M., & Deci, E. L. (Eds.). (2002). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, *55*(2), 68–78.

Ryde, G., & Brown, H. (2017). Physical activity and workplace wellbeing. In L. Cary, M. Cooper, & P. Leitner (Eds.), *The Routledge Companion to Wellbeing at Work* (p. 298). Routledge.

Sallis, J. F., & Hovell, M. F. (1990). Determinants of exercise behavior. *Exercise and Sport Sciences Reviews*, *18*, 307–330.

Sallis, J., Bull, F., Guthold, R., Heath, G., Inoue, S., Kelly, P., Oyeyemi, A. L., Perez, L., Richards, J., & Hallal, P. C. (2016). Progress in physical activity over the Olympic Quadrennium. *The Lancet*, *27*, 1267–1268.

Sallis, R. (2009). Exercise is medicine and physicians need to prescribe it! *British Journal of Sports Medicine*, *43*(1), 3–4.

Sannö, A., Ericsen Öberg, A., Flores-Garcia, E., & Jackson, M. (2019). Increasing the impact of industry-academia collaboration through co-production. *Technology Innovation Management Review*, *9*(4), 37–47.

Sannö, A., Ericson Öberg, A., & Jackson, M. (2018). *How to Succeed with Co-Production: Experiences from Industrial Researchers*. Mälardalen University.

Saunders, M.N.K., Lewis, P., Thornhill, A. and Bristow, A. (2015). Understanding research philosophy and approaches to theory development. In: Saunders, M.N.K., Philip, L. and Thornhill, A. (eds.). Research Methods for Business Students, Harlow: Pearson Education, 122-161.

Scholes, S., & Mindell, J. (2012). Physical activity in adults. In R. Craig & J. Mindell (Eds.), *Health Survey for England*. Health and Social Care Information Centre.

Sedentary Behaviour Research Network. (2012). Letter to the Editor: standardized use of the terms sedentary and sedentary behaviours. *Applied Physiology Nutrition and Metabolism*, *37*(3), 540–542.

Shanahan, D. F., Bush, R., Gaston, K. J., Lin, B. B., Dean, J., Barber, E., & Fuller, R. (2016). Health benefits from nature experiences depend on dose. *Scientific Reports, 6*, 28551.

Silverman, D. (2006). Interpreting qualitative data: Methods for analyzing talk, text and interaction (3rd ed.). Sage Publications Ltd.

Smith, L. P., Ng, S. W & Popkin, B. M. (2014) No time for the gym? Housework and other non-labor market time use patterns are associated with meeting physical activity recommendations among adults in full-time, sedentary jobs. *Social Science & Medicine.* 120, 126–134

Spangenberg, E. R. (1997). Increasing health club attendance through self-prophecy. *Marketing Letters*, *8*(1), 23–31.

Sport England. (2016a). *Active Lives Survey*. Sport England. https://www.sportengland.org/media/11498/active-lives-survey-yr-1-report.pdf

Sport England. (2016b). *Sport England: Towards an active nation*. Sport England https://www.sportengland.org/media/10629/sport-england-towards-an-active-nation.pdf

Statista. (2016). *Fitness industry in the United Kingdom (UK) - Statistics & Facts.* Statista. https://www.statista.com/topics/3411/fitness-industry-in-the-united-kingdom-uk/

Stewart, B., & Smith, A. (2014). The significance of critical incidents in explaining gym use amongst adult populations, *Qualitative Research in Sport, Exercise and Health*, *6*(1), 45–61.

Stride, V., Cranney, L., Scott, A., & Hua, M. (2017). Outdoor gyms and older adults - acceptability, enablers and barriers: A survey of park users. *Health Promotion Journal of Australia*, *13*(4), e019546.

Strobach, T., Englert, C., Jekauc, D., & Pfeffer, I. (2020). Predicting adoption and maintenance of physical activity in the context of dual-process theories. *Performance Enhancement & Health*, 100162.

Strong K. A., Parks, S. L., Anderson, E. (2008) Weight gain prevention: identifying theory-based targets for health behavior change in young adults. *Journal of the American Dietetic Association*. 108, 1708–1715.

Swift, D. L., Johannsen, N. M., Lavie, C. J., Earnest, C. P., & Church, T. S. (2014). The role of exercise and physical activity in weight loss and maintenance. *Progress in Cardiovascular Diseases*, *56*(4), 441–447.

Tawfik, G. M., Giang, H., Ghozy, S., Altibi, A. M., Kandil, H., Le, H. H., Eid, P. S., Radwan, I., Makram, O. M., Hien, T., Sherif, M., Hossain, A. S., Thang, T., Puljak, L., Salem, H., Numair, T., Moji, K., & Huy, N. T. (2020). Protocol registration issues of systematic review and meta-analysis studies: a survey of global researchers. *BMC medical research methodology*, *20*(1), 213.

The European Commission. (2014). *Becoming the hub: The health and fitness sector and the future of health enhancing physical activity*. EOSE. http://eose.eu/wp-content/uploads/2014/03/HUB_THE-FINAL-REPORT.pdf

Thivel, D., Tremblay, A., Genin, P. M., Panahi, S., Rivière, D., & Duclos, M. (2018). Physical activity, inactivity, and sedentary behaviors: definitions and implications in occupational health. *Frontiers in public health*, 6, 288.

Thompson, C. E., & Wankel, L. M. (1980). The effects of perceived activity choice upon frequency of exercise behavior. *Journal of Applied Social Psychology*, *10*(5), 436–443.

Trost, S.G. (2020). Population-level physical activity surveillance in young people: are accelerometer-based measures ready for prime time? *International Journal of Behavioral Nutrition and Physical Activity,* 17**,** 28.

Tucker, J. M., Welk, G. J., & Beyler, N. K. (2011). Physical activity in US adults: Compliance with the physical activity guidelines for Americans. *American Journal of Preventive Medicine*, *40*(4), 454–461.

Turton, R., Bruidegom, K., Cardi, V., Hirsch, C. R., & Treasure, J. (2016). Novel methods to help develop healthier eating habits for eating and weight disorders: A systematic review and meta-analysis. *Neuroscience & Biobehavioral Reviews*, *61*, 132–55.

UK Active. (2016). *Physical Activity Looking to the Future.* UK Active. https://www.ukactive.com/wp-content/uploads/2018/05/Physical_Activity_Looking_to_the_future_2016.pdf

United States Department of Health and Human Services. (2008). *Physical activity guidelines for Americans*. United States Department of Health and Human Services.

Van der Ploeg, H. P., & Hillsdon, M. (2017). Is sedentary behaviour just physical inactivity by another name? *International Journal of Behavioral Nutrition and Physical Activity*, *14*, 142.

Varney, J. (2015). *Public health matters, getting active having fun*. Gov.UK. https://publichealthmatters.blog.gov.uk/2015/09/09/getting-active-having-fun/

Verplanken, B. (2018). *The psychology of habit: Theory, mechanisms, change, and contexts*. Springer International.

Verplanken, B., & Melkevik, O. (2008). Predicting habit: The case of physical exercise. *Psychology of Sport and Exercise, 9*(1), 15–26.

Verplanken, B., Walker, I., Davis, A., & Jurasek, M. (2008). Context change and travel mode choice: Combining the habit discontinuity and selfactivation hypotheses. *Journal of Environmental Psychology*, *28*, 121−127.

Walker, T. (2018). *Fitness start-ups selected for ActiveLab accelerator programme.* Health Club Management. http://www.healthclubmanagement.co.uk/health-club-management-news/Fitness-start-ups-selected-for-ActiveLab-accelerator-programme/336964

Wallston, K. A. (2001). Control beliefs. In N. J. Smelser & P. B. Baltes (Eds.), *International encyclopedia of the social and behavioral sciences* (pp. 2724–2726). Elsevier Science.

Wankel, L. M., & Thompson, C. (1977). Motivating people to be physically active: Self-persuasion vs. balanced decision making. *Journal of Applied Social Psychology*, *7*(4), 332–340.

Warburton, D. E. R. (2015). The health benefits of physical activity: A brief review. In D. E. R. Warburton (Ed.), Health-related exercise prescription for the qualified exercise professional (5th ed., pp. 1–17). Vancouver: Health & Fitness Society of BC.

Warburton, D. E. R., Nicol, C. W., & Bredin, S. S. D. (2006). Health benefits of physical activity: The evidence. *Canadian Medical Association Journal*, *174*(6), 801–809.

Warburton, D., & Bredin, S. (2017). Health benefits of physical activity: a systematic review of current systematic reviews. *Current Opinion in Cardiology*, *32*(5), 541–556.

Watts, H., & Francis-Smythe, J. (2008). *Membership Retention in the Fitness Industry: A Qualitative Study and the Development of a Predictive Model.* Selected Proceedings of the First International Conference on Social Sciences.

Weed, M. (2016). Evidence for physical activity guidelines as a public health intervention: efficacy, effectiveness, and harm – A critical policy sciences approach. *Health Psychology and Behavioral Medicine*, *4*(1), 56–69.

Wenzel, S. E. (2006). Asthma: Defining of the Persistent Adult Phenotypes. *The Lancet*, *368*, 804–813.

Whelton, S. P., Chin, A., & Xin, X. (2002). Effect of aerobic exercise on blood pressure: A meta-analysis of randomized, control trial. *Annals of Intern Medicine*, *136*(3), 493–503.

White, S. M., Wójcicki, T. R., and McAuley, E. (2012). Social cognitive influences on physical activity behavior in middle-aged and older adults. *The* j*ournals of Gerontology, Series B: Psychological Sciences and Social Sciences*. 67, 18–26.

Williams, N. H., Hendry, M., France, B., Lewis, R., & Wilkinson, C. (2007). Effectiveness of exercise-referral schemes to promote physical activity in adults: systematic review. *The British journal of general practice : the journal of the Royal College of General Practitioners*, *57*(545), 979–986.

Williams, S. L., & French, D. P. (2011). What are the most effective intervention techniques for changing physical activity self-efficacy and physical activity behaviour-and are they the same? *Health Education Research*, *26*(2), 308–322.

Wood, W. (2017). Habit in personality and social psychology. *Personality and Social Psychology Review, 21*(4), 389–403.

Wood, W., & Neal, D. T. (2009). The habitual consumer. *Journal of Consumer Psychology*, *19*(4), 579–592.

Wood, W., & Neal, D. T. (2016). Healthy through habit: Interventions for initiating and maintaining health behavior change. *Behavioral Science & Policy*, *2*(1), 71–83.

Woodcock, J., Tainio, M., Cheshire, J., O'Brien, O., & Goodman, A. (2014). Modelled health impacts of the London bicycle sharing system. *British Medical Journal*, *348*, 425.

World Health Organisation. (2016a). *Investing in treatment for depression and anxiety leads to fourfold return.* WHO. http://www.who.int/news-room/detail/13-04-2016-investing-in-treatment-for-depression-and-anxiety-leads-to-fourfold-return

World Health Organization. (2016b). *Global report on diabetes* .WHO *.* http://www.who.int/iris/handle/10665/204871

World Health Organisation. (2017). *Depression: Let's talk*. WHO. http://www.who.int/mental_health/management/depression/en/

World Health Organisation. (2018a). *Physical Activity.* WHO. http://www.who.int/ncds/prevention/physical-activity/en/

World Health organisation. (2018b). *Cancer.* WHO. http://www.who.int/news-room/fact-sheets/detail/cancer

World Health Organisation. (2018c). *Global recommendations on physical activity for health.* WHO. http://www.who.int/dietphysicalactivity/factsheet_recommendations/en/

Appendix A Collaboration agreement with Sheffield City Trust

White Rose Doctoral Training Partnership Collaborative Awards 2017/18

23 Carbrook Hall Road
Sheffield S9 2DH

I am writing on behalf of Sheffield City Trust to confirm our support for a White Rose DTP Collaborative Award for a doctoral research student to undertake research and training within our organisation in collaboration with the University of Sheffield.

As providers of sport and exercise facilities and activities across the city we have a longstanding commitment to understanding how better we can support our local communities to improve their health and wellbeing through engagement in activities and provision of facilities which support and encourage healthy lifestyles. Our commitment has led to some highly innovative developments already. For example, in July 2016 we were the first leisure centre provider in the UK to introduce a 20p levy on sugary drinks sold across our leisure centres, and to deliver a health promotion campaign to promote this intervention which attracted local and national media coverage. Early results suggest this scheme is having a significant effect on consumer behaviour. We know there is significant interest in our scheme and its impact from similar leisure providers across the UK. Therefore there is real potential to replicate our own impact across the country and influence public health policy in areas well beyond Sheffield.

For SCT this forms part of a more fundamental drive to measure our success and improve our insight into 'what works', and how we can continually improve our policies and programmes in order to achieve our key charitable aim. In 2016 we became the first organisation to utilise the Social Return on Investment in Sport model developed by Sheffield Hallam University in partnership with DCMS and Sport England, showing that we deliver significant social value through our activities. We know we make a positive difference, and aim to make even more difference over the coming years.

There is therefore currently a unique opportunity for a cross-disciplinary PhD to explore the potential impact of this and other interventions to promote behaviour change in leisure centres, using our services and the data we collect on our customers and the University of Sheffield's expertise in public health, health psychology and health economics.

This research will also contribute to our wider work and collaborative partnership with the universities and other local partners in the National Centre for Sport and Exercise Medicine (NCSEM), increasing our knowledge and evidence base of how we can deliver meaningful health interventions for the public, and the impact of these. The reach of improved evidence base is international through the NCSEM at national level and work through wider networks.
We are delighted to be able to support this proposed doctoral project.

Yours Sincerely,

Rob Womack
Healthy Partnerships Manager
Sheffield City Trust

Appendix B Confidentiality agreement between Sheffield City Trust and University of Sheffield

CONFIDENTIALITY AGREEMENT

This Confidentiality Agreement is made this day 16/4/18

BETWEEN:

(1) **SHEFFIELD CITY TRUST LIMITED** (reg 2164600), including subsidiaries, **SIV ENTERPRISES LIMITED** (reg 6385377), **SHEFFIELD INTERNATIONAL VENUES LIMITED** (reg 2226575), and **7 HILLS LEISURE TRUST LIMITED** (reg 7923816), companies registered in England and Wales, whose registered office address is at: Riverside East, 2 Millsands, Sheffield S3 8DT and whose Head Office is 23 Carbrook Hall Road, Sheffield, S9 2EH, ("the Company" and "the Disclosing Party"); and

(2) University of Sheffield, whose registered office is Western Bank, S10 2TN, ("the Receiving Party")

WHEREAS Sheffield City Trust and associated subsidiaries agree to allow privileged technical access to Confidential Information (as defined below) with the Receiving Party (as defined below).

NOW THEREFORE, in consideration of such access to Confidential Information the parties agree, acknowledge and undertake on the terms set out below:

1. Interpretation

1.1 **"Agents"** shall mean directors, officers, employees, agents, professional advisers, contractors or appointed representatives;

1.2 **"the Disclosing Party"** shall mean the party disclosing the Confidential Information

1.3 **"the Receiving Party"** shall mean the party receiving the Confidential Informaion

1.4 **"Confidential Information"** shall mean all data relating directly or indirectly to the business, including, for the avoidance of doubt, stored on fixed media systems or removable media, in hardcopy or softcopy format, any projects and this agreement and of the discussions and negotiations between you and us, if any, disclosed by or acquired in any way (and whether directly or indirectly) from either party or from either party's respective Agents and includes Information which contains or otherwise reflects or is generated from such Information but excluding:

16. Governing Law and Jurisdiction

16.1 This agreement shall be governed by and construed in accordance with English law and the parties hereby submit to the exclusive jurisdiction of the English courts.

IN WITNESS WHEREOF the parties hereto have duly executed this agreement as of the date first before written.

[redacted]

Name: [redacted] Name: Matt Land

Title: Chief Executive Title: PhD Researcher

For and on behalf of

Sheffield City Trust Ltd

and associated subsidiaries

(Sheffield International Venues Ltd,
SIV Enterprises Ltd,
7 Hills Leisure Trust Ltd)

(the Disclosing Party)

For and on behalf of

University of Sheffield

(the Receiving Party)

Appendix C Script used to contact participants in Study 2

- Hello, my name is Matthew Rand calling on behalf of Sheffield City Trust. How are you today?

- I am contacting you about a research project we are conducting with our members about their use of SIV health and fitness venues. We'd like to conduct some interviews with members of the [venue] to better understand the reasons why they attend frequently.

- Would you be potentially interested in taking part in this research? The interviews would take approximately 45 minutes to an hour and can take place at a date, time and location of your choice – for example, at the venue you attend.

- (**If no**): [*Thank them for their time and close the call*]

- (**If yes**): That's great. I will be running the research. Let's book a time then… Do you have a date and time that suits you? Where would be best for you? [*essentially set up the date, time and location*].

- Great, that is all booked for you. If you need to contact me prior to the discussion he can be contacted on [telephone number]. We look forward to you taking part in the research.

- Thank you for your time.

Appendix D Interview Guide used in Study 2

Interview Guide

What are the enablers of sustained attendance of members at health and fitness venues?

Section One

[standardised preamble]

Hello, my name is Matthew Rand from University of Sheffield. Thank you for choosing to participate in this interview.

The purpose of this interview is to better understand the reasons why members have sustained attendance and we are speaking to a number of members like yourself to do this research.

The information from this research will be used by both University of Sheffield and [the venue] to find ways of encouraging greater attendance amongst a greater proportion of members.

In the reporting of the results I intend to use quotes from our discussion to outline the key themes. I will ensure that all participants' identities are not included and are anonymous. Information collected from the discussion will be kept confidential. I intend to record the interview to ensure I do not miss any vital information. Do you agree to the recording of this discussion?

There are no right or wrong answers and if you do not want to answer a question please just say 'no comment'. Do you have any questions before we begin?

I would just like you to sign this written informed consent before we move onto the first question.

Section Two – Written Informed Consent

I fully understand all of the above and willingly volunteer to participate in this research study.

Signature:

Print Name:

Date:

Section Three –Interview Questions

	Integral interview questions	Follow up probes
1.1	Firstly, to start the interview, it would be great to know more about you as a member to give us some context for the interview. How long have you been a member at [the venue]? Why did you decide to sign up as a member of the venue? What activities do you tend to do when you are at the venue? Do you attend on your own or with somebody else? Approximately, how often do you attend the venue? Have you been a member of a different venue or organisation? Approximately, how long was this and when was it?	

2.1	You mentioned that you attend the venue [x times], why do you believe you attend this frequently?	Why do you choose to attend the venue instead of undertaking a different activity? e.g. staying at home or going somewhere else What do you enjoy about attending the venue? Why did you choose [x activity(s)] to do at the venue? Is there anything you do at the venue other than those activity(s)? Why do you do these? Do you find that there are consistencies in your attendance e.g. you do the same activities, or attend at the same time or with the same people? How does your general levels of attendance compare with when you first started attending? Why do you think this is the case? Is there anything you could do even more of to help you to attend more frequently?

2.2	Is there anything you do that you think helps you to attend frequently? Describe what you do here.	Why do you think you use these methods or techniques? Which of these helps you the most? Do you do these all of the time or occasionally? Are these methods or techniques the same or different from when you first joined as a member?

2.3	Is there anything others do, such as family or friends, or the venue itself, that helps you to attend frequently? Describe what they do here.	Why do these help you? Do you find that the venue makes it easy for you, for example exercise classes at a specific time or swimming lanes open at suitable times? Why does this help? What could family or friends or the venue do even more of to help you attend more frequently?

2.4	Talk me through a typical visit to the venue. Describe what happens or what you do. For example the preparation you do before you go and the journey you take leading up to the time you arrive at the venue.	Why do you feel it is necessary to do these things? From what you have described, do any of these things make it more likely you will attend than not attend? Why is this? Have any of these things changed over time or since you started as a member? Why is this?

2.5	Think of a time or a period of time when you feel you did not attend as frequently as you would have liked, aside from holidays or illnesses etc. Why do you think this was the case?	What led you to attend less frequently during this time? Looking back, what might you have done differently? Why were you able to attend frequently before and/or after this time? Did you or anyone else purposefully do anything to help you attend more frequently?

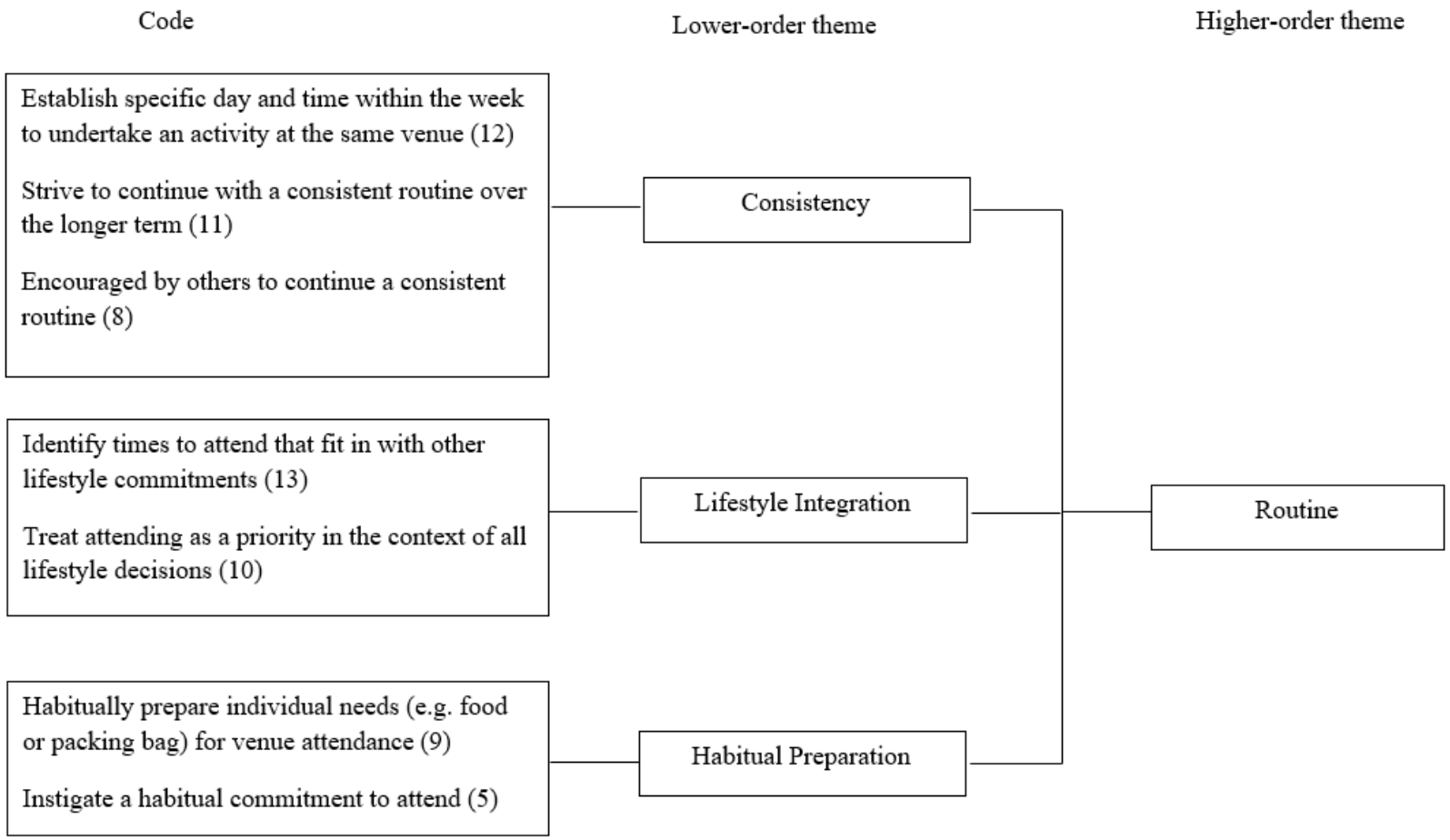
2.6	If you were speaking to another member who was finding it difficult to attend [the venue] frequently even though they had the intention to, from your own experience what would you recommend to them to do to increase the frequency in which they attend? This could be from actions you take or have seen other people take.	Which of these is the most important? Why do you think this? Describe how they might put these recommendations into action. Why might they not be doing these things in the first place?
3.1	Is there anything you would like to add concerning the topics we have discussed during this interview?	

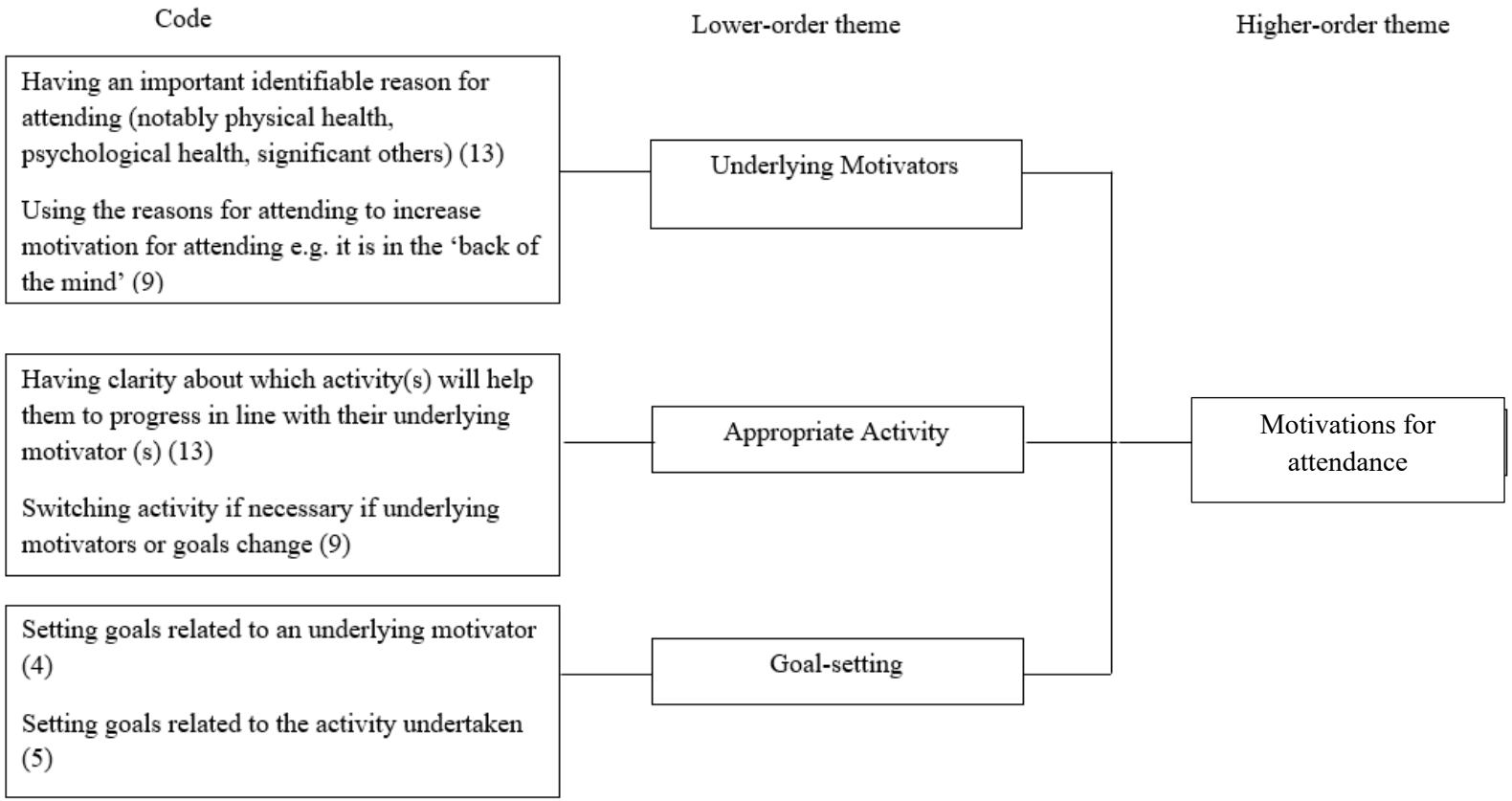
3.2	Do you feel we captured an accurate picture of what enables or facilitates you to attend [the venue]?	

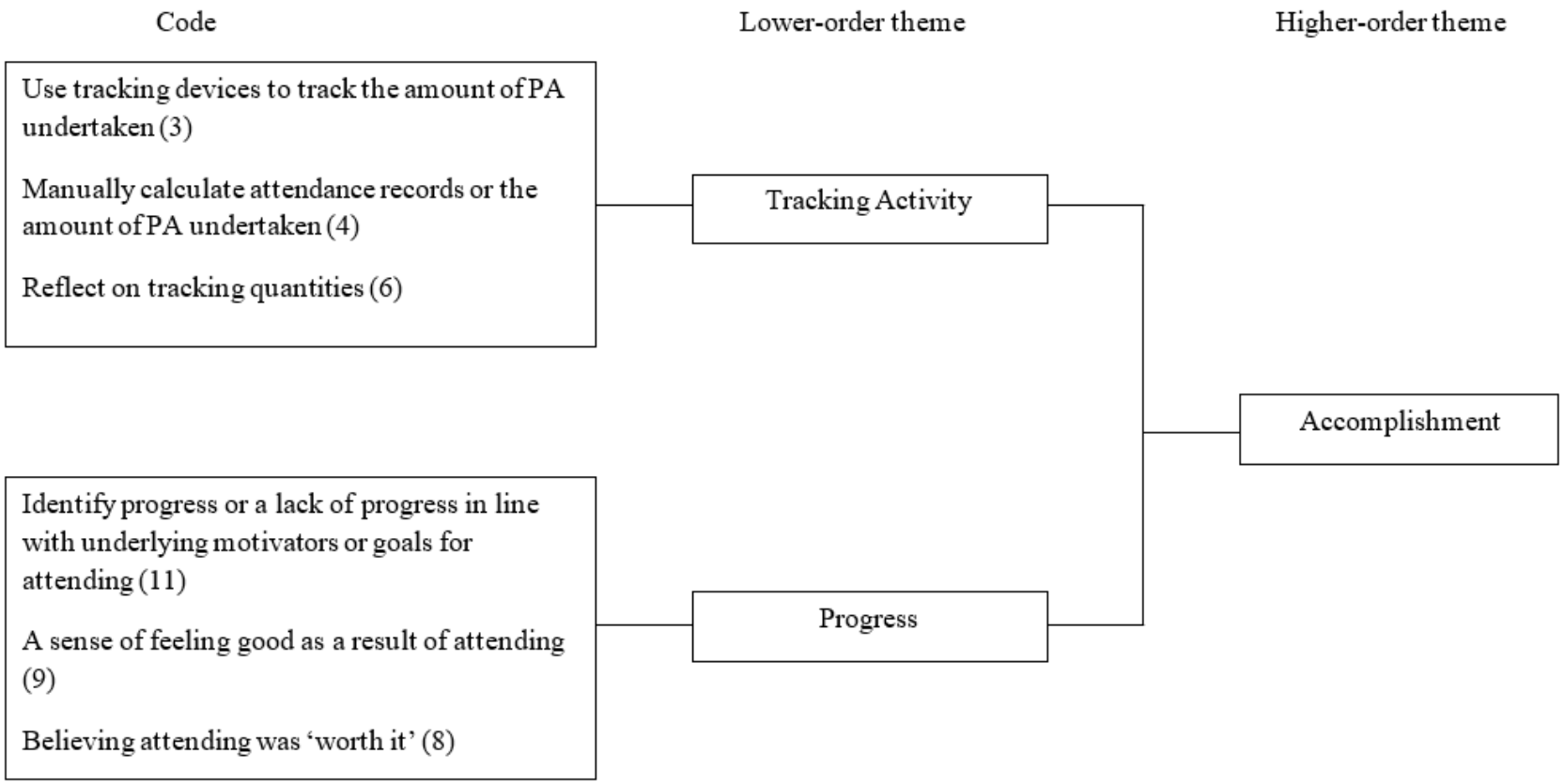
Thank you for participating in this project, your answers will provide us with high quality and targeted insight that will inform future research and work within the health and fitness industry.

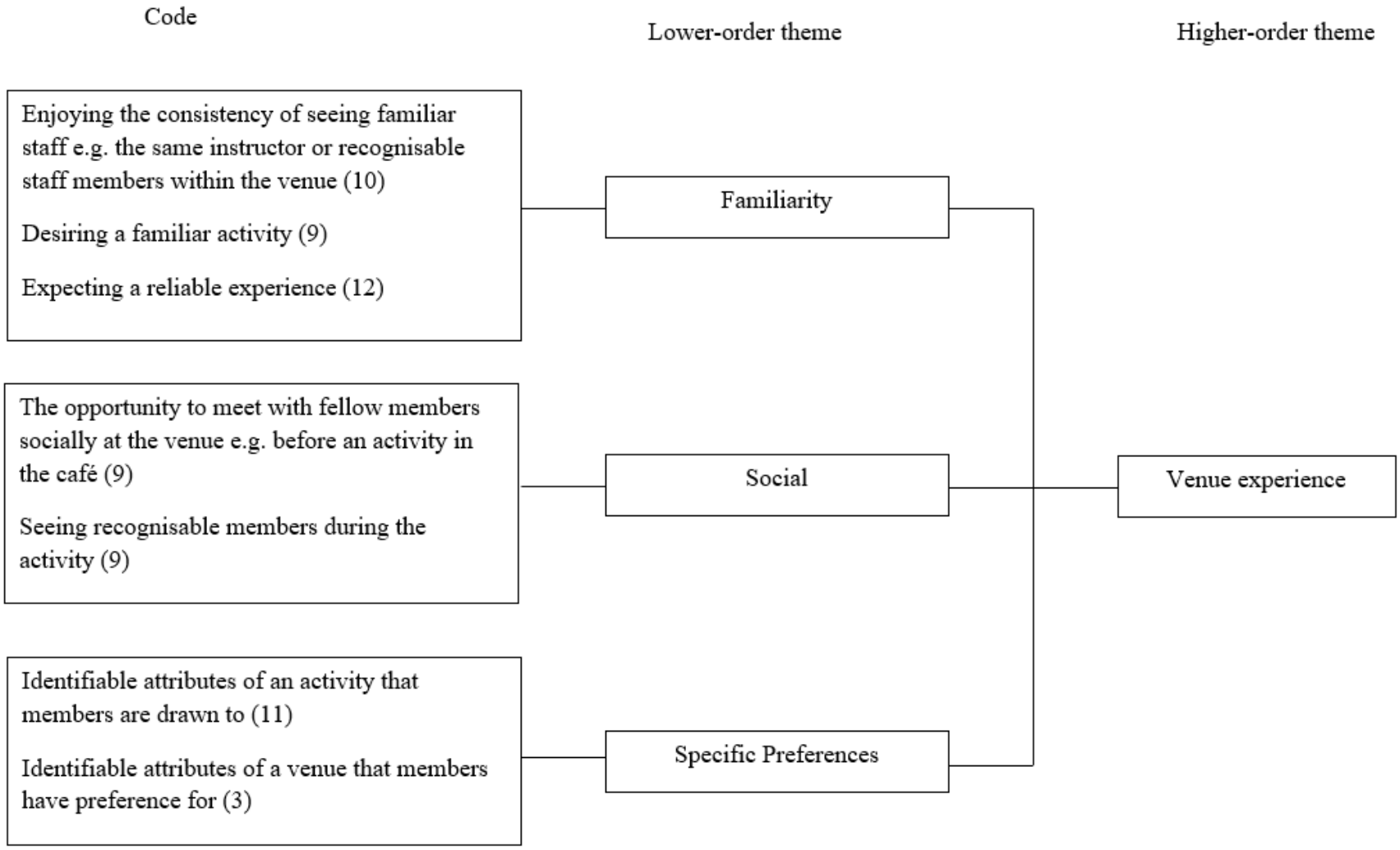
Appendix E Thematic Analysis Results in Study 2

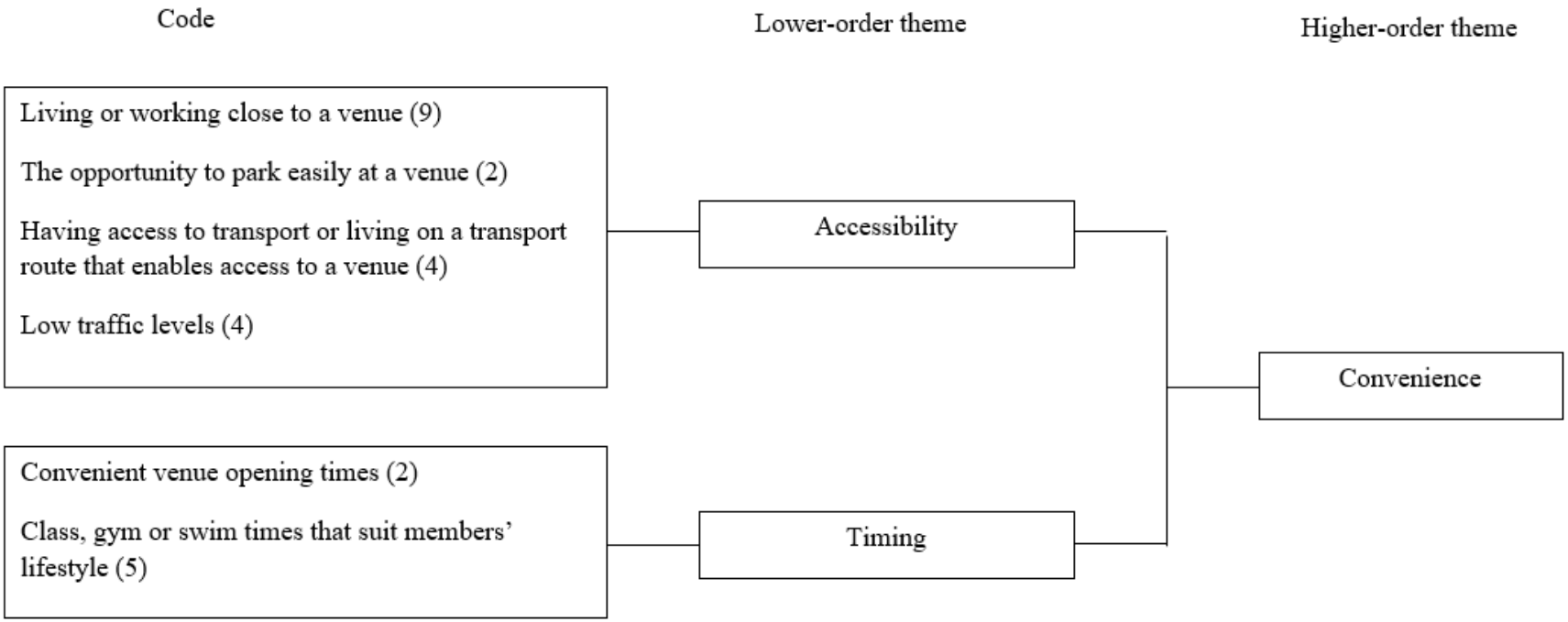
***number of participants in brackets




Code
Lower-order theme
Higher-order theme
Having an important identifiable reason for attending (notably physical health, psychological health, significant others) (13)
Using the reasons for attending to increase motivation for attending e.g. it is in the 'back of the mind' (9)
Underlying Motivators
Having clarity about which activity(s) will help them to progress in line with their underlying motivator (s) (13)
Switching activity if necessary if underlying motivators or goals change (9)
Appropriate Activity
Setting goals related to an underlying motivator (4)
Setting goals related to the activity undertaken (5)
Goal-setting
Motivations for attendance


Code
Lower-order theme
Higher-order theme
Use tracking devices to track the amount of PA undertaken (3)
Manually calculate attendance records or the amount of PA undertaken (4)
Reflect on tracking quantities (6)
Tracking Activity
Identify progress or a lack of progress in line with underlying motivators or goals for attending (11)
A sense of feeling good as a result of attending (9)
Believing attending was 'worth it' (8)
Progress
Accomplishment


Code
Lower-order theme
Higher-order theme
Enjoying the consistency of seeing familiar staff e.g. the same instructor or recognisable staff members within the venue (10)
Desiring a familiar activity (9)
Expecting a reliable experience (12)
Familiarity
The opportunity to meet with fellow members socially at the venue e.g. before an activity in the café (9)
Seeing recognisable members during the activity (9)
Social
Identifiable attributes of an activity that members are drawn to (11)
Identifiable attributes of a venue that members have preference for (3)
Specific Preferences
Venue experience


Code
Lower-order theme
Higher-order theme
Living or working close to a venue (9)
The opportunity to park easily at a venue (2)
Having access to transport or living on a transport route that enables access to a venue (4)
Low traffic levels (4)
Accessibility
Convenient venue opening times (2)
Class, gym or swim times that suit members' lifestyle (5)
Timing
Convenience

Appendix F Protocol used for Study 3

Systematic Review Protocol

1.1. Review Question

To assess the effectiveness of interventions conducted in health and fitness venues that aim to increase levels of member attendance

1.2 Specific Objectives

Objective 1. To understand which interventions have been implemented

Objective 2. To evaluate how effective specific BCTs have been in increasing greater levels of attendance amongst members.

Objective 3. To assess the implications for academic literature and the leisure / fitness industry.

1.3 Criteria for including studies in the review - PICOCS format

Population

Studies of individuals who have paid for a subscription at a leisure or fitness venue; any gender; any age; non clinical (only) populations

Intervention

Any intervention or combination of interventions aimed to encourage greater levels of attendance amongst participants

Comparison

No specified or intentional intervention

Outcomes

Higher levels of attendance at a venue as a result of the specified intervention(s). This is in comparison to no intervention

Setting

Interventions implemented within the setting of a leisure or health and fitness venue

Study design

Both non-randomised and randomised controlled trials

1.4. Study selection and review

Three stages:

1. A screening of titles and abstracts against the inclusion criteria to identify

potentially relevant papers

2. A screening of the papers identified as possibly relevant in the initial screening (i.e., stage 1)

3. Critique / appraisal of each identified study in line with the project protocol

1.5. Search Methods

Databases:

Business Source Premier

Cochrane Controlled Trials Register

Google Scholar

MEDLINE

Physical Education Index

PsychINFO

Scopus

Other methods used for identifying relevant research

Reference checking and hand searching of these

Contacting experts in the field

Hand searching any relevant journals that do not show up in the electronic data base search

1.6 Search terms

Fitness club attendance, Fitness club commitment, Gym attendance interventions, Fitness club attendance interventions, Gym retention, Gym increase attendance, Fitness club habit, Gym attendance, Gym habit.

These whole list of phrases and associated words with And/or commands were used within the databases outlined (i.e. section 1.5)

1.7 Recent articles in field – citation and key words searching

Rohde and Verbeke (2017) We like to see you in the gym—A field experiment on financial incentives for short and long term gym attendance https://www-sciencedirect-com.sheffield.idm.oclc.org/science/article/pii/S0167268116302943

Kaushal et al (2017) Increasing physical activity through principles of habit formation in new gym members: a randomised controlled trial https://link-springer-com.sheffield.idm.oclc.org/article/10.1007/s12160-017-9881-5

Appendix G 93 BCT taxonomy (v1) (Michie et al, 2013) used for Study 3 and Study 4

BCT Taxonomy (v1): 93 hierarchically-clustered techniques

Note for Users

The definitions of Behavior Change Techniques (BCTs):

contain verbs (e.g., provide, advise, arrange, prompt) that refer to the action(s)

taken by the person/s delivering the technique. BCTs can be delivered by an 'interventionist' or self-delivered

contain the term "behavior" referring to a single action or sequence of actions that includes the performance of wanted behavior(s) and/or inhibition (non-performance) of unwanted behavior(s)

note alternative or additional coding where relevant

note the technical terms associated with particular theoretical frameworks where relevant (e.g. 'including implementation intentions)

No.	Label	Definition	Examples
1. Goals and planning			
1.1	*Goal setting (behavior)*	Set or agree on a goal defined in terms of the behavior to be achieved *Note: only code goal-setting if there is sufficient evidence that goal set as part of intervention; if goal unspecified or a behavioral outcome, code 1.3, Goal setting (outcome); if the goal defines a specific context, frequency, duration or intensity for the behavior, also code 1.4, Action planning*	Agree on a daily walking goal (e.g. 3 miles) with the person and reach agreement about the goal Set the goal of eating 5 pieces of fruit per day as specified in public health guidelines
1.2	*Problem solving*	Analyse , or prompt the person to analyse, factors influencing the behavior and generate or select strategies that include overcoming	Identify specific triggers (e.g. being in a pub, feeling anxious) that generate the urge/want/need to drink and

No.	Label	Definition	Examples
		barriers and/or increasing facilitators (includes 'Relapse Prevention*' and 'Coping Planning*') *Note: barrier identification without solutions is not sufficient. If the BCT does not include analysing the behavioral problem, consider 12.3, Avoidance/changing exposure to cues for the behavior, 12.1, Restructuring the physical environment, 12.2, Restructuring the social environment, or 11.2, Reduce negative emotions*	develop strategies for avoiding environmental triggers or for managing negative emotions, such as anxiety, that motivate drinking Prompt the patient to identify barriers preventing them from starting a new exercise regime e.g., lack of motivation, and discuss ways in which they could help overcome them e.g., going to the gym with a buddy
1.3	*Goal setting (outcome)*	Set or agree on a goal defined in terms of a positive outcome of wanted behavior *Note: only code guidelines if set as a goal in an intervention context; if goal is a behavior, code 1.1, Goal setting (behavior); if goal unspecified code 1.3, Goal setting (outcome)*	Set a weight loss goal (e.g. 0.5 kilogram over one week) as an outcome of changed eating patterns
1.4	*Action planning*	Prompt detailed planning of performance of the behavior (must include at least one of context, frequency, duration and intensity). Context may be environmental (physical or social) or internal (physical, emotional or cognitive) (includes 'Implementation Intentions*'*) *Note: evidence of action planning does not necessarily imply goal setting, only code latter if sufficient evidence*	Encourage a plan to carry condoms when going out socially at weekends Prompt planning the performance of a particular physical activity (e.g. running) at a particular time (e.g. before work) on certain days of the week

No.	Label	Definition	Examples
1.5	*Review behavior goal(s)*	Review behavior goal(s) jointly with the person and consider modifying goal(s) or behavior change strategy in light of achievement. This may lead to re-setting the same goal, a small change in that goal or setting a new goal instead of (or in addition to) the first, or no change *Note: if goal specified in terms of behavior, code 1.5, Review behavior goal(s), if goal unspecified, code 1.7, Review outcome goal(s); if discrepancy created consider also 1.6, Discrepancy between current behavior and goal*	Examine how well a person's performance corresponds to agreed goals e.g. whether they consumed less than one unit of alcohol per day, and consider modifying future behavioral goals accordingly e.g. by increasing or decreasing alcohol target or changing type of alcohol consumed
1.6	*Discrepancy between current behavior and goal*	Draw attention to discrepancies between a person's current behavior (in terms of the *form, frequency, duration, or intensity* of that behavior) and the person's previously set outcome goals, behavioral goals or action plans (goes beyond self-monitoring of behavior) *Note: if discomfort is created only code 13.3, Incompatible beliefs and not 1.6, Discrepancy between current behavior and goal; if goals are modified, also code 1.5, Review behavior goal(s) and/or 1.7, Review outcome goal(s); if feedback is provided, also code 2.2, Feedback on behaviour*	Point out that the recorded exercise fell short of the goal set
1.7	*Review outcome goal(s)*	Review outcome goal(s) jointly with the person and consider modifying goal(s) in light of achievement. This may lead to re-setting the same goal, a small change in that goal or setting a new goal instead of, or in addition to the first	Examine how much weight has been lost and consider modifying outcome goal(s) accordingly e.g., by increasing or decreasing subsequent weight loss targets

No.	Label	Definition	Examples
		Note: if goal specified in terms of behavior, code 1.5, Review behavior goal(s), if goal unspecified, code 1.7, Review outcome goal(s); if discrepancy created consider also 1.6, Discrepancy between current behavior and goal	
1.8	*Behavioral contract*	Create a written specification of the behavior to be performed, agreed on by the person, and witnessed by another *Note: also code 1.1, Goal setting (behavior)*	Sign a contract with the person e.g. specifying that they will not drink alcohol for one week
1.9	*Commitment*	Ask the person to affirm or reaffirm statements indicating commitment to change the behavior *Note: if defined in terms of the behavior to be achieved also code 1.1, Goal setting (behavior)*	Ask the person to use an "I will" statement to affirm or reaffirm a strong commitment (i.e. using the words "strongly", "committed" or "high priority") to start, continue or restart the attempt to take medication as prescribed
2. Feedback and monitoring			
2.1	*Monitoring of behavior by others without feedback*	Observe or record behavior with the person's knowledge as part of a behavior change strategy *Note: if monitoring is part of a data collection procedure rather than a strategy aimed at changing behavior, do not code; if feedback given, code only 2.2, Feedback on behavior, and not 2.1, Monitoring of behavior by others without feedback; if monitoring outcome(s) code 2.5, Monitoring outcome(s) of behavior by others without feedback; if self-monitoring*	Watch hand washing behaviors among health care staff and make notes on context, frequency and technique used

No.	Label	Definition	Examples
		behavior, code 2.3, Self-monitoring of behaviour	
2.2	*Feedback on behavior*	Monitor and provide informative or evaluative feedback on performance of the behavior *(e.g. form, frequency, duration, intensity)* *Note: if Biofeedback, code only 2.6, Biofeedback and not 2.2, Feedback on behavior; if feedback is on outcome(s) of behavior, code 2.7, Feedback on outcome(s) of behavior; if there is no clear evidence that feedback was given, code 2.1, Monitoring of behavior by others without feedback; if feedback on behaviour is evaluative e.g. praise, also code 10.4, Social reward*	Inform the person of how many steps they walked each day (as recorded on a pedometer) or how many calories they ate each day (based on a food consumption questionnaire).
2.3	*Self-monitoring of behavior*	Establish a method for the person to monitor and record their behavior(s) as part of a behavior change strategy *Note: if monitoring is part of a data collection procedure rather than a strategy aimed at changing behavior, do not code; if monitoring of outcome of behavior, code 2.4, Self-monitoring of outcome(s) of behavior; if monitoring is by someone else (without feedback), code 2.1, Monitoring of behavior by others without feedback*	Ask the person to record daily, in a diary, whether they have brushed their teeth for at least two minutes before going to bed Give patient a pedometer and a form for recording daily total number of steps
2.4	*Self-monitoring of outcome(s) of behavior*	Establish a method for the person to monitor and record the outcome(s) of their behavior as part of a behavior change strategy *Note: if monitoring is part of a data collection procedure rather than a strategy aimed at changing behavior,*	Ask the person to weigh themselves at the end of each day, over a two week period, and record their daily weight on a graph to increase exercise behaviors

No.	Label	Definition	Examples
		do not code ; if monitoring behavior, code 2.3, Self-monitoring of behavior; if monitoring is by someone else (without feedback), code 2.5, Monitoring outcome(s) of behavior by others without feedback	
2.5	*Monitoring outcome(s) of behavior by others without feedback*	Observe or record outcomes of behavior with the person's knowledge as part of a behavior change strategy *Note: if monitoring is part of a data collection procedure rather than a strategy aimed at changing behavior, do not code; if feedback given, code only 2.7, Feedback on outcome(s) of behavior; if monitoring behavior code 2.1, Monitoring of behavior by others without feedback; if self-monitoring outcome(s), code 2.4, Self-monitoring of outcome(s) of behavior*	Record blood pressure, blood glucose, weight loss, or physical fitness
2.6	*Biofeedback*	Provide feedback about the body *(e.g. physiological or biochemical state)* using an external monitoring device as part of a behavior change strategy *Note: if Biofeedback, code only 2.6, Biofeedback and not 2.2, Feedback on behavior or 2.7, Feedback on outcome(s) of behaviour*	Inform the person of their blood pressure reading to improve adoption of health behaviors
2.7	*Feedback on outcome(s) of behavior*	Monitor and provide feedback on the outcome of performance of the behavior *Note: if Biofeedback, code only 2.6, Biofeedback and not 2.7, Feedback on outcome(s) of behavior; if feedback is on behavior code 2.2, Feedback on*	Inform the person of how much weight they have lost following the implementation of a new exercise regime

No.	Label	Definition	Examples
		behavior; if there is no clear evidence that feedback was given code 2.5, Monitoring outcome(s) of behavior by others without feedback; if feedback on behaviour is evaluative e.g. praise, also code 10.4, Social reward	
3. Social support			
3.1	*Social support (unspecified)*	Advise on, arrange or provide social support *(e.g. from friends, relatives, colleagues,' buddies' or staff)* or non-contingent praise or reward for performance of the behavior. It includes encouragement and counselling, but only when it is directed at the behavior *Note: attending a group class and/or mention of 'follow-up' does not necessarily apply this BCT, support must be explicitly mentioned; if practical, code 3.2, Social support (practical); if emotional, code 3.3, Social support (emotional)* (includes 'Motivational interviewing' and 'Cognitive Behavioral Therapy')	Advise the person to call a 'buddy' when they experience an urge to smoke Arrange for a housemate to encourage continuation with the behavior change programme Give information about a self-help group that offers support for the behavior
3.2	*Social support (practical)*	Advise on, arrange, or provide practical help *(e.g. from friends, relatives, colleagues, 'buddies' or staff)* for performance of the behavior *Note: if emotional, code 3.3, Social support (emotional); if general or unspecified, code 3.1, Social support (unspecified) If only restructuring the physical environment or adding objects to the environment, code 12.1, Restructuring the physical environment or 12.5, Adding objects to the*	Ask the partner of the patient to put their tablet on the breakfast tray so that the patient remembers to take it

No.	Label	Definition	Examples
		environment; attending a group or class and/or mention of 'follow-up' does not necessarily apply this BCT, support must be explicitly mentioned.	
3.3	*Social support (emotional)*	Advise on, arrange, or provide emotional social support *(e.g. from friends, relatives, colleagues, 'buddies' or staff)* for performance of the behavior *Note: if practical, code 3.2, Social support (practical); if unspecified, code 3.1, Social support (unspecified)*	Ask the patient to take a partner or friend with them to their colonoscopy appointment
4. Shaping knowledge			
4.1	*Instruction on how to perform a behavior*	Advise or agree on how to perform the behavior (includes 'Skills training') *Note: when the person attends classes such as exercise or cookery, code 4.1, Instruction on how to perform the behavior, 8.1, Behavioral practice/rehearsal and 6.1, Demonstration of the behavior*	Advise the person how to put a condom on a model of a penis correctly
4.2	*Information about antecedents*	Provide information about antecedents (*e.g. social and environmental situations and events, emotions, cognitions)* that reliably predict performance of the behaviour	Advise to keep a record of snacking and of situations or events occurring prior to snacking
4.3	*Re-attribution*	Elicit perceived causes of behavior and suggest alternative explanations *(e.g. external or internal and stable or unstable)*	If the person attributes their over-eating to the frequent presence of delicious food, suggest that the 'real' cause may be the person's inattention

No.	Label	Definition	Examples
			to bodily signals of hunger and satiety
4.4	*Behavioral experiments*	Advise on how to identify and test hypotheses about the behavior, its causes and consequences, by collecting and interpreting data	Ask a family physician to give evidence-based advice rather than prescribe antibiotics and to note whether the patients are grateful or annoyed
5. Natural consequences			
5.1	*Information about health consequences*	Provide information (e.g. written, verbal, visual) about health consequences of performing the behavior *Note: consequences can be for any target, not just the recipient(s) of the intervention; emphasising importance of consequences is not sufficient; if information about emotional consequences, code 5.6, Information about emotional consequences; if about social, environmental or unspecified consequences code 5.3, Information about social and environmental consequences*	Explain that not finishing a course of antibiotics can increase susceptibility to future infection Present the likelihood of contracting a sexually transmitted infection following unprotected sexual behavior
5.2	*Salience of consequences*	Use methods specifically designed to emphasise the consequences of performing the behaviour with the aim of making them more memorable (goes beyond informing about consequences) *Note: if information about consequences, also code 5.1, Information about health consequences, 5.6, Information about emotional consequences or 5.3,*	Produce cigarette packets showing pictures of health consequences e.g. diseased lungs, to highlight the dangers of continuing to smoke

No.	Label	Definition	Examples
		Information about social and environmental consequences	
5.3	*Information about social and environmental consequences*	Provide information (e.g. written, verbal, visual) about social and environmental consequences of performing the behavior *Note: consequences can be for any target, not just the recipient(s) of the intervention; if information about health or consequences, code 5.1, Information about health consequences; if about emotional consequences, code 5.6, Information about emotional consequences; if unspecified, code 5.3, Information about social and environmental consequences*	Tell family physician about financial remuneration for conducting health screening Inform a smoker that the majority of people disapprove of smoking in public places
5.4	*Monitoring of emotional consequences*	Prompt assessment of feelings after attempts at performing the behavior	Agree that the person will record how they feel after taking their daily walk
5.5	*Anticipated regret*	Induce or raise awareness of expectations of future regret about performance of the unwanted behavior *Note: not including 5.6, Information about emotional consequences*; *if suggests adoption of a perspective or new perspective in order to change cognitions also code 13.2, Framing/reframing*	Ask the person to assess the degree of regret they will feel if they do not quit smoking

No.	Label	Definition	Examples
5.6	*Information about emotional consequences*	Provide information (e.g. written, verbal, visual) about emotional consequences of performing the behavior *Note: consequences can be related to emotional health disorders (e.g. depression, anxiety) and/or states of mind (e.g. low mood, stress); not including 5.5, Anticipated regret; consequences can be for any target, not just the recipient(s) of the intervention; if information about health consequences code 5.1, Information about health consequences; if about social, environmental or unspecified code 5.3, Information about social and environmental consequences*	Explain that quitting smoking increases happiness and life satisfaction
6. Comparison of behaviour			
6.1	*Demonstration of the behavior*	Provide an observable sample of the performance of the behaviour, directly in person or indirectly e.g. via film, pictures, for the person to aspire to or imitate (includes 'Modelling'). *Note:* if advised to practice, also code, *8.1, Behavioural practice and rehearsal; If provided with instructions on how to perform, also code 4.1, Instruction on how to perform the behaviour*	Demonstrate to nurses how to raise the issue of excessive drinking with patients via a role-play exercise
6.2	*Social comparison*	Draw attention to others' performance to allow comparison with the person's own performance *Note: being in a group setting does not necessarily mean that social comparison is actually taking place*	Show the doctor the proportion of patients who were prescribed antibiotics for a common cold by other doctors and compare with their own data
6.3	*Information about others' approval*	Provide information about what other people think about the behavior. The	Tell the staff at the hospital ward that staff at all other

No.	Label	Definition	Examples
		information clarifies whether others will like, approve or disapprove of what the person is doing or will do	wards approve of washing their hands according to the guidelines
7. Associations			
7.1	*Prompts/cues*	Introduce or define environmental or social stimulus with the purpose of prompting or cueing the behavior. The prompt or cue would normally occur at the time or place of performance *Note: when a stimulus is linked to a specific action in an if-then plan including one or more of frequency, duration or intensity also code 1.4, Action planning.*	Put a sticker on the bathroom mirror to remind people to brush their teeth
7.2	*Cue signalling reward*	Identify an environmental stimulus that reliably predicts that reward will follow the behavior (includes 'Discriminative cue')	Advise that a fee will be paid to dentists for a particular dental treatment of 6-8 year old, but not older, children to encourage delivery of that treatment (the 6-8 year old children are the environmental stimulus)
7.3	*Reduce prompts/cues*	Withdraw gradually prompts to perform the behavior (includes 'Fading')	Reduce gradually the number of reminders used to take medication

No.	Label	Definition	Examples
7.4	*Remove access to the reward*	Advise or arrange for the person to be separated from situations in which unwanted behavior can be rewarded in order to reduce the behavior (includes 'Time out')	Arrange for cupboard containing high calorie snacks to be locked for a specified period to reduce the consumption of sugary foods in between meals
7.5	*Remove aversive stimulus*	Advise or arrange for the removal of an aversive stimulus to facilitate behavior change (includes 'Escape learning')	Arrange for a gym-buddy to stop nagging the person to do more exercise in order to increase the desired exercise behaviour
7.6	*Satiation*	Advise or arrange repeated exposure to a stimulus that reduces or extinguishes a drive for the unwanted behavior	Arrange for the person to eat large quantities of chocolate, in order to reduce the person's appetite for sweet foods
7.7	*Exposure*	Provide systematic confrontation with a feared stimulus to reduce the response to a later encounter	Agree a schedule by which the person who is frightened of surgery will visit the hospital where they are scheduled to have surgery
7.8	*Associative learning*	Present a neutral stimulus jointly with a stimulus that already elicits the behavior repeatedly until the neutral stimulus elicits that behavior (includes 'Classical/Pavlovian Conditioning') *Note: when a BCT involves reward or punishment, code one or more of: 10.2, Material reward (behavior); 10.3, Non-specific reward; 10.4, Social reward, 10.9, Self-reward; 10.10, Reward (outcome)*	Present repeatedly fatty foods with a disliked sauce to discourage the consumption of fatty foods

No.	Label	Definition	Examples
8. Repetition and substitution			
8.1	*Behavioral practice/ rehearsal*	Prompt practice or rehearsal of the performance of the behavior one or more times in a context or at a time when the performance may not be necessary, in order to increase habit and skill *Note: if aiming to associate performance with the context, also code 8.3, Habit formation*	Prompt asthma patients to practice measuring their peak flow in the nurse's consulting room
8.2	*Behavior substitution*	Prompt substitution of the unwanted behavior with a wanted or neutral behavior *Note: if this occurs regularly, also code 8.4, Habit reversal*	Suggest that the person goes for a walk rather than watches television
8.3	*Habit formation*	Prompt rehearsal and repetition of the behavior in the same context repeatedly so that the context elicits the behavior *Note: also code 8.1, Behavioral practice/rehearsal*	Prompt patients to take their statin tablet before brushing their teeth every evening
8.4	*Habit reversal*	Prompt rehearsal and repetition of an alternative behavior to replace an unwanted habitual behavior *Note: also code 8.2, Behavior substitution*	Ask the person to walk up stairs at work where they previously always took the lift
8.5	*Overcorrection*	Ask to repeat the wanted behavior in an exaggerated way following an unwanted behaviour	Ask to eat only fruit and vegetables the day after a poor diet

No.	Label	Definition	Examples
8.6	*Generalisation of a target behavior*	Advise to perform the wanted behaviour, which is already performed in a particular situation, in another situation	Advise to repeat toning exercises learned in the gym when at home
8.7	*Graded tasks*	Set easy-to-perform tasks, making them increasingly difficult, but achievable, until behavior is performed	Ask the person to walk for 100 yards a day for the first week, then half a mile a day after they have successfully achieved 100 yards, then two miles a day after they have successfully achieved one mile
9. Comparison of outcomes			
9.1	*Credible source*	Present verbal or visual communication from a credible source in favour of or against the behavior *Note: code this BCT if source generally agreed on as credible e.g., health professionals, celebrities or words used to indicate expertise or leader in field and if the communication has the aim of persuading; if information about health consequences, also code 5.1, Information about health consequences, if about emotional consequences, also code 5.6, Information about emotional consequences; if about social, environmental or unspecified consequences also code 5.3, Information about social and environmental consequences*	Present a speech given by a high status professional to emphasise the importance of not exposing patients to unnecessary radiation by ordering x-rays for back pain
9.2	*Pros and cons*	Advise the person to identify and compare reasons for wanting (pros) and	Advise the person to list and compare the advantages and

No.	Label	Definition	Examples
		not wanting to (cons) change the behavior (includes 'Decisional balance'*)* *Note: if providing information about health consequences, also code 5.1, Information about health consequences; if providing information about emotional consequences, also code 5.6, Information about emotional consequences; if providing information about social, environmental or unspecified consequences also code 5.3, Information about social and environmental consequences*	disadvantages of prescribing antibiotics for upper respiratory tract infections
9.3	*Comparative imagining of future outcomes*	Prompt or advise the imagining and comparing of future outcomes of changed versus unchanged behaviour	Prompt the person to imagine and compare likely or possible outcomes following attending versus not attending a screening appointment
10. Reward and threat			
10.1	*Material incentive (behavior)*	Inform that money, vouchers or other valued objects *will be* delivered if and only if there has been effort and/or progress in performing the behavior (includes 'Positive reinforcement') *Note: if incentive is social, code 10.5, Social incentive if unspecified code 10.6, Non-specific incentive, and not 10.1, Material incentive (behavior); if incentive is for outcome, code 10.8, Incentive (outcome). If reward is*	Inform that a financial payment will be made each month in pregnancy that the woman has not smoked

No.	Label	Definition	Examples
		delivered also code one of: 10.2, Material reward (behavior); 10.3, Non-specific reward; 10.4, Social reward, 10.9, Self-reward; 10.10, Reward (outcome)	
10.2	*Material reward (behavior)*	Arrange for the delivery of money, vouchers or other valued objects if and only if there *has been* effort and/or progress in performing the behavior (includes 'Positive reinforcement') *Note: If reward is social, code 10.4, Social reward, if unspecified code 10.3, Non-specific reward, and not 10.1, Material reward (behavior); if reward is for outcome, code 10.10, Reward (outcome). If informed of reward in advance of rewarded behaviour, also code one of: 10.1, Material incentive (behaviour); 10.5, Social incentive; 10.6, Non-specific incentive; 10.7, Self-incentive; 10.8, Incentive (outcome)*	Arrange for the person to receive money that would have been spent on cigarettes if and only if the smoker has not smoked for one month
10.3	*Non-specific reward*	Arrange delivery of a reward if and only if there *has been* effort and/or progress in performing the behavior (includes 'Positive reinforcement') *Note: if reward is material, code 10.2, Material reward (behavior), if social, code 10.4, Social reward, and not 10.3, Non-specific reward; if reward is for outcome code 10.10, Reward (outcome). If informed of reward in advance of rewarded behaviour, also code one of: 10.1, Material incentive (behaviour); 10.5, Social incentive; 10.6, Non-specific incentive; 10.7, Self-incentive; 10.8, Incentive (outcome)*	Identify something (e.g. an activity such as a visit to the cinema) that the person values and arrange for this to be delivered if and only if they attend for health screening

No.	Label	Definition	Examples
10.4	*Social reward*	Arrange verbal or non-verbal reward if and only if there *has been* effort and/or progress in performing the behavior (includes 'Positive reinforcement') *Note: if reward is material, code 10.2, Material reward (behavior), if unspecified code 10.3, Non-specific reward, and not 10.4, Social reward; if reward is for outcome code 10.10, Reward (outcome). If informed of reward in advance of rewarded behaviour, also code one of: 10.1, Material incentive (behaviour); 10.5, Social incentive; 10.6, Non-specific incentive; 10.7, Self-incentive; 10.8, Incentive (outcome)*	Congratulate the person for each day they eat a reduced fat diet
10.5	*Social incentive*	Inform that a verbal or non-verbal reward *will be* delivered if and only if there has been effort and/or progress in performing the behavior (includes 'Positive reinforcement') *Note: if incentive is material, code 10.1, Material incentive (behavior), if unspecified code 10.6, Non-specific incentive, and not 10.5, Social incentive; if incentive is for outcome code 10.8, Incentive (outcome). If reward is delivered also code one of: 10.2, Material reward (behavior); 10.3, Non-specific reward; 10.4, Social reward, 10.9, Self-reward; 10.10, Reward (outcome)*	Inform that they will be congratulated for each day they eat a reduced fat diet
10.6	*Non-specific incentive*	Inform that a reward *will be* delivered if and only if there has been effort and/or progress in performing the	Identify an activity that the person values and inform them that this will happen if and

No.	Label	Definition	Examples
		behavior (includes 'Positive reinforcement') *Note: if incentive is material, code 10.1, Material incentive (behavior), if social, code 10.5, Social incentive and not 10.6, Non-specific incentive; if incentive is for outcome code 10.8, Incentive (outcome). If reward is delivered also code one of: 10.2, Material reward (behavior); 10.3, Non-specific reward; 10.4, Social reward, 10.9, Self-reward; 10.10, Reward (outcome)*	only if they attend for health screening
10.7	*Self-incentive*	Plan to reward self in future if and only if there has been effort and/or progress in performing the behavior *Note: if self-reward is material, also code 10.1, Material incentive (behavior), if social, also code 10.5, Social incentive, if unspecified, also code 10.6, Non-specific incentive; if incentive is for outcome code 10.8, Incentive (outcome). If reward is delivered also code one of: 10.2, Material reward (behavior); 10.3, Non-specific reward; 10.4, Social reward, 10.9, Self-reward; 10.10, Reward (outcome)*	Encourage to provide self with material (e.g., new clothes) or other valued objects if and only if they have adhered to a healthy diet
10.8	*Incentive (outcome)*	Inform that a reward *will be* delivered if and only if there has been effort and/or progress in achieving the behavioural outcome (*includes* 'Positive reinforcement') *Note: this includes social, material, self- and non-specific incentives for outcome; if incentive is for the*	Inform the person that they will receive money if and only if a certain amount of weight is lost

No.	Label	Definition	Examples
		behavior code 10.5, Social incentive, 10.1, Material incentive (behavior), 10.6, Non-specific incentive or 10.7, Self-incentive and not 10.8, Incentive (outcome). If reward is delivered also code one of: 10.2, Material reward (behavior); 10.3, Non-specific reward; 10.4, Social reward, 10.9, Self-reward; 10.10, Reward (outcome)	
10.9	*Self-reward*	Prompt self-praise or self-reward if and only if there *has been* effort and/or progress in performing the behavior *Note: if self-reward is material, also code 10.2, Material reward (behavior), if social, also code 10.4, Social reward, if unspecified, also code 10.3, Non-specific reward; if reward is for outcome code 10.10, Reward (outcome). If informed of reward in advance of rewarded behaviour, also code one of: 10.1, Material incentive (behaviour); 10.5, Social incentive; 10.6, Non-specific incentive; 10.7, Self-incentive; 10.8, Incentive (outcome)*	Encourage to reward self with material (e.g., new clothes) or other valued objects if and only if they have adhered to a healthy diet
10.10	*Reward (outcome)*	Arrange for the delivery of a reward if and only if there *has been* effort and/or progress in achieving the behavioral outcome (includes 'Positive reinforcement') *Note: this includes social, material, self- and non-specific rewards for outcome; if reward is for the behavior code 10.4, Social reward, 10.2, Material reward (behavior), 10.3, Non-specific reward or 10.9, Self-reward and not 10.10, Reward (outcome). If informed of reward in advance of*	Arrange for the person to receive money if and only if a certain amount of weight is lost

No.	Label	Definition	Examples
		rewarded behaviour, also code one of: 10.1, Material incentive (behaviour); 10.5, Social incentive; 10.6, Non-specific incentive; 10.7, Self-incentive; 10.8, Incentive (outcome)	
10.11	*Future punishment*	Inform that future punishment or removal of reward will be a consequence of performance of an unwanted behavior (may include fear arousal) (includes 'Threat')	Inform that continuing to consume 30 units of alcohol per day is likely to result in loss of employment if the person continues
11. Regulation			
11.1	*Pharmacological support*	Provide, or encourage the use of or adherence to, drugs to facilitate behavior change *Note: if pharmacological support to reduce negative emotions (i.e. anxiety) then also code 11.2, Reduce negative emotions*	Suggest the patient asks the family physician for nicotine replacement therapy to facilitate smoking cessation
11.2	*Reduce negative emotions* [b]	Advise on ways of reducing negative emotions to facilitate performance of the behavior (includes 'Stress Management') *Note: if includes analysing the behavioural problem, also code 1.2, Problem solving*	Advise on the use of stress management skills, e.g. to reduce anxiety about joining Alcoholics Anonymous
11.3	*Conserving mental resources*	Advise on ways of minimising demands on mental resources to facilitate behavior change	Advise to carry food calorie content information to reduce the burden on memory in making food choices

No.	Label	Definition	Examples
11.4	*Paradoxical instructions*	Advise to engage in some form of the unwanted behavior with the aim of reducing motivation to engage in that behaviour	Advise a smoker to smoke twice as many cigarettes a day as they usually do Tell the person to stay awake as long as possible in order to reduce insomnia
12. Antecedents			
12.1	*Restructuring the physical environment*	Change, or advise to change the physical environment in order to facilitate performance of the wanted behavior or create barriers to the unwanted behavior (other than prompts/cues, rewards and punishments) *Note: this may also involve 12.3, Avoidance/reducing exposure to cues for the behavior; if restructuring of the social environment code 12.2, Restructuring the social environment;* *if only adding objects to the environment, code 12.5, Adding objects to the environment*	Advise to keep biscuits and snacks in a cupboard that is inconvenient to get to Arrange to move vending machine out of the school
12.2	*Restructuring the social environment*	Change, or advise to change the social environment in order to facilitate performance of the wanted behavior or create barriers to the unwanted behavior (other than prompts/cues, rewards and punishments) *Note: this may also involve 12.3, Avoidance/reducing exposure to cues*	Advise to minimise time spent with friends who drink heavily to reduce alcohol consumption

No.	Label	Definition	Examples
		for the behavior; if also restructuring of the physical environment also code 12.1, Restructuring the physical environment	
12.3	*Avoidance/reducing exposure to cues for the behavior*	Advise on how to avoid exposure to specific social and contextual/physical cues for the behavior, including changing daily or weekly routines *Note: this may also involve 12.1, Restructuring the physical environment* and/or *12.2, Restructuring the social environment*; if the BCT includes analysing the behavioral problem, only code *1.2*, *Problem solving*	Suggest to a person who wants to quit smoking that their social life focus on activities other than pubs and bars which have been associated with smoking
12.4	*Distraction*	Advise or arrange to use an alternative focus for attention to avoid triggers for unwanted behaviour	Suggest to a person who is trying to avoid between-meal snacking to focus on a topic they enjoy (e.g. holiday plans) instead of focusing on food
12.5	*Adding objects to the environment*	Add objects to the environment in order to facilitate performance of the behavior *Note: Provision of information (e.g. written, verbal, visual) in a booklet or leaflet is insufficient. If this is accompanied by social support, also code 3.2, Social support (practical); if the environment is changed beyond the addition of objects, also code 12.1, Restructuring the physical environment*	Provide free condoms to facilitate safe sex Provide attractive toothbrush to improve tooth brushing technique

No.	Label	Definition	Examples
12.6	*Body changes*	Alter body structure, functioning or support directly to facilitate behavior change	Prompt strength training, relaxation training or provide assistive aids (e.g. a hearing aid)
13. Identity			
13.1	*Identification of self as role model*	Inform that one's own behavior may be an example to others	Inform the person that if they eat healthily, that may be a good example for their children
13.2	*Framing/reframing*	Suggest the deliberate adoption of a perspective or new perspective on behavior (e.g. its purpose) in order to change cognitions or emotions about performing the behavior (includes 'Cognitive structuring'); *If information about consequences then code 5.1, Information about health consequences, 5.6, Information about emotional consequences or 5.3, Information about social and environmental consequences instead of 13.2, Framing/reframing*	Suggest that the person might think of the tasks as reducing sedentary behavior (rather than increasing activity)
13.3	*Incompatible beliefs*	Draw attention to discrepancies between current or past behavior and self-image, in order to create discomfort (includes *'*Cognitive dissonance')	Draw attention to a doctor's liberal use of blood transfusion and their self-identification as a proponent of evidence-based medical practice
13.4	*Valued self-identity*	Advise the person to write or complete rating scales about a cherished value or personal strength as a means of affirming the person's identity as part	Advise the person to write about their personal strengths before they receive a message

No.	Label	Definition	Examples
		of a behavior change strategy (includes 'Self-affirmation')	advocating the behavior change
13.5	*Identity associated with changed behavior*	Advise the person to construct a new self-identity as someone who 'used to engage with the unwanted behavior'	Ask the person to articulate their new identity as an 'ex-smoker'
14. Scheduled consequences			
14.1	*Behavior cost*	Arrange for withdrawal of something valued if and only if an unwanted behavior is performed (includes 'Response cost'). Note if withdrawal of contingent reward code*, 14.3, Remove reward*	Subtract money from a prepaid refundable deposit when a cigarette is smoked
14.2	*Punishment*	Arrange for aversive consequence contingent on the performance of the unwanted behavior	Arrange for the person to wear unattractive clothes following consumption of fatty foods
14.3	*Remove reward*	Arrange for discontinuation of contingent reward following performance of the unwanted behavior (includes 'Extinction')	Arrange for the other people in the household to ignore the person every time they eat chocolate (rather than attending to them by criticising or persuading)
14.4	*Reward approximation*	Arrange for reward following any approximation to the target behavior, gradually rewarding only performance	Arrange reward for any reduction in daily calories, gradually requiring the daily

No.	Label	Definition	Examples
		closer to the wanted behavior (includes *'*Shaping*'*) *Note: also code one of 59-63*	calorie count to become closer to the planned calorie intake
14.5	*Rewarding completion*	Build up behavior by arranging reward following final component of the behavior; gradually add the components of the behavior that occur earlier in the behavioral sequence (includes *'*Backward chaining') *Note: also code one of 10.2, Material reward (behavior); 10.3, Non-specific reward; 10.4, Social reward, 10.9, Self-reward; 10.10, Reward (outcome)*	Reward eating a supplied low calorie meal; then make reward contingent on cooking and eating the meal; then make reward contingent on purchasing, cooking and eating the meal
14.6	*Situation-specific reward*	Arrange for reward following the behavior in one situation but not in another (includes *'*Discrimination training') *Note: also code one of 10.2, Material reward (behavior); 10.3, Non-specific reward; 10.4, Social reward, 10.9, Self-reward; 10.10, Reward (outcome)*	Arrange reward for eating at mealtimes but not between meals
14.7	*Reward incompatible behavior*	Arrange reward for responding in a manner that is incompatible with a previous response to that situation (includes *'*Counter-conditioning') *Note: also code one of 10.2, Material reward (behavior); 10.3, Non-specific reward; 10.4, Social reward, 10.9, Self-reward; 10.10, Reward (outcome)*	Arrange reward for ordering a soft drink at the bar rather than an alcoholic beverage

No.	Label	Definition	Examples
14.8	*Reward alternative behavior*	Arrange reward for performance of an alternative to the unwanted behavior (includes 'Differential reinforcement') *Note: also code one of 10.2, Material reward (behavior); 10.3, Non-specific reward; 10.4, Social reward, 10.9, Self-reward; 10.10, Reward (outcome); consider also coding 1.2, Problem solving*	Reward for consumption of low fat foods but not consumption of high fat foods
14.9	*Reduce reward frequency*	Arrange for rewards to be made contingent on increasing duration or frequency of the behavior (includes 'Thinning') *Note: also code one of 10.2, Material reward (behavior); 10.3, Non-specific reward; 10.4, Social reward, 10.9, Self-reward; 10.10, Reward (outcome)*	Arrange reward for each day without smoking, then each week, then each month, then every 2 months and so on
14.10	*Remove punishment*	Arrange for removal of an unpleasant consequence contingent on performance of the wanted behavior (includes 'Negative reinforcement')	Arrange for someone else to do housecleaning only if the person has adhered to the medication regimen for a week
15. Self-belief			
15.1	*Verbal persuasion about capability*	Tell the person that they can successfully perform the wanted behavior, arguing against self-doubts and asserting that they can and will succeed	Tell the person that they can successfully increase their physical activity, despite their recent heart attack.
15.2	*Mental rehearsal of successful performance*	Advise to practise imagining performing the behavior successfully in relevant contexts	Advise to imagine eating and enjoying a salad in a work canteen

No.	Label	Definition	Examples
15.3	*Focus on past success*	Advise to think about or list previous successes in performing the behavior (or parts of it)	Advise to describe or list the occasions on which the person had ordered a non-alcoholic drink in a bar
15.4	*Self-talk*	Prompt positive self-talk (aloud or silently) before and during the behavior	Prompt the person to tell themselves that a walk will be energising
16. Covert learning			
16.1	*Imaginary punishment*	Advise to imagine performing the unwanted behavior in a real-life situation followed by imagining an unpleasant consequence (includes *'*Covert sensitisation')	Advise to imagine overeating and then vomiting
16.2	*Imaginary reward*	Advise to imagine performing the wanted behavior in a real-life situation followed by imagining a pleasant consequence (includes *'*Covert conditioning')	Advise the health professional to imagine giving dietary advice followed by the patient losing weight and no longer being diabetic
16.3	*Vicarious consequences*	Prompt observation of the consequences (including rewards and punishments) for others when they perform the behavior *Note: if observation of health consequences, also code 5.1, Information about health consequences; if of emotional consequences, also code 5.6, Information about emotional consequences, if of social, environmental or unspecified consequences, also code 5.3,*	Draw attention to the positive comments other staff get when they disinfect their hands regularly

No.	Label	Definition	Examples
		Information about social and environmental consequences	

[a] Notes are provided underneath most BCTs to help distinguish them from similar techniques

[b] An additional technique 'Increase positive emotions' will be included in BCT Taxonomy v2

Appendix H Ethics approval for Study 1

The University Of Sheffield.

Downloaded: 27/09/2020
Approved: 26/07/2019

Matthew Rand
Registration number: 170128874
School of Health and Related Research
Programme: Health and Related Research (PhD/Health & Related Res FT) - HARR31

Dear Matthew

PROJECT TITLE: Understanding attendance in the health and fitness industry
APPLICATION: Reference Number 030469

This letter confirms that you have signed a University Research Ethics Committee-approved self-declaration to confirm that your research will involve only existing research, clinical or other data that has been robustly anonymised. You have judged it to be unlikely that this project would cause offence to those who originally provided the data, should they become aware of it.

As such, on behalf of the University Research Ethics Committee, I can confirm that your project can go ahead on the basis of this self-declaration.

If during the course of the project you need to deviate significantly from the above-approved documentation please inform me since full ethical review may be required.

Yours sincerely

Charlotte Claxton
Departmental Ethics Administrator

Appendix I Ethics approval for Study 2

The University Of Sheffield.

Downloaded: 27/09/2020
Approved: 05/12/2018

Matthew Rand
Registration number: 170128874
School of Health and Related Research
Programme: Health and Related Research (PhD/Health & Related Res FT) - HARR31

Dear Matthew

PROJECT TITLE: What are the enablers of attendance at health and fitness venues?
APPLICATION: Reference Number 023605

On behalf of the University ethics reviewers who reviewed your project, I am pleased to inform you that on 05/12/2018 the above-named project was **approved** on ethics grounds, on the basis that you will adhere to the following documentation that you submitted for ethics review:

- University research ethics application form 023605 (form submission date: 28/11/2018); (expected project end date: 31/07/2019).
- Participant information sheet 1052860 version 3 (28/11/2018).
- Participant information sheet 1052870 version 4 (03/12/2018).
- Participant information sheet 1053664 version 1 (28/11/2018).
- Participant consent form 1052858 version 2 (28/11/2018).

If during the course of the project you need to deviate significantly from the above-approved documentation please inform me since written approval will be required.

Your responsibilities in delivering this research project are set out at the end of this letter.

Yours sincerely

Charlotte Claxton
Ethics Administrator
School of Health and Related Research

Please note the following responsibilities of the researcher in delivering the research project:

- The project must abide by the University's Research Ethics Policy: https://www.sheffield.ac.uk/rs/ethicsandintegrity/ethicspolicy/approval-procedure
- The project must abide by the University's Good Research & Innovation Practices Policy: https://www.sheffield.ac.uk/polopoly_fs/1.671066!/file/GRIPPolicy.pdf
- The researcher must inform their supervisor (in the case of a student) or Ethics Administrator (in the case of a member of staff) of any significant changes to the project or the approved documentation.
- The researcher must comply with the requirements of the law and relevant guidelines relating to security and confidentiality of personal data.
- The researcher is responsible for effectively managing the data collected both during and after the end of the project in line with best practice, and any relevant legislative, regulatory or contractual requirements.

Appendix J Ethics approval for Study 4

The University Of Sheffield.

Downloaded: 27/09/2020
Approved: 07/06/2018

Matthew Rand
Registration number: 170128874
School of Health and Related Research
Programme: Health and Related Research (PhD/Health & Related Res FT) - HARR31

Dear Matthew

PROJECT TITLE: Could the leisure industry do more to encourage greater physical activity attendance amongst its members?
APPLICATION: Reference Number 018874

On behalf of the University ethics reviewers who reviewed your project, I am pleased to inform you that on 07/06/2018 the above-named project was **approved** on ethics grounds, on the basis that you will adhere to the following documentation that you submitted for ethics review:

- University research ethics application form 018874 (form submission date: 04/06/2018); (expected project end date: 01/10/2020).

If during the course of the project you need to deviate significantly from the above-approved documentation please inform me since written approval will be required.

Your responsibilities in delivering this research project are set out at the end of this letter.

Yours sincerely

Jennifer Burr
Ethics Administrator
School of Health and Related Research

Please note the following responsibilities of the researcher in delivering the research project:

- The project must abide by the University's Research Ethics Policy: https://www.sheffield.ac.uk/rs/ethicsandintegrity/ethicspolicy/approval-procedure
- The project must abide by the University's Good Research & Innovation Practices Policy: https://www.sheffield.ac.uk/polopoly_fs/1.671066!/file/GRIPPolicy.pdf
- The researcher must inform their supervisor (in the case of a student) or Ethics Administrator (in the case of a member of staff) of any significant changes to the project or the approved documentation.
- The researcher must comply with the requirements of the law and relevant guidelines relating to security and confidentiality of personal data.
- The researcher is responsible for effectively managing the data collected both during and after the end of the project in line with best practice, and any relevant legislative, regulatory or contractual requirements.

Appendix K Executive Summary Slide Pack for Sheffield City Trust

Increasing attendances at health and fitness venues

PhD project Summary

The University Of Sheffield.

SHEFFIELD CITY TRUST

The 'problem'

- We know from previous literature and anecdotal evidence that health and fitness organisations can do more to increase attendances at venues (from a public health standpoint).
- The PhD project sought to analyse members' attendance data to develop a theoretically informed evidence-based intervention to increase attendance at health and fitness venues.
- There were four main objectives (related to four studies):
    1. To understand attendance levels and correlates of attendance of members in health and fitness venues
    2. To understand the enablers of attendance that might explain why members of health and fitness venues continue to use these venues
    3. To understand the effectiveness of interventions designed to increase attendance at health and fitness venues
    4. To develop and conduct a trial of a behavioural intervention to increase attendance at health and fitness venues

The University Of Sheffield.

SHEFFIELD CITY TRUST

Study 1

- A secondary data analysis was conducted on the attendance data of 1726 new members at Sheffield City Trust over the first 12 months of their membership.
- Associations were assessed between members' frequency and pattern of attendance during the first quarter of their membership, age, gender, and home location and their attendance levels in the fourth quarter after joining.
- There was a significant reduction in the frequency of attendance over time from a mean of 7.48 times in the first month to a mean of 0.92 in the 12th month after joining.
- Older age, starting membership in the autumn or spring, frequency of attendance in the first quarter and stability of the context of attendance (i.e., same time and location) in month three were all significantly associated with increased attendance levels in the fourth quarter (after starting a membership).
- This study has been published in *Psychology of Sport and Exercise:* https://www.sciencedirect.com/science/article/pii/S146902922030279X

Study 2

- 13 interviews were undertaken with Sheffield City Trust members who attended venues on average once a week. Individuals had been members for at least two years and attended a mix of Sheffield City Trust venues.
- The aim of the interviews was to establish the enablers/facilitators of attendance that might explain why members of health and fitness organisations continue to use these venues.
- Five main themes resulted from the interviews:
    1. *Routine* was defined as the habitual scheduling, preparation and execution of attendance.
    2. *Motivations for attendance* was defined as the motivational factors to attend and the clear knowledge of the specific activities that could support this.
    3. *Accomplishment* was defined as the measurement and interpretation of PA activity undertaken that indicates the accomplishment of attending.
    4. *Venue experience* was defined as the key experiences within a health and fitness venue that ensured members wanted to attend.
    5. *Convenience* was defined as the factors that are required for attendance to occur with ease.

The University Of Sheffield.

Study 3

- Given the need to understand how to increase attendances at venues, a systematic review (Study 3) sought to examine the effectiveness of interventions to increase attendance at health and fitness venues and identify the behaviour change techniques (BCTs) included in effective interventions.
- Fourteen papers reporting 20 interventions were included in the review.
- Most interventions were found to have negligible or small effects on attendance, although one had a medium and three had a large effect.
- Of the interventions with large effect sizes, two used the Behaviour Change Techniques (BCTs) “Problem solving” and “Pros and cons” and one used “Goal setting (behaviour)” and “Review behaviour goals”. These were taken from the Behavioural Change Taxonomy v93.
- This study demonstrated that only a small number of studies have tested interventions to increase attendance at health and fitness venues, with predominantly small effects. There is little evidence for the effectiveness of specific BCTs. Further research is required to identify the key components of effective interventions to increase attendance at health and fitness venues.

The University Of Sheffield.

Study 4

- Study 4 utilised a Service Evaluation to trial a ‘habit planner’ to increase attendance within Sheffield City Trust.
- This study sought to investigate the Behaviour Change Techniques (BCTs) of ‘action planning’ and ‘habit formation’ to encourage new members to attend frequently in a stable context (e.g., say day, time and venue) in order to promote increased longer-term attendance.
- The findings of this study indicated that the BCTs of ‘action planning’ and ‘habit formation’ can be used to significantly increase the attendance behaviour of members by month 6 of their membership.
  - The intervention condition significantly differed from the control condition in their attendance frequency in month 6, attendance in the intervention condition was greater (3.78 times) than in the control condition (2.86 times). The intervention therefore boosted attendance in month 6 by 32% (i.e., by almost an extra visit). Interestingly, the mean attendance in the control condition (2.86) is broadly in line with the findings from Study 1, which found a mean attendance of 2.44 in month 6.
  - The effect of the habit planner on attendance behaviour was mediated by context stability (i.e., same day time and venue) - members attended more frequently as a result of having more stable attendance patterns. This finding builds on existing literature that habit formation can be an effective mechanism of action to target when attempting to increase PA at health and fitness venues.

The University Of Sheffield.

SHEFFIELD CITY TRUST

Implications for Sheffield City Trust

- Outlining the importance of context stability, as found in Study 4, in addition to the Behaviour Change Techniques of goal setting (behaviour) alongside reviewing behavioural goals and pros/cons alongside problem solving, as highlighted in Study 3, are practical recommendations for Sheffield City Trust to increase attendances.
- Such recommendations may incorporate these techniques whilst experimenting with different modes of delivery to gain further knowledge about how these BCTs can increase attendance within health and fitness venues.
- Sheffield City Trust could utilise the findings within Study 1 to promote greater attendances to younger adults and they could use the findings from Study 2 to apply the key enablers of attendance to improve attendance rates.
- Due to the COVID-19 members who have developed behaviour that is consistent and stable (e.g., they attend on the same day and time each week), there will have been disruption to this routine.
- Sheffield City Trust may therefore need to work out how to help members form habits in a different context than they were previously formed, until restrictions are eased and attending a venue returns to a more 'normal' experience.