A theory-based approach to promote student participation in recreational sport and physical activity

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The candidate confirms that the work submitted is his own, except where work which has formed part of jointly authored publications has been included. The contribution of the candidate and the other authors to this work has been explicitly indicated below. The candidate confirms that appropriate credit has been given within the thesis where reference has been made to the work of others.

The work in Chapter 3 of the thesis has appeared in publication as follows:

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I was responsible for the design, data collection and analysis of the study. I also wrote the manuscript. J A Brunton contributed to the design of the study and provided guidance on the manuscript.

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Abstract

Participation in recreational sport and physical activity (PA) provides many health benefits, particularly for students within higher education. For example, participation can reduce the likelihood of chronic conditions and enhance cognitive functioning. Despite these benefits, a large majority of students do not meet recommended guidelines to achieve such health benefits. However, the transitioning period of first-year students to university renders the university setting an ideal opportunity to promote health behaviours. Interventions targeting health improvements should be developed using the insights of health psychological theory, especially as such theory enables relevant psychological determinants to be identified for intervention. The current thesis aimed to develop and implement theory-based interventions targeting first-year students' participation in recreational sport and PA.

Five empirical studies are presented within the thesis. Two studies identified first-year university students' motivations towards participation in recreational sport using the Theory of Planned Behaviour (TPB). Study 1 identified the salient behavioural, normative and control beliefs underlying students' participation and Study 2 identified the critical beliefs influencing participation. Following this, Study 3 identified the behaviour change techniques (BCTs) relevant to changing these beliefs. Studies 4 and 5 then adopted the short message service (SMS) delivery mode to deliver interventions targeting students' participation in recreational sport and PA through manipulating attitude and goal priority.

The studies provide support for the TPB in developing and undertaking interventions promoting two important health behaviours. Interventions promoting university recreational sport should target the key beliefs identified in the thesis and should utilise the identified BCTs and additional content to do so. Research attempting to change students' rates of PA should adopt similar text messages to change key psychological determinants. Future work is needed to examine the characteristics influencing the effectiveness of the goal priority strategy within the SMS delivery mode.

Table of Contents

Acknowledgments iii
Abstract iv
List of included tables x
List of included figures x
List of abbreviations xi
Chapter 1 Introduction 12
1.1 Thesis overview 14
1.2 Overview of chapters 14
1.3 Summary 16
Chapter 2 Literature review 17
2.1 Introduction 17
2.2 PA and sports participation 17
2.2.1 University sport 18
2.2.2 British Universities and Colleges Sport 19
2.2.3 Recreational sport 20
2.2.4 Sport England Projects 21
2.2.4.1 The Active Universities Project and the University Sport Activation Fund 21
2.3 The need for theory 23
2.3.1 Intervention frameworks 23
2.3.2 The role of theory 24
2.3.3 Social cognition models 26
2.3.4 The TPB 26
2.3.4.1 Advantages in using this model 29
2.3.4.2 Support for the model 29
2.3.4.2.1 The influence of TPB constructs 29
2.3.4.2.2 Intervention studies adopting the TPB 30
2.3.4.3 Formative research using the TPB 31
2.3.4.3.1 Gap in the literature 33
2.4 The intention-behaviour gap 33
2.4.1 The importance of intention 33
2.4.2 Bridging the intention-behaviour gap 35
2.4.2.1 The goal priority strategy 35
2.4.2.1.1 Gap in the literature 37
2.5 Behaviour change 37
2.5.1 BCTs and taxonomies 37

2.5.2 Influential BCTs 39
2.5.3 Mapping BCTs to mechanisms 40
2.5.3.1 Gap in the literature 41
2.6 Intervention delivery modes 42
2.6.1 eHealth and mHealth 42
2.6.2 SMS 43
2.6.2.1 Intervention findings 44
2.6.2.1.1 Gap in the literature 45
2.7 Chapter summary 45
Chapter 3 Identifying the salient (Study 1) and key (Study 2) beliefs underlying student participation in recreational sport 47
3.1 Introduction 47
3.2 Study 1: Belief elicitation using the TPB 47
3.2.1 Purpose of Study 1 50
3.2.2 Method 51
3.2.2.1 Sample 51
3.2.2.2 Procedure 51
3.2.2.3 Instrument 52
3.2.2.4 Data analysis 53
3.2.3 Results 54
3.2.3.1 Behavioural beliefs 54
3.2.3.2 Normative beliefs 54
3.2.3.3 Control beliefs 56
3.3 Study 2: Belief identification 56
3.3.1 Purpose of Study 2 57
3.3.2 Method 58
3.3.2.1 Sample 58
3.3.2.2 Design and procedure 58
3.3.2.3 Measures 59
3.3.2.4 Statistical analysis 60
3.3.2.4.1 Validity checks 60
3.3.2.4.2 Direct and indirect items 60
3.3.3 Results 61
3.3.3.1 Preliminary analyses 61
3.3.3.1.1 Participant characteristics 61
3.3.3.1.2 Missing data 61
3.3.3.1.3 Validity checks 61

3.3.3.1.4 Distributional properties, descriptive statistics and correlation matrix 61
3.3.3.2 Predicting recreational sports participation intentions and behaviour 62
3.3.3.3 Key belief analysis 62
3.3.3.3.1 Intention 62
3.3.3.3.2 Behaviour 62
3.4 General discussion 69
3.4.1 Behavioural beliefs 69
3.4.2 Normative beliefs 70
3.4.3 Control beliefs 71
3.4.4 Can these beliefs be changed? 72
3.4.5 Direct constructs 73
3.4.6 Study implications 74
3.4.7 Strengths and limitations 75
3.5 Conclusion 77
Chapter 4 Informing the content of a behaviour change intervention targeting recreational sports participation (Study 3) 78
4.1 Introduction 78
4.2 Study 3: Identifying the reasons, solutions and BCTs applicable to the identified key beliefs 78
4.2.1 Understanding the participants' perspective 80
4.2.2 Reasons and solutions 80
4.2.3 Summary 82
4.3 Purpose of Study 3 83
4.4 Method 83
4.4.1 Study design and participants 83
4.4.2 Procedure 83
4.4.3 Analysis 84
4.5 Results 85
4.5.1 Reasons and Solutions 85
4.5.2 BCTs 85
4.6 Discussion 92
4.6.1 Reasons and Solutions 92
4.6.2 BCTs 95
4.6.3 Study implications 97
4.6.4 Strengths and limitations 98
4.7 Conclusion 99

Chapter 5 A text messaging intervention targeting student participation in recreational sport (Study 4) and PA (Study 5) 100
5.1 Introduction 100
5.2 Background to the study 100
5.3 Purpose of Study 4 101
5.4 Method 101
5.4.1 Design and procedure 101
5.4.2 Participants 102
5.4.3 The intervention 102
5.5 Results 104
5.5.1 Randomisation checks 104
5.5.2 Attrition analyses 104
5.5.3 Main analyses 106
5.6 Discussion 106
5.6.1 PA and rates of participation 108
5.6.2 Behaviour change interventions using technology and the role of attitude 109
5.7 Purpose of Study 5 109
5.8 Method 110
5.8.1 Design and procedure 110
5.8.2 Participants 111
5.8.3 SMS intervention 111
5.8.4 Measures 113
5.9 Results 114
5.9.1 Randomisation checks 114
5.9.2 Attrition analyses 114
5.9.3 Main analyses 115
5.10 Discussion 122
5.10.1 Attitude messages 122
5.10.2 Goal priority messages 122
5.10.3 Study implications 123
5.10.4 Strengths and limitations 124
5.11 Conclusion 125
Chapter 6 General discussion 127
6.1 Introduction 127
6.2 Thesis aims 127
6.3 Summary of studies undertaken 129
6.4 Strengths and limitations of the work 131

6.4.1 Strengths 132
6.4.2 Limitations 135
6.5 Novel implications of the thesis 140
6.5.1 Theoretical 140
6.6 Suggestions for future research 144
6.7 Conclusion 148
References 149
Appendices 180

List of included tables

Table 3.1. *Modal salient behavioural, normative and control beliefs (n = 30)* 55
Table 3.2. *Descriptive statistics of study participants* 63
Table 3.3. *Descriptive statistics of sports participation: Bivariate correlations, means, and SD of TPB variables (attitude, SN, and PBC), past behaviour, intention (N = 206) and behaviour (n = 95)* 64
Table 3.4. *A hierarchical multiple regression analyses of attitude, SN, PBC (step 1) and past behaviour (step 2) on intention (N = 206)* 65
Table 3.5. *Multiple regressions of intention and PBC on behaviour (n = 95)* 66
Table 3.6. *Means, SD, and correlations of behavioural, normative, and control beliefs related to university students' sporting participation* 67
Table 3.7. *Summary of the multiple regression analyses predicting intention and behaviour from beliefs* 68
Table 4.1. *Reasons why recreational sport is enjoyable* 86
Table 4.2. *Reasons why friends may approve of participation in recreational sport* 87
Table 4.3. *Reasons why family members may approve of participation in recreational sport* ... 88
Table 4.4. *Reasons why friends may themselves participate in recreational sport* 89
Table 4.5. *Solutions to time constraints influencing participation in recreational sport* 90
Table 4.6. *Potential BCTs to target the key beliefs* 91
Table 5.1. *Means of attitude, goal priority, intention and behaviour assessed by message condition (n = 27)* 107
Table 5.2. *Pooled descriptive means of attitude, goal priority, intention and behaviour assessed by message condition (N = 289)* 118

List of included figures

Figure 2.1. The Theory of Planned Behaviour (Ajzen, 1985) 28
Figure 5.1. CONSORT flow diagram of Study 4 participants 105
Figure 5.2. CONSORT flow diagram of Study 5 participants 112
Figure 5.3. Main effect of attitude messages on attitude (N = 289) 119
Figure 5.4. Main effect of attitude messages on intention (N = 289) 119
Figure 5.5. Main effect of attitude messages on behaviour (N = 289) 120
Figure 5.6. A statistical diagram of the serial multiple mediator model for the impact of attitude messages on behaviour through attitude and intention 121

List of abbreviations

Apps	Mobile Applications
BCTs	Behaviour Change Techniques
BCTTv1	Behaviour Change Technique Taxonomy Version 1
BUCS	British Universities and Colleges Sport
CALO-RE	Coventry, Aberdeen and London – Refined
CI	Confidence Interval
eHealth	Electronic Health
IM	Intervention Mapping
MANOVA	Multivariate Analysis of Variance
MANCOVA	Multivariate Analysis of Covariance
mHealth	Mobile Health
MRC	Medical Research Council
PA	Physical Activity
PBC	Perceived Behavioural Control
PRECEDE-PROCEED	Predisposing, Reinforcing, and Enabling Constructs in Educational/Environmental Diagnosis and Evaluation, and Policy, Regulatory, and Organisational Constructs in Educational and Environmental Development
SD	Standard Deviation
SMS	Short Message Service
SN	Subjective Norm
TACT	Target, Action, Context, and Time
TPB	Theory of Planned Behaviour
UK	United Kingdom

Chapter 1 **Introduction**

Students making the transition into university tend to engage in less health enhancing behaviours and more in unhealthy behaviours (Crombie, Ilich, Dutton, Panton, & Abood, 2009; Goldstein, Xie, Hawkins, & Hughes, 2015). This could be attributed to evidence that first-year students are moving from stable behavioural environments, such as being at home, to those that are less predictable (Steptoe et al., 2002). However, this period of instability represents an ideal opportunity for interventions to influence the types of health behaviours these students undertake and direct them towards those that are beneficial (Allom, Mullan, Cowie, & Hamilton, 2016; Wang, Ou, Chen, & Duan, 2009). Recreational sport provides a non-competitive environment for students to participate in sport whilst at university. Participating in these types of activities can afford many benefits for students such as facilitating friendship formation (Miller, 2011) and creating a positive distraction from academic work (Kanters, 2000).

As part of the Youth and Community Strategy (Sport England, 2012), Sport England made significant investment into promoting recreational sport within universities. This investment provided institutions the opportunity to increase students' participation in university recreational sport through developing and implementing projects and interventions. Despite the investment, these interventions only demonstrated limited success, with moderate increases in student participation rates achieved from the projects. The outcomes of these projects could be a consequence of the funded interventions not using health psychological theory in their design. Theory enables the identification of relevant and modifiable psychological determinants that that can be targeted within interventions. Moreover, health psychological theory provides an explanation for intervention effectiveness (Michie et al., 2008) and interventions underpinned by theory have demonstrated greater effectiveness than those not using theory (Taylor, Conner, & Lawton, 2012). This is important given Sport England (2014) acknowledged that the marginal increases in sports participation may not have been a consequence of the funded interventions. Thus, there is a clear need to identify the psychological determinants underlying students' participation in recreational sport using health psychological theory. This can provide important information for a behavioural intervention targeting participation increases in recreational sport.

Adopting health psychological theory provides guidance on what to change (i.e. psychological determinants) but limited information is given on how change can be

achieved. Interventions developed to promote health behaviours can be delivered using many strategies, or behaviour change techniques (BCTs). BCTs are the important ingredients included within an intervention designed to manipulate psychological determinants (Michie et al., 2013). Thus, they are of clear importance to behaviour change interventions. Despite the importance of BCTs, it is not clear which specific techniques can be adopted to target the psychological mechanisms underlying students' participation in recreational sport. Efforts have been made recently to link or map BCTs onto appropriate psychological determinants (e.g. Cane, Richardson, Johnston, Ladha, & Michie, 2015; Carey et al., 2018; Connell et al., 2018; Michie et al., 2008). The purpose of this cumulative work is to, ultimately, identify the specific ingredients that can be used by intervention developers to change specific psychological mechanisms. However, the recency of this work means research has not yet been able to identify what should be used to target the psychological determinants identified in the thesis. Thus, there exists a need to identify appropriate BCTs to be included within an intervention targeting students' participation in recreational sport. In addition to this, BCTs do not provide information on the specific content of the intervention. That is, information is lacking regarding what the BCTs should comprise. Thus, it is also important to identify supplementing content that could be included within an intervention.

In addition to recreational sports participation, student participation in physical activity (PA) is also poor (Haase, Steptoe, Sallis, & Wardle, 2004), despite regular participation demonstrating a reduction in chronic conditions and other benefits (Economos, Hildebrandt, & Hyatt, 2008; Guiney & Machado, 2013; Warburton, Charlesworth, Ivey, Nettlefold, & Bredin, 2010). Not only are participation numbers generally low amongst university students (Keating, Guan, Pinero, & Bridges, 2005), participation has been shown to decrease considerably during the first year of study (Bray & Born, 2004; Pullman et al., 2009). Thus, it is of great importance that research is undertaken to attend to the number of first-year university students participating in PA.

Interventions developed to promote health behaviours can be delivered using many modalities. The short message service (SMS) delivery mode has demonstrated recent success in changing rates of PA (Buchholz, Wilbur, Ingram, & Fogg, 2013; Kinnafick, Thøgersen-Ntoumani, & Duda, 2016). However, it is not clear whether the important psychological determinants and subsequent participation in recreational sport and PA within first-year students can be manipulated using text messages. Moreover, a

gap between intention and behaviour has been established, with many of those motivated to undertake health behaviours, such as PA, not successfully doing so (Rhodes & de Bruijn, 2013a; Rhodes & Dickau, 2012). Prioritising a goal has demonstrated recent success in strengthening the intention-behaviour relationship (Conner et al., 2016). However, it is presently unknown whether this implemental strategy can effectively promote participation in recreational sport and PA when delivered within SMS. Thus, it is also important to establish whether first-year students' priorities towards these behaviours can be manipulated using text messages.

1.1 Thesis overview

Due to the lack of theoretically informed behaviour change interventions relating to university recreational sport, research is needed to attend to this behaviour using health psychological theory. More specifically, research is needed to both identify the motives underlying participation and to promote participation within intervention. This research would help extend our knowledge of ways to ensure a greater number of first-year students participate in recreational sport. Additionally, more research is needed to address the declining rates of PA when students begin university. The aim of the thesis is to develop and implement theoretically-informed behaviour change interventions targeting student participation in recreational sport and PA. Specifically, the thesis aims to: (1) identify the psychological processes underpinning first-year students' recreational sports participation, (2) provide additional content for an intervention targeting students' participation in recreational sport, (3) test a novel intervention promoting students' recreational sports participation, and (4) test a refined intervention targeting students' participation in PA.

1.2 Overview of chapters

The thesis is structured into six chapters including five empirical research studies. Chapter 2 provides a literature review of: (1) the broader PA literature and sports participation, (2) the importance of health psychological theory in understanding and changing behaviour, (3) the gap between forming a behavioural intention and enacting the behaviour, (4) techniques that can be used within interventions to target psychological mechanisms and induce change, and (5) the various modes of delivery that can be adopted to undertake an intervention. With regards to the early part of the thesis, the review identifies the Theory of Planned Behaviour (TPB; Ajzen, 1985) as a

theory with great potential to promote health behaviours. Consequently, the formative research required to be undertaken when adopting the theory is outlined.

Chapter 3 reports Studies 1 and 2 undertaking the formative research specified by the TPB to identify key intervention targets relating to student participation in recreational sport. Study 1 identified the modal salient behavioural, normative and control beliefs using open-ended questionnaires. Study 2 used the beliefs elicited in Study 1 to identify specific psychological intervention targets. A prospective design was used to establish the key beliefs and determinants associated with recreational sports participation.

Chapter 4 presents Study 3 which aimed to provide additional content for a behaviour change intervention targeting recreational sports participation. More specifically, Study 3 undertook focus groups to identify the reasons and solutions to the key beliefs identified in Study 2. Additionally, the study identified a number of BCTs that could be included within an intervention to increase participation in recreational sport.

Chapter 5 reports a pilot behavioural intervention targeting student participation in recreational sport using text messages (Study 4). The intervention targeted motives towards the behaviour using a key behavioural belief identified in Study 2 and the reasons for the belief identified in Study 3 were embedded in the text messages. Goal priority was used as a strategy for facilitating intention translation. A two (attitude: yes vs. no) by two (goal priority: yes vs. no) by two (time: immediately post-intervention, four weeks post-intervention) factorial design was used to test main and interactive effects of messages on psychological determinants and recreational sports behaviour. The pilot study found no effects for text messages. However, there was difficulty in recruiting participants to the study as well as high rates of attrition. The behaviour was therefore broadened to PA in Study 5 and the intervention was replicated, albeit with minor changes to the text messages. The study found evidence for the influence of attitude messages on key psychological determinants and PA behaviour.

Chapter 6 provides a general discussion of the studies included in the thesis. The aims of the thesis are revisited followed by a summary of the five studies undertaken. Relevant strengths and limitations attached to the studies are outlined and both the theoretical and practical implications of the thesis are explored. The chapter then offers suggestions for future research.

1.3 Summary

To summarise, there is a need to increase the number of first-year students participating in university recreational sport and PA. This thesis presents the motivations towards recreational sports participation by undertaking the formative research outlined within the TPB. Following this, additional information to the motives are provided and useful strategies to change these motives are identified. Finally, the thesis presents SMS interventions targeting first-year students' participation in recreational sport and PA through manipulating motivation and goal priority.

Chapter 2 **Literature review**

2.1 Introduction

The literature review presented in this chapter briefly introduces PA and sport, how the latter is offered within universities and previous attempts at increasing rates of student participation. Following this, the review highlights the need for adopting health psychological theory to design interventions promoting behaviour change. The TPB is then identified as an effective theory for explaining and changing student participation in recreational sport due to the guidance given on identifying specific psychological intervention targets. Following this, the review introduces the apparent theoretical gap between intention and behaviour, and focus is given to the evidence underpinning the goal priority strategy to reduce this discrepancy. The literature review then demonstrates how research has identified relevant techniques to change the psychological mechanisms underpinning behaviour and how this work could facilitate interventions designed to change recreational sports participation. Finally, various intervention modes of delivery are discussed, and the use of text messages is suggested to have great potential to increase students' participation in recreational sport.

2.2 PA and sports participation

PA is defined as any bodily movement produced by skeletal muscles that requires energy expenditure (Caspersen, Powell, & Christenson, 1985). Regularly participating in PA has the potential to reduce mortality rates (Warburton et al., 2010) and delay the onset of many chronic diseases such as cancer, diabetes, and heart disease (Booth, Roberts, & Laye, 2012). Additionally, PA can prevent weight gain (Economos et al., 2008), enhance cognitive functioning (Chodzko-Zajko et al., 2009; Guiney & Machado, 2013), and improve work productivity (Conn, Hafdahl, Cooper, Brown, & Lusk, 2009). Participation in PA is therefore an important part of a healthy lifestyle and a behaviour that should be regularly undertaken.

As a subset of PA, sport can often be seen as the participation in relatively freely chosen activities that require moderately intense physical effort (Beaton & Funk, 2008). Sport has an emphasis on performance, rules and competition, and is usually perceived to be beneficial or enjoyable (Coakley, 2009; McPherson, Curtis, & Loy, 1989; Portenga, Aoyagi, & Cohen, 2017). Amongst the many benefits of regular sports participation, engaging in sport can influence health outcomes through improving levels

of fitness and contributing to weight reduction (Buckworth, Dishman, O'Connor, & Tomporowski, 2013). Additionally, participating in sport can improve self-esteem, aid concentration, and reduce the risk of anxiety and depression (Mammen & Faulkner, 2013). Regular participation in sport should therefore be encouraged.

2.2.1 University sport

Sport can be undertaken within formal (e.g. sports clubs) and informal (e.g. recreational parks) settings. Educational settings such as schools, colleges, and universities also provide an opportunity for sport. The university setting is an ideal opportunity to promote sport given the number of students enrolled in higher education. Indeed, approximately 1.5 million students were undertaking an undergraduate degree course in the United Kingdom (UK) during the 2016-2017 academic year (Higher Education Statistics Agency, 2018). Of particular relevance are first-year students transitioning to university who are adjusting to new environments and taking on greater responsibility for the first time (Arnett, 2000; Goldstein et al., 2015; Perry, Hladkyj, Pekrun, & Pelletier, 2001). The transition from familiar and controlled environments to those that are more unstable means students face considerable challenges to participate in health-related behaviours and adopt healthy lifestyles (Crozier, Gierc, Locke, & Brawley, 2015; Steptoe et al., 2002). In the absence of parental guidance, first-year students could be tempted to undertake many unhealthy behaviours such as excessive alcohol consumption, high fat food intake, and smoking (in its many forms). For example, it has been shown that rates of binge drinking increase when students begin university (Cameron et al., 2015) and weight gain is greatest during the university transitioning year (Vella-Zarb & Elgar, 2010; Wengreen & Moncur, 2009). Additionally, the university setting is one that promotes sedentary behaviour with students spending a considerable time in a seated position using the computer and internet (Buckworth & Nigg, 2004; Fotheringham, Wonnacott, & Owen, 2000). Paradoxically, as first-year students are still developing their behavioural patterns during the transitioning year, this period of instability offers a teachable moment to develop interventions to influence the types of health behaviours undertaken (Allom et al., 2016; Lawson & Flocke, 2009; Stewart-Brown et al., 2000). Universities are therefore well placed to target health improvements through sport (Hensley, 2000; Kwan, Bray, & Martin Ginis, 2009; Leslie, Sparling, & Owen, 2001).

Research has demonstrated there to be many benefits afforded to those students participating in sport and recreational activities throughout their time in university (Forrester, 2015; Webb & Forrester, 2015). These benefits include greater rates of student learning (Haines, 2001), grade attainment (Huesman, Brown, Lee, Kellogg, & Radcliffe, 2009) and retention (Kampf & Teske, 2013). These activities have also been shown to promote campus community (Elkins, Forrester, & Noël-Elkins, 2011), enhance student life (Byl, 2002), increase social cohesion (Miller, 2011), and help students cope with academic stresses (Iso-Ahola, 1989; Kanters, 2000). Students participating in physical activities during this period are also likely to continue such behaviours later in life (Forrester, Arterberry, & Barcelona, 2006; Huang, Shimel, Lee, Delancey, & Strother, 2007; Scott & Willits, 1998). Thus, attending to the number of students that participate in sport whilst at university is of great importance.

2.2.2 British Universities and Colleges Sport

The provision of sport within universities can occur in many ways. In the UK, the most common type of sports provision are formal inter-university competitions. These competitions provide students the opportunity to represent their university whilst competing against other institutions. This provision of sport has similarities with the regulated National Collegiate Athletic Association sports offered in the United States which have been defined as "a group of students that are voluntary organized [*sic*] to further their common interests in an activity through participation and competition" (Lifschutz, 2012, p. 106). Typically, a trialling process determines those students gaining a place on a team, with those successfully doing so then proceeding to compete in weekly matches throughout the academic year in a league system. This league system is governed by British Universities and Colleges Sport (BUCS) who are the national governing body for higher education sport in the UK and oversee the allocation of fixtures and leagues. During the 2017/2018 academic year it was reported that over 170 institutions (including some Further Education Colleges) competed in BUCS competitions and inter-university leagues in over 50 sports. This included over 5,800 teams in over 120 championships.

In addition to gaining the physiological, psychological, and social benefits of sport previously outlined, students specifically participating in inter-university competitions can develop a sense of pride, satisfaction and achievement through representing their university, and the weekly competition can provide the social

foundation for bonds with teammates (Martin, Wilson, Evans, & Spink, 2015). Despite these benefits, there exists a number of disadvantages to inter-university sport. First, only a limited number of students can participate (Kanters, Bocarro, Edwards, Casper, & Floyd, 2013) as institutions are restricted by the number of teams that can be entered, and these teams have a finite number of players that can be allocated a place. Second, students may be hesitant to undertake a trial, be fearful of not successfully gaining a place, or be unable to attend the trial itself (Capstick & Trudel, 2010). Thus, the selection process restricts the number of students able to participate in sport (Lipsyte, 1979). Third, students may be unwilling to commit a considerable time to participation, particularly as match days can require a full afternoon and these sports have scheduled training requirements (Lower, Turner, & Petersen, 2013). Fourth, there may be cost attached to participation and the culture surrounding these teams, which typically involve social activities and other events, may not appeal to all students (Vasold, Deere, & Pivarnik, 2019). Finally, the specific sports students wish to undertake might not be provided by the university. Thus, there are some disadvantages to the provision of competitive inter-university sport which may influence the number of students participating in sport.

2.2.3 Recreational sport

To address some of the issues with inter-university sport, universities also offer additional intramural and informal sports. These recreational sports are typically undertaken on the university campus and organised by sports activators employed by the university. These sports are non-competitive, available to all students, and do not require students to commit to participation over a period of time. Moreover, there are a variety of recreational sports offered, with the sports available at various times throughout the week and at a relatively low cost, if any. As a consequence, there are a number of advantages to recreational sports, particularly when compared to those afforded by BUCS. First, the lack of consideration of ability enables the less athletically gifted students or those students not achieving selection for a competitive team to still partake in sport (Koplan, Liverman, & Kraak, 2005; Tsigilis, Masmanidis, & Koustelios, 2009). Second, those students doubting their ability to participate in competitive sport or not wanting to play competitively have an alternative version of sport to undertake. Third, the availability of many sports (e.g. rounders, golf, futsal) and the variations in sports (e.g. 6-a-side football, quick cricket, give it a go badminton)

ensures students are not restricted to traditional sports with standard rules. Fourth, students can decide when they want to participate and are not required to attend training sessions. Finally, the flexible timetables and cost-effectiveness of recreational sports reduces a number of barriers for students. Thus, the availability of recreational sport within universities provides an alternative way for students to participate in sport.

2.2.4 Sport England Projects

Sport England is the leading body for sports provision in the UK and recognise the role institutions have in developing and maintaining interest in sporting activities. Sport England committed itself to involving over 75% of university students in sport as part of the 2012-2017 Sport England Youth and Community Strategy (Sport England, 2012). The organisation made considerable investments into targeting school and college leavers to participate in sport at least once per week for 30 minutes with the ambition that students develop a 'sporting habit for life' (Sport England, 2012). To achieve this, two large projects were funded; the Active Universities Project and the University Sport Activation Fund. Crucially, these projects were funded to increase participation in recreational sport and the funding applications required universities to justify how the investment would benefit participation in informal sport. Bids facilitating or relating to BUCS or competitive sport were rejected.

2.2.4.1 The Active Universities Project and the University Sport Activation Fund

The first project, the Active Universities, was a three-year project (2011-2014) targeting an increase in the number of students participating in sport at university for at least 30 minutes once per week. The £8 million lottery funding provided institutions the opportunity to compete for money for sporting programmes and equipment. The award funded a total of 41 projects within 49 universities (the same project was used in some cases). Baseline measures of 55 universities (some of whom did not receive funding) showed that 55% of students participated in any form of sport at least once per week for 30 minutes. Following the interventions, results of the higher education sport survey showed a 2% increase in participation across the three years. This increase meant the projects attracted 160,018 new students to sport resulting in a 130% achievement of the overall target. It was also found that 67% of students participated in sport at any point during a month and 34% of students engaged in sport three times per week. Findings

were not all positive, however. The main behavioural outcome of 30 minutes of sport once per week established that the 2% increase (from 55%-57%) was only demonstrated during the first year (2011-2012). This meant that during the remaining two years (2012-2014) no increase in sports participation was seen (Sport England, 2014).

Developing from the success of the Active Universities Project, Sport England invested a further £15 million in a second project, the University Sport Activation Fund. Higher education institutions were invited to apply for a maximum of £30,000 funding which, again, had to facilitate the provision of university recreational sport. This led to 62 universities successfully receiving funding. Results from the project showed that 55% of students participated in any sport once per week for 30 minutes during both the first (2014/15) and second (2015/16) years. Unlike the first project, these findings also distinguished between sport provided by universities and sports provided outside of the university setting. It was found that of the 55% of students participating in any form of sport during the first year, 54% of students participated in university provided sport (1x30 minutes per week). Regarding the second year, a 1% increase showed that 55% of students participated in university provided sport (1x30 minutes per week).

In summary, the University Sport Activation Fund demonstrated a 2% decrease in participation in any sport from the final year of the Active Universities project (from 57%-55%). Furthermore, only a 1% increase was observed in the number of students participating in university provided sport (from 54%-55%). It is clear that despite providing opportunities to participate in sporting activities, merely offering sport does not translate to actual participation (Hashim, 2012). Further, Sport England (2014) acknowledged that the slight increase may not have been solely attributable to the projects. Given the significant investment into these projects and the marginal increase in recreational sports participation, there is a clear need for more targeted research to be undertaken into promoting the behaviour.

One explanation for the limited findings and the lack of clarity regarding project outcomes could be the absence of psychological theory used in developing these interventions. Projects were funded on many criteria such as the potential to widen the sport on offer and improve the marketing of sport, but the inclusion of a theoretical base was not prescribed. Although there exists a lack of theory relating to recreational sports research (Sweeney & Barcelona, 2012), the need for a theoretical base underpinning any efforts promoting healthy behaviours is something that has been recently emphasised (Glanz & Bishop, 2010).

2.3 The need for theory

2.3.1 Intervention frameworks

A number of frameworks and planning models have been introduced to facilitate the development of interventions promoting health behaviours, each of which encourage the adoption of theory. Three of these frameworks are mentioned subsequently. First, the Medical Research Council (MRC) provided robust guidelines on the development and evaluation of complex interventions (Campbell et al., 2000; Craig et al., 2008), with a revision expected later this year (Craig et el., 2019). Complex interventions are those comprising many independent and inter-dependent components. The MRC framework includes the following stages; theory, modelling, exploratory, randomised control trial, and long-term implementation. The theory stage was described by Campbell et al. (2000) as allowing one to "Explore relevant theory to ensure best choice of intervention and hypothesis and to predict major confounders and strategic design issues" (p. 695). In this respect, theory is needed to hypothesise the changes expected from an intervention and subsequently explain intervention findings (Craig et al., 2013). Second, Intervention Mapping (IM; Bartholomew, Parcel, Kok, & Gottlieb, 2006) was developed as a planning framework for the development of theory- and evidence-based health promotion programmes. IM provides guidelines and tools for the empirical and theoretical foundation of health promotion programmes, for the application of theory, for the translation of theory into practice, for the management of programme adoption and implementation, and for the collaboration between designers and stakeholders. IM offers detailed guidance on the application of theory and evidence in the development of behavioural interventions in six stages (Buunk & Van Vugt, 2007). The use of behavioural theory is required at stage 2 where psychological determinants and constructs are selected as intervention targets. Third, the PRECEDE-PROCEED model (PRECEDE; Predisposing, Reinforcing, and Enabling Constructs in Educational/Environmental Diagnosis and Evaluation, PROCEED; Policy, Regulatory, and Organisational Constructs in Educational and Environmental Development) outlines eight phases in planning and evaluating health promotion programmes (Green & Kreuter, 2005). Of particular importance to the model is the role of theory in providing a conceptual framework that guides construction of an intervention and its evaluation (Crosby & Noar, 2011).

2.3.2 The role of theory

From the planning frameworks and models outlined, it is evident that theory should be utilised in the development of interventions designed to change health behaviours (Glanz & Bishop, 2010; Peters, Ruiter, & Kok, 2013). A theory has been defined as "a set of concepts and/or statements which specify how phenomena relate to each other" (Davis, Campbell, Hildon, Hobbs, & Michie, 2015, p. 327). There are many reasons why theory should underpin health behaviour change efforts. Firstly, theory can provide the basis from which interventions aimed at changing behaviour can be developed (Noar & Zimmerman, 2005). More specifically, theory enables the understanding of the causal mechanisms of behaviour and informs how intervention development should be approached (Michie et al., 2008). Secondly, theory allows behavioural interventions to be tested which can facilitate the understanding of what works, what does not and why this is maybe so (Michie et al., 2008). This understanding, in turn, safeguards researchers reinventing the wheel and enables the evolution of behavioural science (Michie & Abraham, 2004). Thirdly, interventions underpinned by theory allow theories and models to be refined (Rothman, 2004). For example, if an intervention provides evidence against a particular theory or one of its constructs, subsequent accumulated evidence should lead to theory refinement. The final and perhaps the most important reason for the adoption of theory concerns its influence on intervention outcomes. Recent accumulated evidence suggests interventions underpinned by theory to be more successful than those not using theory (e.g. Bluethmann, Bartholomew, Murphy, & Vernon, 2017; Prestwich, Webb, & Conner, 2015; Protogerou & Johnson, 2014; Taylor et al., 2012; Webb, Joseph, Yardley, & Michie, 2010). For example, an effect size of $d = 0.34$ was reported by Taylor et al. (2012) when theory was used to develop interventions compared to an effect size of $d = 0.21$ when theory was not. Similarly, Webb et al. (2010) found a more extensive use of theory led to greater positive health outcomes in interventions.

Given the importance of theory, it is vital that interventions promoting health behaviours are developed using theoretical insights from behavioural psychology (Sniehotta, 2009). Despite this necessity, interventions are rarely designed using theory (Dombrowski, Sniehotta, Avenell, & Coyne, 2007). Davies, Walker and Grimshaw (2010) noted that less than a quarter of behaviour change interventions were developed using a theoretical basis. Health promotion efforts not adopting theory typically utilise an intuitive or logical approach to intervention development (Eccles et al., 2007). This

approach tends to focus on the strategies to be utilised within the intervention rather than identifying the specific psychological determinants to be targeted (Gourlan et al., 2016). To change behaviour, attention is thus afforded to what the intervention should include rather than what the intervention should alter. Even when theory is stated to have been adopted, it is commonly not used rigorously (Prestwich et al., 2014). Instead of been 'inspired' by theory, interventions should be 'based' on theory (Michie & Abraham, 2004). If an intervention adopts the former then research moves from rigorous systematic evaluations to more intuitive methods (Michie et al., 2008). Atheoretical approaches decrease the opportunity to understand the behaviour change process (Cane, O'Connor, & Michie, 2012) which hampers the design of future interventions (Webb et al., 2010). In this respect, it is difficult to determine either what worked within the intervention and thus should be retained or what did not and thus should be altered. Without theory, the opportunity to gain and understand crucial processes are restricted (Lippke & Ziegelmann, 2008).

To summarise, frameworks have been developed to guide the development and evaluation of health promotion efforts. The role of theory is included within these frameworks as theory enables researchers to highlight changeable variables, test hypotheses, and gather evidence (Prestwich et al., 2015). Theory-based interventions are also likely to demonstrate greater efficacy than those lacking a theoretical base, but interventions using theory are rare, as was demonstrated within the projects funded by Sport England. The exclusion of theory is perhaps because, when compared to the extensive period of time such theories have been available, the explicit call for theoretically informed behavioural interventions was only made relatively recently (e.g. Craig et al., 2008; Green & Kreuter, 2005). Alternatively, it could be because there exists a lack of criteria for selecting a particular theory (Hardeman et al., 2005; Masters, Ross, Hooker, & Wooldridge, 2018). The planning frameworks previously described are not health theories because they cannot test causal mechanisms (Tomar, 2009). This is made even more difficult given the great number of theories pertaining to behaviour change. In a scoping review, Davis et al. (2015) identified a total of 82 theories used in behavioural science. The issue is further complicated given many theories have similar overlapping constructs (Bandura, 2004; Michie et al., 2005).

Most theories used in health psychology have been adopted from the social cognition tradition. Indeed, social cognition models have been the predominant approach to understanding and explaining health behaviour since the behaviourist

paradigm (Rhodes, McEwan, & Rebar, 2019). These will now be briefly introduced, and focus will be given to a prominent social cognition model.

2.3.3 Social cognition models

Social cognition models focus on the individual factors influencing behaviour. These individual factors include a small number of psychological processes comprising cognitive and affective behavioural determinants (i.e. beliefs, feelings, motives, intentions). The identification of these processes enables theories to predict and explain behaviour. It also allows the researcher to identify the relevant psychological processes associated with the behaviour which can then inform intervention design. Indeed, health psychological theories, models, and campaigns have been applied to change the individual's beliefs or knowledge on the assumption that such changes are necessary to bring about behaviour change (Abraham & Sheeran, 2004; Biddle & Mutrie, 2008). Models of social cognition commonly share the expectancy-value paradigm (Cook & Artino, 2016). This approach assumes behaviour is processed logically by anticipating the consequences of the behaviour (expectancy) and then attaching the perceived value to such consequences (value) (Feather & Newton, 1982). From the number of theories relating to behaviour change, one of the most cited, utilised and critiqued models is the TPB (Gold, 2011; Ntoumanis, Thøgersen-Ntoumani, Quested, & Chatzisarantis, 2018).

2.3.4 The TPB

The TPB was developed to understand, predict and change human behaviour (Ajzen, 2012). The theory evolved from its predecessor, the Theory of Reasoned Action (Fishbein & Ajzen, 1975), which itself was introduced at a time when the importance of the attitude concept was being questioned (Wicker, 1969). However, from their extensive literature review, Fishbein and Ajzen (1975) concluded that attitude should be a good predictor of behaviour only when the attitude and behaviour measures show a high degree of correspondence. Termed the 'principle of compatibility', this occurs when attitude and behaviour measures are matched at the *t*arget (who), *a*ction (what), *c*ontext (where), and *t*ime (when) (TACT) (Fishbein & Ajzen, 1975). Thus, global attitudes are deemed inappropriate to predict highly specific behaviours (Fishbein & Middlestadt, 1989).

The TPB asserts that the proximal determinant of behaviour is an individual's intention (see Figure 2.1). Intentions represent a person's motivation of their conscience

plan or decision to exert effort to perform the behaviour (Abraham & Sheeran, 2003). According to Ajzen (1991) "intentions are assumed to capture the motivational factors that influence behaviour; they are indicators of how hard people are willing to try, of how much effort they are planning to exert in order to perform the behavior [*sic*]" (p. 181). Intention is determined by three factors, namely attitude, subjective norm (SN) and perceived behavioural control (PBC). The attitude construct refers to the individual's perception toward the behaviour, whether it be favourable or unfavourable (Doll & Ajzen, 1992; Fishbein & Ajzen, 2009). SN refers to perceptions of social pressure from significant others to perform the behaviour (Ajzen & Fishbein, 1980). PBC relates to the perceived ease or difficulty of performing the behaviour (Ajzen, 1988) and shares similarities with Bandura's (1977) self-efficacy construct. In addition to indirectly influencing behaviour through its influence on intention, PBC can directly affect behaviour together with intention. This occurs when PBC accurately reflects the individual's actual control over behaviour (Sheeran, Trafimow, & Armitage, 2003) and the individual possesses an intention to undertake the behaviour.

Just as intentions are theorised to have determinants, attitude, SN and PBC are also assumed to have determinants in the form of beliefs. According to Fishbein and Ajzen (1975), people can possess a large number of beliefs towards a specific behaviour but can only attend to a relatively small number of them at any given moment. It is these salient beliefs most accessible in memory that influence the determinants. More specifically, the theory postulates that salient beliefs govern one's attitude, SN, PBC and subsequently, their intention (Ajzen, 2002). Different types of beliefs are suggested to underlie the relevant determinants.

Attitude towards a behaviour are assumed to be influenced by behavioural beliefs which are the perceived consequences of the behaviour and people's evaluation of these consequences (Ajzen & Fishbein, 1980). Thus, consistent with the expectancy-value approach, behavioural beliefs are a consequence of the strength of the belief multiplied by the motivation to comply. Belief strength is the subjective probability that a given behaviour will produce a certain outcome and motivation to comply is how one evaluates that outcome (Fishbein & Ajzen, 1975). For example, a person may be informed that sports participation can help relieve stress (expectancy) and relieving stress is something valued positively (value). SN are influenced by normative beliefs which are the perceptions of important referents. Similar to attitude and behavioural beliefs, an expectancy-value approach is adopted for SN and normative beliefs. More

specifically, SN is the product of normative beliefs about how people who are important to the individual expect them to act coupled with the individual's motivation to comply with these expectations (Ajzen, 1991). For example, an individual may believe their parents want them to participate in recreational sport and also value the opinion of the said parents. Control beliefs are people's perceptions and evaluations about the presence of factors that may facilitate or impede performance of the behaviour (Ajzen & Madden, 1986). These beliefs also follow the expectancy-value paradigm. Specifically, the power of each control factor to facilitate or inhibit performance of a behaviour is aggregated by the subjective probability that the control factor is present. Control beliefs can derive from internal factors such as skills, abilities, and knowledge, or external obstacles such as time, opportunity, and cooperation with other people (Ajzen & Madden, 1986). As an example, an individual may perceive the cost of joining a gymnasium to be a potential hindrance, yet possess the belief the required funds can be generated.

Though intentions are theorised to be influenced by attitude, SN and PBC, the importance of these determinants need not be equal in all behaviours (Ajzen 2011). Indeed, variations in the TACT principle may result in one behaviour influenced strongly by attitude, a second by SN, a third by PBC, and a fourth by a combination of these determinants. For example, attitudes may govern participation in PA (i.e. running after work), SN may influence informal sports participation (i.e. playing with friends on the local sports field), and PBC may influence attendance at a gymnasium (i.e. undertaking weight training). Regardless of how the intention is formed, the TPB asserts that the intention leads to behaviour, given sufficient control.

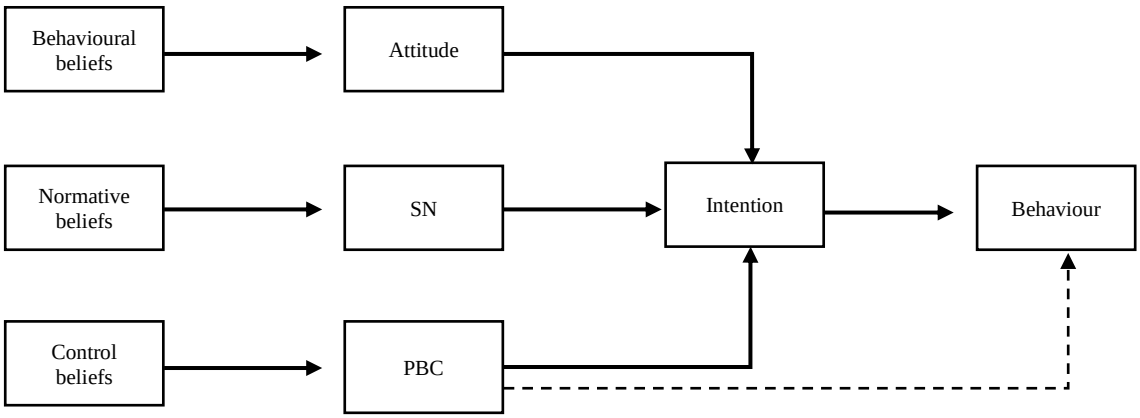

Figure 2.1. The Theory of Planned Behaviour (Ajzen, 1985).

2.3.4.1 Advantages in using this model

There are many advantages to adopting the TPB to explain and change behaviour. First, the theory is a general theory meaning it can be applied to a range of behaviours, including those pertaining to health (Head & Noar, 2014; Steinmetz, Knappstein, Ajzen, Schmidt, & Kabst, 2016). Compared to other models that relate to specific behaviours (i.e. the Multi-Process Action Control Approach, Rhodes & De Bruijn, 2013b; the Integrated Model for Physical Activity, Hagger & Chatzisarantis, 2014), this generality enables researchers within various health disciplines to use the model to explain, predict and change the behaviour of interest (Kok & Ruiter, 2014). Second, the TPB is a parsimonious model that provides a simple explanation for behaviour. According to the sufficiency assumption, other potential influences of behaviour are assumed to be mediated through the determinants within the model (Ajzen, 1985). Any suggested additions to the model should demonstrate a substantial increase in its predictive validity (Ajzen, 2011). Third, the TPB's usefulness can be inferred from the extensive number of studies adopting the theory (Ajzen, 2012), despite the availability of many health behaviour change theories (Davis et al., 2015). Fourth, the TPB is the most established model for explaining intentional behaviours (Armitage & Christian, 2003). Participation in recreational sport can be seen as an intentional behaviour given the reasoned and deliberative decision making prior to its undertaking. Finally, and most applicable to the early part of this thesis, the TPB offers specific guidance on how to identify the psychological mechanisms to be targeted within an intervention. These specifications are of great importance when the purpose of the research is to not only explain and predict behaviour, but to devise interventions to change it. It is this, according to Fishbein and Ajzen (2010), that is the TPB's most important contribution to behaviour change interventions.

2.3.4.2 Support for the model

2.3.4.2.1 The influence of TPB constructs

A number of studies have examined the correlations between the TPB's determinants and intention (e.g. Courneya, 1995; Hagger, Chan, Protogerou, & Chatzisarantis, 2016; Plotnikoff, Lubans, Costigan, & McCargar, 2013). For example, in relation to PA Plotnikoff et al. (2013) found correlations between attitude, SN, PBC and intention to be r_+ = .40, .30, and .60, respectively (i.e. a medium-large correlation). Similarly,

Courneya (1995) found correlations of r_+ = .51, .47 and .48 between the same constructs relating to PA. In terms of regression models employed to understand its predictive utility, reviews have found attitude, SN, and PBC to explain between 40%-45% of the variance in intentions (Armitage & Conner, 2001; Hagger, Chatzisarantis, & Biddle, 2002; McEachan, Conner, Taylor, & Lawton, 2011). In general, studies have established attitude and PBC to be the most influential determinants governing intentions (Allom et al., 2016; Armitage & Conner, 2001; Gucciardi & Jackson, 2015; Hamilton & White, 2008; Hausenblas, Carron, & Mack, 1997). For example, in relation to transitioning university students, Allom et al. (2016) found that attitude and PBC accounted for large amounts of the variance (β = .34 & β = .52) when significantly predicting intention, but SN did not (β = .05). Similarly, Gucciardi and Jackson (2015) found attitude and PBC explained intention to continue participation in sport. However, the importance of SN has been found to increase when different behaviours are examined such as alcohol consumption (Cooke, Dahdah, Norman, & French, 2016) and safe sex (Armitage & Talibudeen, 2010), albeit not related to PA.

Studies have also confirmed the association between TPB variables and behaviour (Hagger et al., 2016; McEachan et al., 2011; Plotnikoff et al., 2013; Riebl et al., 2015; Sheeran, 2002). Sheeran (2002) and McEachan et al. (2011) found the correlations between intention, PBC and behaviour to be r_+ = .53 and .48, respectively, consistently reflecting the strength of association seen in other studies. Additionally, a number of studies have demonstrated the validity of intention and PBC in predicting behaviour (Armitage & Conner, 2001; Hagger et al., 2002; McEachan et al., 2011). These reviews found regression models to account for between 19%-36% of the variance in behaviour. Moreover, intention has been identified as the most important determinant of behaviour (Cooke et al., 2016; Sheeran, Klein, & Rothman, 2017). It can therefore be surmised that accumulated evidence has supported the TPB in providing a good account of behaviour (Ajzen, 2015; Steinmetz et al., 2016).

2.3.4.2.2 Intervention studies adopting the TPB

With regards to studies adopting the TPB to change constructs, interventions have successfully altered the determinants (e.g. Chatzisarantis & Hagger, 2005; Gustafsson & Borglin, 2013; Hardeman, Kinmonth, Michie, & Sutton, 2009). A review undertaken by Sheeran et al. (2016) found experimental studies had medium-sized changes in attitude, SN and control (Cohen's d = 0.47, 0.62, & 0.65, respectively). Similar findings have

been gained in relation to the influence of TPB constructs on intention. Sheeran et al. (2016) established changes in attitude, norms, and self-efficacy had medium-sized changes in intention (d = 0.48, 0.49, & 0.51) and Webb and Sheeran (2006) also demonstrated medium-sized changes in this construct (d = 0.66). Moreover, a systematic review conducted by Hardeman et al. (2002) examining the TPB's applicability to behaviour change interventions reported roughly half of the interventions (6/13) successfully changed intention.

In terms of changing behaviour, reviews have shown sma+ll-to-medium effects when using the TPB (Hardeman et al., 2002; Webb & Sheeran, 2006). For example, Webb and Sheeran (2006) found an effect size of only d = 0.36 and of the 13 interventions reviewed by Hardeman et al. (2002), behaviour was only positively changed in four of them; approximately a third of occasions. Furthermore, some studies have found no changes in behaviour when adopting the theory (e.g. Kothe & Mullan, 2014; Mullan & Wong, 2010; Sniehotta, 2009). This heterogeneity was supported in a recent review by Steinmetz et al. (2016) where some TPB-based interventions had large effects on behaviour whereas no changes were seen in others.

It is evident that studies examining the relationships between TPB constructs have demonstrated greater success than intervention studies using the TPB to change behaviour (Conn, Hafdahl, & Mehr, 2011). However, of the studies that have targeted behaviour change through interventions, many have not undertaken the necessary formative research (Ajzen, 2015; Hardeman et al., 2002). The TPB could be a useful theory for developing interventions targeting health behaviours provided this research is undertaken. Indeed, many interventions have demonstrated success when undertaking this formative work (e.g. Booth, Norman, Goyder, Harris, & Campbell, 2014; Sainsbury, Mullan, & Sharpe, 2013; Zoellner et al., 2016). Specific to the thesis, the formative guidelines could be used to increase the number of students participating in recreational sport. These specifications are now outlined.

2.3.4.3 Formative research using the TPB

According to Ajzen (1988), interventions using the TPB must be developed on two pieces of formative research. First, a belief elicitation study is required to identify the underlying salient behavioural, normative, and control beliefs. As was mentioned previously, salient beliefs are those most accessible in memory. Although salient beliefs apply at the level of the individual, it is more practical to target the beliefs held most

commonly amongst the target population. This is done through identifying the *modal* salient beliefs (Ajzen & Fishbein, 1980), typically within a convenience sample representative of the group of interest (Francis et al., 2004). As beliefs vary from population to population (Fishbein & Manfredo, 1992), belief elicitation should be conducted specific to each behaviour using the TACT principle. Although this process is arbitrary, the purpose of this principle, as previously mentioned, is that a change in one of these elements will redefine the behaviour (Fishbein & Ajzen, 1975). Subsequently, a change in the behavioural definition would lead to different underlying salient beliefs. For example, the beliefs underlying university students' participation in sport are likely to differ from those underlying participation of the elderly. Similarly, beliefs will further differ for student's participating in sport at university compared to student's participating in sport at the weekend for a local team. Thus, a change in any of the TACT elements and the subsequent behavioural definition would result in different salient beliefs underlying the behaviour.

Elicitation studies provide greater psychological information than the correlational and predictive studies identifying the influence of direct determinants. That is because the salient beliefs offer an understanding of the psychological foundations underlying the determinants (Ajzen & Fishbein, 1980). Despite this, elicitation studies alone are insufficient to inform the development of an intervention. Many beliefs are likely to be obtained within the modal set and, given time and budget constraints, only a limited number can be targeted within health interventions (White et al., 2015). Ajzen (1988) therefore suggests that following the elicitation study, a main quantitative study should be conducted to identify the influential determinants and beliefs. This second piece of research identifies the specific psychological processes to be targeted within a behaviour change intervention.

It is important that these pieces of research are undertaken in order for the relevant psychological processes to be identified (Sutton, 2002). Although the number of studies undertaking these procedures has risen during the past few years (Steinmetz et al., 2016), they are still relatively modest compared to the number of studies predicting intention and behaviour (Hamilton, Spinks, White, Kavanagh, & Walsh, 2016; Kok & Ruiter, 2014; Webb, Joseph, Yardley, & Michie, 2010). This is perhaps due to the time-consuming nature of such research (Conner, 2015). Nevertheless, this lack of attention is problematic as the belief foundations underlying the behaviour of interest are unclear. This subsequently poses problems for the onward development of

interventions. More specifically, without knowledge of the specific beliefs that should be targeted, interventions are developed on intuition (Quine, Rutter, & Arnold, 2001) or through targeting beliefs identified in studies investigating a similar behaviour (Curtis, Ham, & Weiler, 2010). For example, although Gucciardi and Jackson (2015) found attitude and PBC to explain intention to continue participation in sport, the beliefs underpinning these determinants were unclear. To develop an intervention to promote sport, one would need to guess the beliefs underlying attitude and PBC towards sport or target beliefs within a similar behaviour or a similar population. In both of these instances it cannot be guaranteed that the correct beliefs are identified and subsequently targeted within intervention. This problem was also outlined in a meta-analysis conducted by Webb et al. (2010). It was found that of the online interventions attempting to change various health behaviours using the TPB, none of them undertook the elicitation process. It is of great importance that interventions adopting the TPB undertake the required formative research (Ajzen, 1988).

2.3.4.3.1 Gap in the literature

Health psychological theory should be adopted when developing interventions to change behaviour. When applying the TPB to develop a behavioural intervention, it is crucial that the formative research outlined within the theory is undertaken. This enables the identification of relevant psychological targets underlying the behaviour of interest. Given the lack of research relating to first-year students' participation in recreational sport, there is a clear need to understand the beliefs underlying the behaviour.

2.4 The intention-behaviour gap

2.4.1 The importance of intention

It has been noted that (a) intention has been found to predict health behaviours (Downs & Hausenblas, 2005; McEachan et al., 2011; Sheeran, 2002), (b) intention is the most influential social cognitive determinant (Sheeran et al., 2017), and (c) intention leads to behaviour change (Hardeman et al., 2002; Rhodes & Dickau, 2012; Webb & Sheeran, 2006). Despite this, accumulated evidence has questioned the importance of intention in influencing behaviour (Webb & Sheeran, 2006). More specifically, a discordance between intention and behaviour has been found. Known as the 'intention-behaviour

gap' (Sheeran, 2002), this discordance can be seen when the relationship between intention and behaviour is examined more closely.

Orbell and Sheeran (1998) divided the relationship between intention and behaviour into four discrete profiles; inclined actors, disinclined actors, disinclined abstainers, and inclined abstainers. Inclined actors are those with an intention to carry out a behaviour and then successfully doing so. Disinclined actors are individuals without an intention but who subsequently undertake the behaviour. Disinclined abstainers are those without an intention and who subsequently do not undertake the behaviour. Inclined abstainers are those with an intention to undertake the behaviour but subsequently fail to do so. These profiles have also been identified by Rhodes and de Bruijn (2013b), albeit using different labels (i.e. successful intenders, disinclined actors, non-intenders, and unsuccessful intenders). From these profiles, two groups can be assumed to act consistently with intentions; those with a positive intention who subsequently perform the behaviour (inclined actors/successful intenders) and those without an intention who subsequently do not (disinclined abstainers/non-intenders). Two groups can also be assumed to not act in accordance with intentions; those without an intention who subsequently perform the behaviour (disinclined actors) and those with an intention who subsequently do not (inclined abstainers/unsuccessful intenders). The discordance between intention and behaviour is attributed to these latter two, particularly inclined abstainers (Orbell & Sheeran, 1998; Rhodes & de Bruijn, 2013b). That is, those with an intention to undertake the behaviour but not successfully doing so.

Rhodes and de Bruijn (2013a) found inclined abstainers accounted for 36% of the discordance between intention and behaviour. It was also found that only 50% of participants translated their PA intentions into behaviour. Evidence for this discordance also suggests that only small-to-medium changes in behaviour (d = 0.36) can be expected from medium-to-large changes in intention (d = 0.66; Webb & Sheeran, 2006). Thus, experimentally manipulating intention rarely leads to meaningful behaviour change (Rhodes & Dickau, 2012). There are a number of explanations for this occurrence. People may forget to perform the behaviour, miss opportunities, or procrastinate (Sheeran & Webb, 2016). People may also fail to overcome urges, impulses, or temptations (Baumeister, Vohs & Tice, 2007). Irrespective of the explanation, it is clear that intention is an important yet insufficient determinant of

behaviour. Research has therefore attempted to bridge the gap between intention and behaviour.

2.4.2 Bridging the intention-behaviour gap

The majority of social cognitive theories, including the TPB, have focussed on motivational processes with little work given to intention enactment (Oettingen & Gollwitzer, 2004). To address this, recent research has included theories comprising post-intentional phases, volitional factors, and strategies that might facilitate the translation of intentions into action (Abraham et al., 1999; Rhodes & Yao, 2015). For example, Rhodes and Yao (2015) identified sixteen models including post-intentional constructs such as the Rubicon Model of Action Phases (Heckhausen & Gollwitzer, 1987) and Health Action Process Approach (Schwarzer, 2008). Additionally, popular strategies facilitating intention translation include Implementation Intentions (Gollwitzer, 1999) and self-monitoring (Miller & Thayer, 1988). Despite the availability of such theories and strategies, they have one significant limitation; they focus on a single intention. This is also problematic when applying the TPB where, despite considering the many evaluative judgements a person may have towards a behaviour, it does not consider the potential for multiple goals (Abraham et al., 1999). Instead of single intentions being isolated from others (Presseau, Francis, Campbell, & Sniehotta, 2011), many health behaviours are part of several additional goals, intentions and behaviours that could be pursued. For example, a first-year student could have the option of undertaking recreational sport, socialising with friends, or studying. Intenders that successfully undertake a behaviour may differ from intenders that do not due to the number of intentions and goals readily available.

2.4.2.1 The goal priority strategy

To understand the specific influence of multiple intentions and behaviours, recent interests have concerned the contents of goals. It has been suggested that the inclusion of additional behaviours can either facilitate the likelihood of enacting the focal intention or decrease the probability of the behaviour being performed (Presseau, Tait, Johnston, Francis, & Sniehotta, 2013). When intentions and goals are held simultaneously, the complexity increases which makes it challenging for them all to be undertaken within the same period. Multiple behaviours can be addressed by prioritising a goal. Abraham et al. (1999) state that ‘The enactment of intentions depends not only

on planning and self-efficacy in relation to preparatory acts, but also on the prioritization [*sic*] of the focal intention over others' (p. 2596). Goal priority refers to the prioritisation of one goal over another (Conner et al., 2016). Goals that are prioritised are more likely to be activated and committed to than goals that are not prioritised. The pursuit of one goal may also interfere with another that is not prioritised (Li & Chan, 2008). Competing goals may gain priority over health-related behaviours, such as PA (Verplanken, & Faes, 1999). For example, a student may prioritise going to the cinema over participating in recreational sport and PA. Alternatively, health-related goals may be prioritised over other behaviours. For example, sports participation and PA may be prioritised over going to the cinema. As such, it is assumed that those successfully enacting their intentions differ from those that do not due to the priority placed on the intention. Goal priority can therefore moderate the intention-behaviour relationship. It is important to note that prioritising a goal is unlikely to be effective in the absence of motivation. That is, those without an intention to undertake a behaviour are unlikely to benefit from prioritising the intention. Thus, a prerequisite of goal priority is sufficient motivation towards the behaviour. Furthermore, prioritising a goal does not increase motivation to undertake the behaviour. Thus, intentions are not developed through goal priority.

Only the four studies reported by Conner et al. (2016) have examined the influence of goal priority on health behaviours. This research comprised both predictive (studies 1 and 4) and experimental (studies 2 and 3) studies relating to single (studies 1-3) and multiple (study 4) health behaviours. Studies 1-3, which focussed on PA, found intention had stronger predictions of behaviour when goal priority was high. This was also replicated in a number of health protection (i.e. eating a low fat diet) and health risk (i.e. binge drinking) behaviours (study 4). In the experimental studies (studies 2 and 3), participants were asked to write down how they would prioritise participation in PA and subsequent self-reported (study 2) and objective (study 3) measures of PA were taken. Both studies found the goal priority manipulation led to increases in goal priority and Study 2 demonstrated greater change in PA within the goal priority condition compared to a control. This series of studies provides preliminary evidence for the importance of goal priority within a number of health behaviours. More specifically, prioritising a goal appears to strengthen the relationship between intention and behaviour.

2.4.2.1.1 Gap in the literature

Although Conner et al. (2016) demonstrated the effectiveness of goal priority relating to different health behaviours within student samples, the effectiveness of the strategy has not been examined relating to recreational sports participation. Goal priority may have particular significance in promoting student participation in recreational sport because first-year students have the opportunity to develop and undertake many other intentions and behaviours. For example, a student could choose from adhering to a healthy diet, participating in recreational sport, or studying in the library. Thus, research is needed to test whether the goal priority strategy can be effective in promoting first-year students' participation in recreational sport. Additionally, Conner et al. (2016) only examined the effectiveness of the strategy using face-to-face manipulations. As is discussed later, there are many other modes of delivery a health intervention can adopt, and it is not yet clear whether goal priority can be effective within them.

2.5 Behaviour change

The TPB provides formative guidelines on how to identify key psychological targets but limited guidance is provided on the best ways to alter such targets (Sniehotta, Presseau, & Araujo-Soares, 2014). Indeed, Ajzen and Fishbein (1980) only suggest the use of persuasive communication strategies whereby arguments in favour of the target behaviour are provided with supplementing evidence. These limited instructions on how to change behaviour are one of the major limitations of the TPB, although the theory was not intended to deliver strategies for change (Ajzen & Manstead, 2007) but was designed to offer a model that could successfully predict behaviour and understand its psychological determinants (Ajzen, 1988; Armitage & Christian, 2003). The issue of changing behaviour is not unique to the TPB as, aside from Social Cognitive Theory (Bandura, 1977), the majority of social cognition theories and models have been used to *explain* rather than *change* behaviour (Noar & Zimmerman, 2005). Nevertheless, this is problematic given the importance of manipulating identified psychological mechanisms in order to induce behaviour change.

2.5.1 BCTs and taxonomies

Behavioural interventions are often complex and consist of many interacting active components (Craig et al., 2008). This complexity can provide challenges when evaluating the content of interventions and performing replications (Bell et al., 2007).

As the potential methods to change behaviour are vast, it is important to understand the specific strategies included within interventions. This enables an explanation of intervention outcomes and provides important information on the effectiveness of strategies. Strategies included within an intervention devised to change behaviour are commonly known as BCTs. BCTs are defined as the observable, replicable components of behaviour change interventions and comprise the 'active ingredients' (Michie et al., 2013).

Although BCTs may be included within behavioural interventions promoting health behaviours, without standardised definitions of BCTs it is difficult to know precisely which strategies were specifically used. Problems are then encountered when evaluating, reporting and replicating interventions. This lack of clarity has led to similar strategies adopted within separate interventions to be reported using different labels and different strategies to be reported using the same label (Michie et al., 2013). For example, the use of 'Goal setting' in one intervention may be labelled 'Setting targets' in another intervention or an intervention adopting 'Modelling' may have actually used 'Social Support'. The strategy may also include a number of BCTs, rather than only the one reported. For example, adopting 'Counselling' may include 'Framing/reframing' and 'Associative learning'. To address these problems, taxonomies of BCTs have been developed to provide a common language for researchers, standardise intervention ingredients, and enable evidence to be synthesised at the technique level (Abraham & Michie, 2008). These classifications are agnostic in terms of the theoretical base but provide clear definitions of BCTs.

Taxonomies of BCTs have been successfully applied to both specific (Abraham & Michie, 2008; Abraham, Good, Warren, Huedo-Medina, & Johnson 2011) and multiple behaviours (Michie et al., 2013). The first taxonomy was developed by Abraham and Michie (2008) and included 26 BCTs commonly used to change PA and dietary behaviours. For example, some BCTs included were 'Prompt intention formation', 'Set graded tasks', and 'Teach to use prompts/cues'. Each of the BCTs were provided with a specific definition of what the strategy comprised. For example, 'Set graded tasks' was defined as "set easy tasks, and increase difficulty until target behaviour is performed". As the Abraham and Michie taxonomy was only developed as the first step towards specifying intervention content, it was updated within the 'Coventry, Aberdeen and London – Refined' taxonomy (CALO-RE; Michie et al., 2011). This taxonomy comprised 40 BCTs, thus included an additional 14 BCTs from

the original taxonomy. Examples of the additional BCTs included are ‘Time management’, ‘Prompt use of imagery’, and ‘Motivational interviewing’.

Michie and colleagues also developed the first taxonomy that was not behaviour specific. The BCT taxonomy v1 (BCTTv1; Michie et al., 2013) is a hierarchically structured list of 93 distinct BCTs developed by 54 experts in the designing and delivery of interventions. These BCTs were then organised further into 16 groups that represented BCTs with similar active ingredients. Its applicability across a number of behavioural domains enabled it to be used by a greater number of intervention designers and researchers. The large number of BCTs was due to its comprehensiveness of different behaviours.

2.5.2 Influential BCTs

The development of taxonomies of BCTs enabled a greater understanding of the specific BCTs included within interventions. The taxonomies have also enabled research to be undertaken in relation to the BCTs most influential in change. This is an important development; if the most effective BCTs can be identified, the effectiveness of future interventions can be increased through their inclusion.

Reviews have been undertaken to identify the BCTs researchers most commonly used in interventions to change health behaviours. Through coding BCTs using the CALO-RE taxonomy (Michie et al., 2011), Conroy, Yang and Maher (2014) found interventions attempting to change rates of PA commonly used ‘Instructions on how to perform the behaviour’ and ‘Demonstrations of the behaviour’. Gardner, Wardle, Poston and Croker (2011) found ‘Self-monitoring’ and ‘Goal setting’ were most frequently adopted within interventions targeting diet and PA. Research has also sought to establish the most effective BCTs in changing behaviour. Michie, Abraham, Whittington, McAteer and Gupta (2009) found BCTs such as ‘Self-monitoring’, ‘Prompting intention formation’, ‘Goal setting’, and ‘Feedback’ to be most effective in promoting PA. Despite the usefulness of this work, it is not without problems. For example, the frequency of adopted BCTs does not provide evidence for effectiveness. Interventions may include certain BCTs because they are easy to implement, are cost effective, or because knowledge of them is greater than that of other BCTs. Moreover, behaviour change does not occur directly from BCTs but, rather, from manipulating the psychological processes mediating between the BCTs and behaviour (Kok et al., 2016). As such, identifying the BCTs most effective in changing behaviour provides limited

information on the influential psychological mechanisms. This provides uncertainty on why behaviour change occurred (or did not) and what the BCTs used within the intervention altered (or did not).

As adopting taxonomies of change does not provide evidence through which BCTs exert influence (Connell et al., 2018), there is a need to establish which specific BCTs can be used to alter specific psychological processes of change (Michie et al., 2016). Intervention designers would then be better positioned to select the BCTs with the greatest probability of success. For example, if determinant 'A' is found to be influenced by BCT 'B' and determinant 'A' leads to behaviour change, interventions could demonstrate greater behaviour change if BCT 'B' is used to change determinant 'A'. This would also provide researchers with an understanding of why BCTs influenced behaviour, that is, the psychological mechanisms that mediated their effect.

2.5.3 Mapping BCTs to mechanisms

Evidence towards understanding the effectiveness of BCTs on psychological mechanisms has been given recent attention (Abraham, 2012). One way these relationships can be understood is through adopting direct methods such as experimental research or meta-analyses (Michie, West, Sheals, & Godinho, 2018). However, as this research is presently lacking in the literature, studies have adopted more indirect methods to link BCTs and psychological processes (e.g. Cane et al., 2015; Carey et al., 2018; Connell et al., 2018; Michie et al., 2008). One indirect method has been through consensus studies where experts in behavioural science outline whether they believe BCTs to change specific mechanisms. Typically, these studies ask experts whether they agree or disagree with a theorised relationship. Due to the vast number of constructs available in health psychology, these studies used the Theoretical Domains Framework (Cane et al., 2012) which organises the major psychological constructs into 14 overriding categories. Experts within the Michie et al. (2008) study agreed that the domain 'Beliefs about consequences' could be targeted with the BCTs 'Self-monitoring', 'Persuasive communication', 'Information regarding the behaviour', 'Feedback', 'Self-talk' and 'Motivational interviewing'. That is, for example, providing information on the performance of the behaviour (feedback) can target a person's beliefs about the consequences of the behaviour. Using the BCTs within the BCTTv1 (Michie et al., 2013), Cane et al. (2015) linked 10 BCTs to the domain "Social influences", including "Information about others' approval" and "Modelling". That is,

for example, informing a person of those individuals that would approve of the behaviour (information about others' approval) can manipulate social influences.

A second indirect method used to provide evidence for links between BCTs and psychological processes has been to review studies examining these relationships in order to understand how researchers have approached this task. Carey et al. (2018) provided a heat map of the links previously identified in published studies. This showed that some BCTs had been used more frequently than others, that some BCTs had been used to target many mechanisms, and that some BCTs had targeted many mechanisms but with one being dominant. For example, "Information about health consequences" was suggested to influence "Knowledge (n = 18)", "Beliefs about consequences (n = 26)", "Attitude towards the behaviour (n = 19)", "Perceived susceptibility/vulnerability (n = 10)", and "Intention (n = 28)". This study also showed that the domains could be influenced by many BCTs. For example, seven BCTs (i.e. "Graded tasks", "Verbal persuasion about capability", "Focus on past success", "Demonstration of the behaviour", "Problem solving", "Behavioural practice/rehearsal", and "Reduce negative emotions") were suggested to influence the domain "Beliefs about capabilities".

The implication of this programme of work is that interventions including the BCTs mapped onto the targeted mechanism could prove more effective in changing the psychological processes than interventions including the BCTs not mapped onto the mechanism. Given the TPB offers little guidance on ways to induce change through manipulating psychological processes, this work could provide important information for the type of strategies that could be used within an intervention to change students' participation in recreational sport. More specifically, drawing on this work could identify the specific BCTs that could be adopted to change important psychological beliefs underlying participation in the behaviour.

2.5.3.1 Gap in the literature

It is not clear what interventions should include to change psychological determinants. More specifically, there is a lack of clarity regarding the BCTs that interventions should comprise to change first-year students' participation in recreational sport. Understanding which BCTs would effectively attend to the identified psychological mechanisms underlying the behaviour is important for the development of an intervention targeting rates of recreational sports participation.

2.6 Intervention delivery modes

Behaviour change interventions can be delivered using different modalities or modes (Beck et al., 2016; Dombrowski, O'Carroll, & Williams, 2016; Michie et al., 2013). The mode of delivery concerns how the intervention is communicated in practice (Dombrowski et al., 2016). There are many modes that an intervention can utilise and not all delivery modes will be effective in changing all behaviours (Knittle et al., 2018). Indeed, in some situations a specific delivery mode may be more suitable than others. Interventions should therefore be delivered using a delivery mode with the greatest likelihood of success.

The modes of delivery traditionally used to deliver health interventions include face-to-face sessions and printed materials (e.g. Noar, Benac, & Harris, 2007; Kaufman et al., 2013). Printed materials, such as posters, flyers and leaflets, are typically easy to implement, can reach a high number of people and are relatively cost-effective (Paul, Redman, & Sanson-Fisher, 2004) although changing certain behaviours, such as smoking (West, 2017), may require face-to-face support. Despite these advantages, there are fidelity issues regarding face-to-face delivery (Walton, Spector, Tombor, & Michie, 2017) and this mode can be time consuming, costly and have limited reach (Butryn, Webb, & Wadden, 2011; Cavill & Ells, 2010). Issues may also be encountered whilst distributing printed materials and there is no certainty they would be read by the target audience. Evidence also suggests printed materials have limited effectiveness in changing behaviour (Brendryen & Kraft, 2008; O'Brien et al., 2015; Prestwich et al., 2017) and face-to-face interventions have been found to be less effective in changing certain behaviours compared to non-face-to-face interventions (Müller & Khoo, 2014). Research has progressed to the adoption of alternative modes of delivery through technology.

2.6.1 eHealth and mHealth

Health psychology has seen a recent revolution in the adoption of technology to promote health behaviour change (Moller et al., 2017). Interventions using technology are known as electronic health (eHealth). Definitions of eHealth vary due to its popularity and use in different contexts (Danaher, Brendryen, Seeley, Tyler, & Woolley, 2015) but it can be broadly regarded as the combined use of electronic communication and information technology in the health sector (Orlikoff & Totten, 2000). eHealth interventions can be administered in many ways including websites, gaming, electronic

monitors, CD-ROM, and emails. The most popular use of eHealth is using mobile devices (Bort-Roig, Gilson, Puig-Ribera, Contreras, & Trost, 2014).

Mobile health (mHealth) is the use of mobile phones, smartphones, Global Position Systems and tablets in health promotion (Olla & Shimskey, 2015). The use of mHealth has become widespread over the past few years, mainly due to its global reach, cost-effectiveness, feasibility, accessibility, and applicability to a number of health behaviours (Fjeldsoe, Marshall, & Miller, 2009). In 2018 it was estimated that 4.4 billion people owned a mobile phone, with 95% of people aged 16-24 years in the UK possessing a device (Statistica, 2019). This vast number of users enable mHealth interventions to have significant reach (Milward, Day, Wadsworth, Strang, & Lynskey, 2015), particularly in university aged students (Fowler & Noyes, 2015). Mobile phones are easily portable due to their small size (Klasnja & Pratt, 2012) and people likely have a mobile phone in their possession which means no additional equipment or material are required to deliver a mHealth intervention (Glynn et al., 2014). Interventions delivered using mHealth can be done so through different mediums; mobile applications (apps), videos, Multimedia Messaging System, and SMS. Presently, the most popular mHealth intervention delivery mode is SMS (Cole-Lewis & Kershaw, 2010).

2.6.2 SMS

SMS is used to send text messages to mobile phones. Messages can include a maximum of 160 characters, with messages exceeding this limit requiring multiple text messages. There are many characteristics involved within a health intervention using SMS such as the duration, dose and interactivity. For example, messages can be sent to the intended recipient without any further input required or a two-way interaction between the sender and receiver can occur (Armanasco, Miller, Fjeldsoe, & Marshall, 2017). SMS interventions can also vary depending on whether the messages are personalised, tailored, or targeted. For example, tailored text messages can be developed that target relevant social cognitive determinants (Naughton & Sutton, 2011).

Research has established many benefits to using SMS to deliver interventions targeting health behaviours. First, SMS is a primary means of communication on a mobile phone which provides great potential for health interventions to target population groups using them, such as students (Leung, 2007; Perry & Lee, 2007). Second, each mobile device is set up to both send and receive text messages and, unlike apps which require downloading, the availability of SMS makes this modality more

likely to be read (de Leon, Fuentes, & Cohen, 2014). Third, text messages can be accessed at any time and delivered immediately, even if a phone has been switched off (Gold, Lim, Hellard, Hocking, & Keogh, 2010). Fourth, the distribution of text messages is relatively cheap (Horner, Agboola, Jethwani, Tan-McGrory, & Lopez, 2017) and the cost can be further reduced when specialised services are used to send the messages in bulk. Finally, SMS allows for in-the-moment, personally tailored health communication (Klasnja et al., 2015) which renders the delivery mode highly appropriate to a number of health behaviours (Naughton & Sutton, 2011).

2.6.2.1 Intervention findings

Although the use of SMS to change health behaviours within intervention was only recently introduced, there has been a recent surge in the number of studies adopting this delivery mode (Suffoletto, 2016). Indeed, studies have adopted the SMS delivery mode targeting many health-related behaviours including alcohol consumption (Crombie et al., 2018; Suffoletto et al., 2014), healthy eating (Carfora, Caso, & Conner, 2016), smoking (Free et al., 2011), medication adherence (Louch, Dalkin, Bodansky, & Conner, 2013; Suffoletto, Calabria, Ross, Callaway, & Yealy, 2012), and PA (Alsaleh, Windle, & Blake, 2016; Griffin et al., 2018; Kim & Glanz, 2013; Kinnafick et al., 2016; McCoy et al., 2017; Sirriyeh, Lawton, & Ward, 2010). However, the surge of studies adopting text messages and the lack of interventions using health psychological theory has made it difficult to synthesise research evidence and thus determine the effectiveness of the delivery mode and specific characteristics (Cole-Lewis & Kershaw, 2010; Dale, Dobson, Whittaker, & Maddison, 2016; Hall, Cole-Lewis, & Bernhardt, 2015). For example, heterogeneity has been found regarding the importance of message characteristics (Fjeldsoe et al., 2009). Orr and King (2015) found messages sent more frequently (daily) had a significantly greater effect than messages sent less frequently, something which has been supported by other studies (e.g. Franklin, Waller, Pagliari, & Greene, 2006; Rodgers et al., 2005). Conversely, some studies found text messages sent in lower frequencies to be more effective (e.g. Pop-Eleches et al., 2011; Weitzel, Bernhardt, Usdan, Mays, & Glanz, 2007). For example, Pop-Eleches et al. (2011) found weekly SMS messages improved medication adherence whereas daily SMS messages did not and Fjeldsoe, Miller, and Marshall (2010) successfully increased PA in postnatal women using three to five text messages per week. This variability also extends to other message characteristics, such as the interactivity. Wald, Butt and Bestwick (2015) found

bidirectional messages to be more effective than unidirectional messages but Head, Noar, Iannarino and Grant Harrington (2013) did not find this to be an important characteristic.

Despite the variability in study findings relating to the SMS delivery mode, a consensus in the literature is that interventions adopting this delivery mode can have small effects on health-related behaviours (Armanasco et al., 2017; Fanning, Mullen, & McAuley, 2012; Head et al., 2013; Orr & King, 2015; Suffoletto, 2016). A meta-analysis conducted by Head et al. (2013) reported SMS interventions to have an effect size of $d = 0.33$ on health behaviours. Given that a vast number of people can be targeted through SMS interventions, these effects can have significant impact on health behaviours (Armanasco et al., 2017). The adoption of SMS as an intervention delivery mode thus appears feasible to change health behaviours, including recreational sports participation.

2.6.2.1.1 Gap in the literature

Despite targeting and successfully changing many health behaviours, research has not attended to recreational sport using the SMS delivery mode. More specifically, no study has adopted text messages to change first-year students' participation in recreational sport. This delivery mode may be particularly effective given the number of students owning a mobile phone. Thus, research is needed to examine whether this delivery mode can be effective in increasing students' rates of recreational sports participation. It is also not clear whether the goal priority strategy can be effective within the SMS modality.

2.7 Chapter summary

This chapter introduced sport and it was shown how university recreational sport has the potential to provide many health benefits for students, particularly for those first-year students making the transition into university. Previous attempts to change rates of recreational sports participation through interventions funded by Sport England (2014) were shown and it was demonstrated how these projects yielded limited success. Given these projects did not require the use of theory within intervention design, the importance of adopting health psychological theory was outlined. The TPB was then identified as a theory with the potential to promote behaviour change in recreational sport, particularly due to the guidance provided on how to identify relevant

psychological intervention targets. The gap between intention and behaviour was discussed and various strategies to reduce this gap were provided. Goal priority was identified as a strategy with particular relevance given students have many intentions and behaviours that could be undertaken instead of recreational sport. The chapter then introduced BCTs and how they comprise the active ingredients within behaviour change interventions. Recent attempts at identifying the most influential BCTs in changing psychological mechanisms were shown and it was suggested that this research could be beneficial in identifying relevant strategies to change the psychological processes underlying students' recreational sports participation. Finally, the chapter identified a number of delivery modes that can be used when undertaking an intervention targeting health behaviours. The SMS delivery mode was identified as one that has many benefits, particularly when attempting to influence students' participation in health behaviours, such as recreational sport.

To conclude, four main avenues for research have been outlined; (1) the need to undertake formative research when adopting the TPB to change first-year students' participation in recreational sport, (2) the need to identify relevant BCTs to change the psychological processes underlying recreational sports participation, (3) the potential to enhance health behaviours using the goal priority strategy, and (4) the potential for the SMS delivery mode to successfully deliver an intervention targeting health behaviours. Chapter 2 presents the first two studies of the thesis which adopt the TPB to identify specific psychological targets pertaining to first-year students' participation in recreational sport.

Chapter 3 **Identifying the salient (Study 1) and key (Study 2) beliefs underlying student participation in recreational sport**

3.1 Introduction

This chapter presents the first two studies of the thesis which identify the psychological mechanisms associated with first-year students' participation in recreational sport. Study 1 undertakes the first stage of TPB guidelines by identifying the modal salient behavioural, normative, and control beliefs underlying the behaviour. Following this, Study 2 uses these findings to identify specific key belief-based intervention targets.

3.2 Study 1: Belief elicitation using the TPB

It was outlined in Chapter 2 that there is a need to undertake formative research when using the TPB to inform the development of a behaviour change intervention (Ajzen, 1988). The first piece of formative research is a belief elicitation study which identifies the salient behavioural, normative, and control beliefs underlying the behaviour. As mentioned, salient beliefs are those most accessible in memory and they influence the proximal determinants of intention. More specifically, the salient behavioural, normative and control beliefs influence attitude, SN and PBC, respectively.

Studies undertaking elicitation research commonly identify the salient beliefs shared amongst the population of interest, known as the modal set (Ajzen, 1988). Ideally all beliefs included within the modal set would be salient to each and every participant from which the beliefs were taken. Furthermore, there would be no beliefs included within the modal set that are not salient to the participants. However, as the modal set are not idiosyncratic (Ajzen, 1991), it is unlikely that all elicited beliefs are relatable to all participants (Francis et al., 2010). Sutton (2002) suggests there is a trade-off between maximising the number of the person's salient beliefs that fall in the modal set and minimising the number of beliefs that are not salient to the individual. Many methods have been used to achieve this trade-off and identify the modal set. Chatzisarantis and Hagger (2005) selected the three to five most frequently mentioned salient beliefs. Ungar, Sieverding, Ulrich and Wiskemann (2015) and Rowe et al. (2016) included beliefs identified by at least three participants. An approach widely used is the use of a percentage criterion, with beliefs mentioned by 20-30% of the sample selected as the modal set (e.g. Epton et al., 2015; Spinks & Hamilton, 2015;

Vayro & Hamilton, 2016). According to Vayro and Hamilton (2016), adopting this percentage ensures that the modal set includes a wide range of underlying beliefs.

Despite the paucity of research undertaking the elicitation procedure (Kok & Ruiter, 2014), especially when compared to the number of studies using the TPB to predict behaviour, research doing so has focussed on behaviours such as binge drinking (French & Cooke, 2012), vegetable purchasing and consumption (Sheats & Middlestadt, 2013), and participation in extra-curricular activities (Anderson, Leyland, & Ling, 2013). This is unfortunate given the importance of understanding the underlying beliefs pertaining to recreational sport. In a behaviour related to sports participation, elicitation studies have also been conducted concerning PA (e.g. Bélanger-Gravel, Godin, Bilodeau, Poirier, & Dagenais, 2013; Bellows-Riecken, Mark, & Rhodes, 2013; Kirk & Rhodes, 2010; Ungar et al., 2015) and PA relating to first-year students transitioning into university (e.g. Cowie & Hamilton, 2014; Epton et al., 2015). For example, Epton et al. (2015) identified 15 beliefs within the modal set; seven behavioural, three normative, and five control. The behavioural beliefs related to the health and fitness benefits of PA, the opportunity to establish friendships and socialise, and the time required to participate. Relevant referents identified included family, friends, and sporty people, and the control beliefs concerned the standard of and access to facilities, and the cost and time restrictions attached to PA participation. Cowie and Hamilton (2014) examined the beliefs of first in family transitioning students. They found nine behavioural beliefs, eight normative beliefs and seven control beliefs towards PA. These beliefs shared similarities with Epton et al. (2015) but also included appearance motives, the likelihood of sustaining an injury, and the consequence of tiredness (behavioural beliefs). The influence of partners, health care professionals, coaches and sports role models were provided as normative beliefs and considerations of weather, inconvenience, and laziness were given as control beliefs.

The beliefs identified within the PA studies provide important information pertaining to the psychological foundations of the behaviour. Moreover, such findings may share similarities with the present behaviour, particularly those studies applied to first-year university students. For example, students may recognise the health and fitness benefits of recreational sports participation. The opinions of friends and family members may influence students' decisions to participate and a perceived lack of time may be a significant barrier. There could, however, be some key differences between the behaviours. In line with Henderson's (2009) suggestion that motives towards sport

are different to that of PA, Kilpatrick, Hebert, and Bartholomew (2005) found that exercise participation was influenced by perceptions of appearance whereas sports participation was governed by perceptions of enjoyment and competition. That is, students engaged in PA to improve their body image and physical appearance whereas students participated in sport to experience competition and enjoy themselves. Due to these discrepancies, it would not suffice to assume the beliefs identified within the elicitation studies pertaining to PA are representative of the beliefs underpinning participation in recreational sport.

In a study more closely related to recreational sport, Sniehotta (2009) undertook an experimental design to alter the elicited behavioural, normative, and control beliefs towards students' participation in PA through using the university's sport and recreation services. Such facilities included the gymnasium and fitness suite and covered a range of exercise activities (i.e. swimming, sports). Although the belief elicitation phase was not reported explicitly, the beliefs targeted during the intervention offer insight into the elicited beliefs. The targeted behavioural beliefs related to the positive effects of PA on health, fitness, mood, stress, and ability. Other targeted behavioural beliefs included the safety of the activities, the number of classes and activities available, the flexible timetables, and the likelihood of continuing participation in the future. The normative beliefs targeted within the intervention were friends, family members, and other relatable people. Finally, the intervention targeted control beliefs concerning the cost of participation, the access to facilities, time constraints, and experiencing feelings of discomfort or embarrassment. Despite having specific psychological targets, the study by Sniehotta (2009) included a number of recreational facilities and both competitive and informal sport. Thus, the elicited beliefs within the study, similar to those relating to PA, may not be relatable to recreational sport. For example, 'feelings of discomfort or embarrassment' could be suggested to align exclusively with participation in gymnasiums. That is, those undertaking physical activities within this environment may feel embarrassed if they struggle to perform the exercise. Beggs, Nicholson, Elkins and Dunleavy (2014) found that when comparing students participating in group fitness programmes to students undertaking informal sports programmes, the former was motivated more towards factors of mastery and competency. Chatzisarantis and Hagger (2007) found that students participating in recreational sport demonstrated intrinsic motivation to participate compared to competitive sport athletes who demonstrated greater extrinsic motivation. Thus, those participating in recreational sport could do so

for pleasure and the satisfaction of the experience (Fortier, Vallerand, Brière, & Provencher, 1995). Studies previously examining beliefs underpinning participation in PA and recreational facilities may not be applicable to recreational sport. Thus, further research is needed specifically relating to the latter.

In terms of studies examining students' perceptions towards intramural sport and recreational activities, research has adopted various theoretical frameworks including Self-Determination Theory (Deci & Ryan, 1985) and Leisure Constraints Model (Crawford, Jackson, & Godbey, 1991). Moreover, many theoretically-informed questionnaires have been adopted to gather information on the motivations, constraints and barriers such as The Leisure Motivation Scale (Beard & Ragheb, 1983), Sport Commitment Model (Scanlan, Simons, Carpenter, Schmidt, & Keeler, 1993), Motivational Style Profile (Apter, Mallows, & Williams, 1998), University Sports Constraints Questionnaire (Masmanidis, Gargalianos, & Kosta, 2009), Modified Leisure Barrier Scale (Raymore, Godbey, Crawford, & von Eye, 1993), and Task and Ego Orientation in Sport Questionnaire (Duda & Whitehead, 1998). These studies have found students perceive recreational activities to be enjoyable (Cooper, Schuett & Phillips, 2012; Webb & Forrester, 2015), improve levels of fitness (Spivey & Hritz, 2013), provide opportunities to socialise (Artinger et al., 2006; Beard & Raghen, 1983; Kanters & Forester, 1997), and relieve stress (Banta, Bradley, & Bryant, 1991). One of the most significant constraints to participation has been found to be a lack of time (Spivey & Hritz, 2013; Young, Ross, & Barcelona, 2003). Despite providing important motives and barriers towards participation in recreational sport, research has not adopted the TPB to identify the modal salient behavioural, normative, and control beliefs underpinning this behaviour. Given the importance of identifying the specific psychological factors underlying the behaviour of interest when adopting the TPB to develop an intervention, it is important that an elicitation study is conducted in this area.

3.2.1 Purpose of Study 1

The purpose of Study 1 was to elicit the salient beliefs associated with recreational sports participation. More specifically, Study 1 aimed to identify the modal salient behavioural, normative, and control beliefs underpinning first-year students' participation in recreational sport.

3.2.2 Method

3.2.2.1 Sample

Studies 1-4 were conducted at a small sized higher education institution in the North of England with a large number of students from low socio-economic backgrounds. A sample of 80 students (n = 36 males, 40 females; age M = 19.2 years, SD = 1.7) volunteered to take part in Study 1. The response rate was 76 (95%) with 4 non-attendees at class during the time the survey was administered. Participants from different programmes of study were selected to generalise to the wider first-year population. The number of participants recruited and their respective degree courses were as follows: Nutrition, Food and Health (n = 20), Secondary Physical Education and Sports Coaching (n = 20), Childhood and Family Welfare Studies (n = 18), and English (n = 18).

3.2.2.2 Procedure

A purposive sampling technique was used to ensure the inclusion of different subject areas. Contact with academic lecturers within the institution was made through email to establish lecture and seminar times, locations and student availability. Once established, participants were approached at the end of lectures and seminars. Participants were verbally given an outline of the study and the study requirements. Participants were also provided with a participant information sheet which detailed the study and gave a definition of the behaviour (see Appendix A1). The researcher explained that participation was voluntary and that they were under no pressure to participate. Participants were assured of confidentiality and anonymity and were given the opportunity to ask any questions. Those students willing to participate were then asked to sign the consent form (see Appendix A2). Participants were asked to complete the questionnaire without interacting with other participants. The questionnaire took approximately 15 minutes to complete. Once the questionnaire was completed, participants were thanked for their participation in the study and provided with a debrief sheet (see Appendix A3). Prior to data collection, ethical approval was gained from the University ethics board (Ref: SSHS/15-16/Ethics/02).

3.2.2.3 Instrument

A questionnaire was developed to assess the behavioural, normative and control beliefs towards recreational sports participation at university using the recommended guidelines of Ajzen (2006) (see appendix A4). Items included within previous elicitation studies were also used to guide this process (e.g. Rhodes, Blanchard, Courneya, & Plotnikoff, 2009; Vayro & Hamilton, 2016) and the recommendations of Sport England (2014) were used to provide a definition of the behaviour in accordance with the TACT principle (Ajzen, 1991). This was defined as follows; recreational sports (target) participation (action) at university (context) once a week for 30 minutes over the next month (time). To emphasise the importance of this principle, the definition was also stated verbally by the researcher prior to questionnaire completion. To further ensure participants understood the meaning of 'participation in recreational sport', similar to Sutton et al. (2003) examples of the behaviour were provided. For example, some of the recreational sports offered at the university were given (i.e. Give it a go badminton) and it was explained how they differed from the BUCS competitions at the university. It was also explained that university sport concerned the sports that the university provided both on and off campus and was not targeting those offered by governing bodies (i.e. BUCS), nor did it relate to elite sports participation. This was due to the difference between competitive and non-competitive sport previously highlighted. Participants were therefore clear regarding the behavioural definition and were instructed to follow this definition throughout questionnaire completion.

Behavioural beliefs were assessed using three questions; 'What do you see as the advantages of you participating in sport at University for at least 30 minutes, once a week for the next month?', 'What do you see as the disadvantages of you participating in sport at University for at least 30 minutes, once a week for the next month?', and 'What else comes to mind when you think about participating in sport at University for at least 30 minutes, once a week for the next month?'. Normative beliefs were assessed by asking the following; 'Please list the types of individuals or groups who would approve or think you should participate in sport at University for at least 30 minutes, once a week for the next month', 'Please list the individuals or groups who would disapprove or think you should not participate in sport at University for at least 30 minutes, once a week for the next month' and 'Are there any other individuals or groups who come to mind when you think about participating in sport at University for at least 30 minutes, once a week for the next month?'. Control beliefs were assessed by asking;

‘Please list any factors or circumstances that would make it easy or enable you to participate in sport at University for at least 30 minutes, once a week for the next month’, ‘Please list any factors or circumstances that would make it difficult or prevent you from participating in sport at University for at least 30 minutes, once a week for the next month?’ and ‘Are there any other issues that come to mind when you think about the difficulty of participating in sport at University for at least 30 minutes, once a week for the next month?’. The questionnaire also took demographic assessments of age, gender, and course of study.

3.2.2.4 Data analysis

From the 76 questionnaires obtained, 30 questionnaires were randomly selected to be analysed. This is a number within the range of those typically used in elicitation studies, with that number specifically used by Bélanger-Gravel et al. (2013). To undertake randomisation, questionnaires were first divided into the separate degree programmes and each third questionnaire was selected. To ensure that saturation had been reached, the study followed the analysis of the initial 30 questionnaires with the analysis of another three (i.e. the 31st, 32nd, and 33rd). Thus, thirty questionnaires were analysed first, followed by a subsequent three. This consecutive rule has been used in a prior study (Robertson, Mullan, & Todd, 2014) and is suggested to be effective (Francis et al., 2010). In total, this procedure led to the analysis of the following numbers from the various degree courses; Nutrition, Food and Health (n = 8), Secondary Physical Education and Sports Coaching (n = 7), Childhood and Family Welfare Studies (n = 7), and English (n = 8). An additional questionnaire from the first three programs were selected as the saturated questionnaires.

In accordance with Francis et al. (2004), data were analysed using content analysis. First, broad categories were identified and then refined into codes. This was attained by identifying frequently cited words and phrases (categories) and generating an overriding belief (codes). For example, the belief ‘‘Enjoyment’’ was created from responses such as ‘‘you could have fun’’ and ‘‘it’s a laugh’’. Following the analysis of thirty questionnaires, no new beliefs were added beyond this number as the following three questionnaires only yielded repetitive information (Glaser & Strauss, 1967). With saturation reached, codes were developed from the responses of 30 participants. These codes were then placed under the TPB belief-based headings (behavioural, normative, and control) and a coding frame was developed to identify the frequency of responses

(see Appendix A5). A frequency count was used to identify the number of responses for each category. To ensure reliability of the frequency count, a second independent coder assisted with this procedure. Specifically, the second coder was provided with the coding sheet and analysed 15 randomly selected questionnaires from the 30 analysed by the main researcher. A similar procedure to the above provided the randomisation with questionnaires arranged into programmes of study and each third questionnaire selected. Inter-rater reliability was calculated using the following: (agreed ratings/total coded) x100. There was 100% agreement between the coder and the researcher regarding the 15 questionnaires, thus inter-rater reliability was achieved. Finally, the modal set was gained by arranging the number of responses per belief in descending order under their respective category (behavioural, normative and control) and applying the 30% criterion (Spinks & Hamilton, 2015). That is, those beliefs mentioned by at least 30% of the sample were selected as the modal set and those mentioned by less than 30% of participants were not retained.

3.2.3 Results

The study elicited a total of 53 beliefs; 18 behavioural, 11 normative, and 24 control (see Appendix A6). When the 30% rule was applied, 17 beliefs were retained; six behavioural, five normative, and six control (see Table 3.1). This is consistent with prior elicitation studies, with a mean of seven behavioural, four normative and six control found in a systematic review (Downs & Hausenblas, 2005).

3.2.3.1 Behavioural beliefs

As can be seen in Table 3.1, four behavioural beliefs were elicited relating to the advantages of performing recreational sport at university and two beliefs relating to the disadvantages. Thus, six behavioural beliefs were mentioned in total by a minimum of 9 participants (30%). The advantage mentioned most frequently was ‘Health and fitness’, followed by ‘Enjoyment’, ‘Opportunities to meet new people’ and ‘Improves mental well-being’. The disadvantages were that sport can be ‘Time consuming’ and provide unwanted ‘Study distractions’.

3.2.3.2 Normative beliefs

Table 3.1 shows the normative beliefs elicited by at least 30% of the sample. Two referents were highlighted as being approving and three seen to be disapproving. Both

Table 3.1. *Modal salient behavioural, normative and control beliefs (n = 30).*

Belief category		Belief stated	Total number of participants	Percentage of participants (%)
Behavioural	Advantages	Health and fitness	24	80
		Enjoyment	18	60
		Opportunities to make new friends	9	30
		Improves mental well-being	9	30
	Disadvantages	Time consuming	22	73
		Study distractions	10	33
Normative	Approve	Friends	24	80
		Family	19	63
	Disapprove	Friends	16	53
		Academic Staff	12	40
		Family	11	37
Control	Easier	Less time constraints	23	77
		Greater awareness	11	37
		Study related	10	33
	Difficult	Study related	17	57
		Time restrictions	14	47
		Lack of motivation	13	43

of those that were seen to approve the behaviour were also seen to disapprove of it. Specifically, the influence of friends was seen as being equally the most salient positive (80%) and negative normative referent (53.3%). Family members were also seen to largely approve and disapprove of the behaviour. Academic staff was the only referent mentioned in one of the categories, with 40% stating that this particular referent would not be supportive of their decision to participate in recreational university sport.

3.2.3.3 Control beliefs

As shown in Table 3.1, six control beliefs were elicited from the sample when the 30% criterion was applied. Having 'Less time constraints' was the main belief that would make sports participation easier with 76.7% sharing this view. Following this, 11 participants (36.7%) stated that 'Greater awareness' would help participation and 33.3% had concerns relating to their studies. Issues regarding academic study were also mentioned as an inhibitor with 56.7% of the sample claiming that this made sports participation more difficult. 'Time restrictions' was the next salient belief pertaining to difficulty (46.7%), followed by a lack of motivation (43.3%).

3.3 Study 2: Belief identification

In accordance with TPB guidelines, an elicitation study should be followed by a second piece of formative work (Ajzen, 1988). This second study can identify the specific determinants and beliefs influencing the behaviour. Through understanding the strength of the relationships between beliefs and TPB constructs, targets for intervention can be identified (Vayro & Hamilton, 2016). There is no specific nor agreed approach to identifying belief targets (Fishbein, von Haeften, & Appleyard, 2001) which has led to studies identifying psychological processes in many ways. One approach has been to focus primarily at the belief level rather than the direct constructs. Hamilton et al. (2016) noted that higher-level global factors (i.e. attitudes, SN, PBC) are merely summative states of more fundamental lower-level elements (i.e. beliefs) and, as the action of behaviour change is at the belief level rather than the summative level, it is more appropriate to identify beliefs directly. More specifically, this enables the identification of the key beliefs as they significantly relate to, and independently influence, the target behaviour (Hamilton et al., 2012).

Studies have identified the key beliefs associated with a number of health-related behaviours such as diet and healthy eating (Spinks & Hamilton, 2015; Vayro &

Hamilton, 2016), sun protection (Bassett-Gunter et al., 2015; Hamilton et al., 2012), hand hygiene (White et al., 2015), walking (Rhodes et al., 2009), and PA (Cowie & Hamilton, 2014; Epton et al., 2015; Rhodes et al., 2014). White et al. (2015) found thirteen beliefs significantly correlated with nurses' hand hygiene behaviour with three beliefs predicting the behaviour. These key beliefs were "Reduce the chance of infection for my co-workers", "Lack of time", and "Forgetfulness". With regards to the PA studies, Epton et al. (2015) and Cowie and Hamilton (2014) specifically examined the behaviour in students transferring to university. The key behavioural, normative and control beliefs identified by Epton et al. (2015) were; behavioural ''Health'', "Fitness", ''Stress relief'', and "Lack of time for study", normative ''Family'' and "Friends", and control "Access to range of facilities", ''Cost'', and "Time restrictions". Though these beliefs predicted intention, some beliefs did not; behavioural "Make friends", "Socialising", and "Time consuming", normative "Sporty people", and control "Poor/few facilities". It is worth noting that no beliefs predicted behaviour. Cowie and Hamilton (2014) found 21 beliefs correlated with intention (behavioural $n = 9$; normative $n = 5$; control $n = 7$) and nine beliefs correlated with behaviour (behavioural $n = 1$; normative $n = 1$; control $n = 7$). When entering these beliefs into a regression analyses, seven beliefs predicted intention (behavioural $n = 4$; normative $n = 1$; control $n = 2$) and five beliefs predicted behaviour (behavioural $n = 1$; normative $n = 1$; control $n = 3$). These key beliefs included "Give me the opportunity to socialise", "Take up too much time", "Health care professionals", and "Lack of motivation". Similar to the other studies undertaking this procedure, these key beliefs are those most important and to be targeted within an intervention. It is therefore important to follow up the elicitation study with a second study identifying key psychological targets.

3.3.1 Purpose of Study 2

The purpose of Study 2 was to identify key belief-based intervention targets by undertaking the second stage of formative research outlined within the TPB. The study used a hybrid approach by identifying the determinants associated with sports participation and, using the findings from Study 1, the key beliefs associated with the behaviour.

3.3.2 Method

3.3.2.1 Sample

Although a statistical power calculation was not undertaken to determine the required sample size, guidance was taken from the work of Francis et al. (2004) who suggest a sample of at least 80 participants would be acceptable for predictive studies using the TPB. Taking into consideration response rate, attrition and the size of the institution, contact was made with a number of lecturers within different disciplines (e.g. Sport, Media, and Psychology) to purposively recruit a diverse sample of first-year undergraduate students. These were the same subject areas used in Study 1 but from a different cohort. This sampling strategy resulted in a total of 206 participants (n = 88 males, 118 females; M = 19.04 years, SD = 2.35) providing consent and completing the questionnaire at baseline (T0).

3.3.2.2 Design and procedure

A prospective design was used with two waves of data collection. Once a convenient time was arranged with lecturers for data collection, participants were approached at the end of classes and asked to read the information sheet outlining the study purpose (see Appendix B1). Those agreeing to participate read and signed the informed consent form (see Appendix B2). Using the TACT principle, a behavioural definition was provided within the questionnaire and stated verbally. This definition was ‘participation in university sport for at least 30 minutes, once a week, during the next month’. Similar to Study 1, the precise meaning of recreational university sport and how this differed from other variants of sport was also given, including examples of the former. Participants completed the questionnaires in silence and participation lasted no longer than 15 minutes. Questionnaires were collected after completion and participants were reminded that they would be contacted again using their provided email address four weeks later (T1) to respond to the follow-up behaviour questionnaire. Once the behavioural questionnaire was returned at T1, participants were thanked for their participation and provided a debrief sheet (Appendix B3). Pseudo codes were used to match T0 and T1 questionnaires and thus ensure anonymisation. Ethical approval for the study was gained from the University ethics board (Ref: SSHS/2016/015).

3.3.2.3 Measures

TPB constructs were assessed in accordance with standard procedures (Ajzen, 1991). The instrument included direct items measuring the major determinants and indirect items measuring the beliefs identified in Study 1 (see Appendix B4). All items used 7-point Likert scales unless stated otherwise. Measures of demographic characteristics were also taken: Age, gender, year of study, and subject area of study.

Five items measured attitude (e.g. For me, participating in university sport at least once per week would be, Bad-Good, Cronbach's $\alpha = .92$), five items measured SN (e.g. People who are important to me think I should participate in sport at university, Disagree-Agree, Cronbach's $\alpha = .95$), seven items measured PBC (e.g. For me, participating in sport at university would be, Very difficult-Very easy, Cronbach's $\alpha = .86$), three items measured intention (e.g. I intend to participate in sport at university, Strongly agree-Strongly disagree, Cronbach's $\alpha = .96$), and one item measured past behaviour (e.g. Please indicate the number of weeks you have performed sport at university for at least 30 minutes, once a week, within the past month, 0-4).

Indirect items included the expectancy arm only rather than a multiplicative approach due to utility and measurement concerns regarding the value component (French & Haskins, 2003; Gagné & Godin, 2000). Behavioural beliefs were presented as statements and participants rated how strongly they agreed with each statement (e.g. For me, participating in sport would enable me to meet new friends, Strongly disagree-Strongly agree). Normative beliefs comprised of injunctive and descriptive aspects and participants were again asked whether they agreed with the statements (e.g. My friends think that I should participate in sport at university, Strongly disagree-Strongly agree). To measure control beliefs, participants were asked to identify whether certain factors would influence the likelihood of them carrying out the behaviour (e.g. How much would a lack of time make you more or less likely to participate in sport at university, Less likely-More likely).

Three items measured behaviour at T1. Two items used 7-point Likert scales (e.g. During the past month, how often did you perform sport at university at least once per week, for 30 minutes, Never-Almost always) and one item required participants to identify the number of weeks the behaviour was performed (scored 0 weeks – 4 weeks, Cronbach's $\alpha = .97$). The three items were converted to z-scores and were then summed and averaged to provide one overall behaviour score.

3.3.2.4 Statistical analysis

3.3.2.4.1 Validity checks

All statistical analyses was undertaken with IBM SPSS (version 21.0). To confirm the validity of the indirect items, bivariate Spearman's rank-order correlations were conducted between direct and indirect measures. Specifically, the average of the belief-based indicators (e.g. behavioural, normative, and control) were correlated with the average of the corresponding direct construct (e.g. attitude, SN, and PBC). According to the TPB, significant correlations should be found between belief-based measures and global constructs (Ajzen, 1991).

3.3.2.4.2 Direct and indirect items

For both analyses, negatively worded items were reversed when required, meaning lower responses represented negative perceptions and higher scores reflected positive perceptions. The mean of each direct item representing the same construct were summed and averaged to give an overall score for each construct. A descriptive analysis of means, standard deviations (SD) and Spearman's rank-order correlations between TPB determinants, intention and behaviour was then conducted. Following this, a hierarchical multiple regression was conducted between attitude, SN and PBC in relation to intention (step 1) and past behaviour (step 2). A multiple linear regression was then conducted between intention and PBC in relation to behaviour.

The results of direct constructs were taken as informative, rather than determining the analyses of key beliefs. Instead, key beliefs were identified using guidelines of von Haeften, Fishbein, Kasprzyk, and Montano (2001) and Hornik and Woolf (1999). Spearman's rank-order correlations were used to identify the beliefs significantly correlating with intention and behaviour. Those beliefs significantly correlating with intention and behaviour were then entered into a multiple linear regression to identify the beliefs independently predicting the outcome variables. von Haeften et al. (2001) suggest intention should be used as the dependent variable for identifying key beliefs. However, the presence of a belief-behaviour relationship is fundamental to the development of an intervention targeting beliefs (Rhodes, Courneya, Blanchard, & Plotnikoff, 2007; Sutton, 2002). As such, the study used the beliefs independently predicting both intention and behaviour as the key beliefs. Finally, a

decision as to whether the belief could be changed was made as, according to Hornik and Woolf (1999), it must be feasible to alter the belief.

3.3.3 Results

3.3.3.1 Preliminary analyses

3.3.3.1.1 Participant characteristics

206 participants completed T0 questionnaires and 95 participants completed questionnaires at T1 (46.1% completion). This exceeded the sample size suggested by Francis et al. (2004). Table 3.2 shows the descriptive statistics for the full sample.

3.3.3.1.2 Missing data

To check whether there were any differences between those participants completing T1 questionnaires and those not, a MANOVA was conducted with age, attitude, SN, PBC, intention, past behaviour, behavioural beliefs, normative beliefs, and control beliefs as the dependent variables and status of participation (completers and non-completers) as the independent variables. There were no significant differences, $F(21, 184) = .34$; Wilks' $\Lambda = .93$, $p = .92$; $\eta p2 = .06$. A chi-square test also revealed no significant differences between status of participation and gender, $\chi^2 (1, N = 206) = .02$, $p = .86$.

3.3.3.1.3 Validity checks

The means of the underlying behavioural and normative beliefs were significantly correlated with attitude ($r_s (204) = .61$, $p < .001$) and SN ($r_s (204) = .58$, $p < .001$). This confirms the association between indirect measures and the corresponding construct. However, there was no significant correlation between control beliefs and PBC ($r_s (204) = .12$, $p < .1$).

3.3.3.1.4 Distributional properties, descriptive statistics and correlation matrix

Data was non-normally distributed and so Spearman's correlation coefficients were used. Descriptive statistics and correlations are shown in Table 3.3. Participants had a moderate level of intention ($M = 3.77$, $SD = 1.89$). Attitude, SN, and PBC showed significant positive correlations with intention, with attitude and SN correlating most

strongly with intention (r_s (204) = .67, p < .001). Intention was significantly correlated with behaviour (r_s (93) = .51, p < .001).

3.3.3.2 Predicting recreational sports participation intentions and behaviour

A hierarchical multiple regression showed attitude, SN, and PBC significantly predicted intention, explaining 56% of the variance, F(3, 202) = 87.81, p < .001. At step 2, past behaviour increased the model's prediction to 71%, F(4, 201) = 125.66, p < .001 (see Table 3.4). A multiple linear regression showed intention and PBC explained 27% of the variance in behaviour (see Table 3.5), F(2, 92) = 18.98, p < .001, although PBC was not significant.

3.3.3.3 Key belief analysis

Means, SD, and correlations with intention and behaviour are shown in Table 3.6. Significantly correlated beliefs were then entered into a multiple regression. Table 3.7 shows the key beliefs that independently predicted intention and behaviour.

3.3.3.3.1 Intention

All beliefs significantly correlated with intention: six behavioural beliefs (r_s (204) = -.25 to .66), five normative beliefs (r_s (204) = .25 to .58), and four control beliefs (r_s (204) = -.19 to -.23). Multiple regression analyses identified two behavioural beliefs ('Enjoyable' (β = .58) and 'Time consuming' (β = -.23)) and three normative beliefs ('Friends'; injunctive (β = .21), 'Friends'; descriptive (β = .17), and 'Family'; injunctive (β = .33)) as key beliefs relating to intention.

3.3.3.3.2 Behaviour

Two behavioural beliefs (r_s (93) = -.26, and .33), and five normative beliefs (r_s (93) = .18 to .30) significantly correlated with behaviour. No control beliefs significantly correlated with behaviour. Multiple regression analyses identified both behavioural beliefs ('Enjoyable' (β = .28) and 'Time consuming' (β = -.27)) as key beliefs relating to behaviour. None of the significantly correlated normative beliefs predicted behaviour.

Table 3.2. *Descriptive statistics of study participants*.

Demographic		(*N* = 206)	Percentage (%)	*M*	*SD*
Age (years)				19.04	2.35
Sex	Male	88	42.7		
	Female	118	57.3		
Area of study	Business	30			
	Childhood Studies	37			
	Film and Television Production	25			
	Media	22			
	Philosophy, Ethics and Religion	12			
	Physical Education and Sports Coaching	31			
	Psychology	30			
	Sport, Exercise, Health and Nutrition	19			

Table 3.3. *Descriptive statistics of sports participation: Bivariate correlations, means, and SD of TPB variables (attitude, SN, and PBC), past behaviour, intention (N = 206) and behaviour (n = 95).*

Variable	2.	3.	4.	5.	6.	*M*	*SD*
1. Attitude	.60***	.48***	.67***	.46***	.36***	5.24	1.20
2. SN		.42***	.65***	.49***	.28**	4.43	1.20
3. PBC			.54***	.47***	.32**	4.65	1.06
4. Intention				.71***	.51***	3.77	1.89
5. Past behaviour					.61***	1.14	1.53
6. Behaviour						0.00	0.97

Note. $^{**}p < .01$, $^{***}p < .001$

Table 3.4. *A hierarchical multiple regression analyses of attitude, SN, PBC (step 1) and past behaviour (step 2) on intention (N = 206).*

	Variable	B	*B*	R^2	Adjusted R^2	Δ R^2
			Criterion: Intention (*N* = 206)			
Step 1:	Attitude	.47	.30***	.56***	.56***	.56***
	SN	.51	.32***			
	PBC	.48	.27***			
Step 2:	Attitude	.38	.24***	.70***	.70***	.14***
	SN	.29	.18***			
	PBC	.19	.11*			
	Past behaviour	.60	.48***			

Note. *$p < .05$, ***$p < .001$

Table 3.5. *Multiple regressions of intention and PBC on behaviour (n = 95).*

Variable	B	*B*	R^2	Adjusted R^2
		Criterion: Behaviour (*n* = 95)		
Intention	.25	.46***	.29***	.27***
PBC	.11	.11		

Note. ***$p < .001$

Table 3.6. *Means, SD, and correlations of behavioural, normative, and control beliefs related to university students' sporting participation*.

Beliefs	M (SD) Total (*N* = 206)	Intention (r_s) Total (*N* = 206)	Behaviour (r_s) Total (*n* = 95)
Behavioural beliefs			
Health and fitness	5.46 (1.43)	.35***	.11
Enjoyable	4.67 (1.58)	.66***	.33**
Opportunities to meet new friends	5.26 (1.41)	.40***	.05
Improves mental well-being	4.72 (1.57)	.45***	.20
Time consuming	2.91 (1.49)	-.28***	-.26**
Study distractions	3.71 (1.55)	-.25***	-.13
Normative beliefs			
Friends (injunctive)	4.00 (1.74)	.58***	.27**
Family (injunctive)	4.25 (1.89)	.58***	.30**
Academic staff (injunctive)	3.60 (1.85)	.40***	.20*
Friends (descriptive)	3.27 (1.85)	.42***	.18*
Academic staff (descriptive)	3.12 (1.56)	.25***	.18*
Control beliefs			
Time restrictions	3.14 (1.76)	-.21**	-.00
Lack of motivation	3.15 (1.49)	-.23**	-.10
Study related	3.25 (1.83)	-.19**	-.01
Awareness	3.32 (1.81)	-.23**	-.14

Note. *$p < .05$, **$p < .01$, ***$p < .001$

Table 3.7. *Summary of the multiple regression analyses predicting intention and behaviour from beliefs*.

	Key beliefs	β	R^2	Adjusted R^2
Intention	Behavioural beliefs		.49	.47
(N = 206)	Health and fitness	.04		
	Enjoyable	.58***		
	Opportunities to meet new friends	-.09		
	Improves mental well-being	.11		
	Time consuming	-.23***		
	Attention taken away from studies	-.06		
	Normative beliefs		.41	.39
	Friends (injunctive)	.21*		
	Family (injunctive)	.33***		
	Academic staff (injunctive)	.07		
	Friends (descriptive)	.17*		
	Academic staff (descriptive)	-.05		
	Control beliefs		.07	.05
	Time restrictions	-.07		
	Lack of motivation	-.14		
	Study related	-.05		
	Awareness	-.16		
Behaviour	Behavioural beliefs		.16	.14
(n = 95)	Enjoyable	.28**		
	Time consuming	-.27**		
	Normative beliefs		.14	.09
	Friends (injunctive)	-.00		
	Family (injunctive)	.26		
	Academic staff (injunctive)	.04		
	Friends (descriptive)	.03		
	Academic staff (descriptive)	.16		

Note. *p < .05, **p < .01, ***p < .001

3.4 General discussion

The purpose of Study 1 was to identify the modal salient behavioural, normative, and control beliefs relating to first-year university students' participation in recreational sport. Following this, Study 2 identified the key beliefs associated with recreational sports participation and examined the influence of the TPB's constructs.

3.4.1 Behavioural beliefs

The modal salient behavioural beliefs identified in Study 1 suggest students are aware of the health, fitness and mental benefits of sport, believe participation to be enjoyable, and perceive recreational sport to provide an opportunity to develop friendships with other students. Results also showed the time required to participate in recreational sport and the potentially negative impact that participation can have on academic study were disadvantages to participation. The correlation between all behavioural beliefs and intention within Study 2 suggests a number of attitudinal factors influence student participation in recreational sport. More pertinently, Study 2 revealed two specific key behavioural beliefs predicting intention and behaviour. Participation in recreational sport has been found to be underpinned by factors of enjoyment (Cooper et al., 2012; Webb & Forrester, 2015), thus it is not surprising this was a significant behavioural belief. Indeed, these types of campus recreational activities provide students with a fun experience outside of academic study (Forrester, 2015). The key belief relating to time constraints is also unsurprising given a lack of time has been found to be the most important barrier to participation in recreational activities (Spivey & Hritz, 2013; Young et al., 2003). Indeed, first-year students have the choice of many academic and social activities whilst also making significant life transitions and adapting to new environments (Bray & Born, 2004).

The majority of the modal behavioural beliefs identified in Study 1 share similarities with those identified in PA elicitation studies (e.g. Cowie & Hamilton, 2014; Epton et al., 2015). For example, Epton et al. (2015) found a behavioural belief related to the potential to make friends. However, the subsequent key beliefs identified within these studies were attributed to health and fitness. With this not found in the present study, this suggests that health-related perceptions exert greater influence in PA than participation in recreational sport. It is also interesting to note that perceptions of competition and tangible incentives were not identified within the present studies. This supports the assertion that beliefs differ with regards to the nature of sport on offer

(Chatzisarantis & Hagger, 2007; Fortier et al., 1995; Sturts & Ross, 2013). For example, Sturts and Ross (2013) found perceptions towards recreational sports participation were not influenced by whether the students were part of the winning team. Findings from the current study suggest participation in recreational sport were influenced by factors of enjoyment rather than elements of competition and performance mastery.

3.4.2 Normative beliefs

Study 1 identified friends, family members, and academic staff as either approving or disapproving recreational sports participation. Due to the social opportunities recreational sport provides, particularly for those students adjusting to life in their first academic year, it is not surprising that friends were mentioned. This could be because these referents are whose opinion matters most during this period. Indeed, the opinion of friends, whether that be approving or disapproving, is likely to exert influence over whether recreational sport is undertaken. More specifically, students are more likely to participate in recreational sport if friends approve and less likely to participate if friends disapprove. Similar to the influence of friends, family members were also found to both approve and disapprove of sports participation. Students are still adjusting to university during this period and, similar to PA (Cowie & Hamilton, 2014; Epton et al., 2015), clearly still exert some influence. Academic staff members were perceived to be a normative influence but, unlike the influence of friends and family members, this influence was only disapproving of the behaviour. It could be that students may believe staff members would rather they engaged in work-related studies. Within other extra-curricular classes, it is common for such referents to be perceived as being negative (Anderson et al., 2013). This referent was not mentioned as being disapproving within the other PA elicitation studies, perhaps because PA can be undertaken outside of the university setting. The activities students undertake off campus may not be influenced by academic staff members. In contrast, those activities undertaken within the university setting may be influence by these referents. With that said, Sniehotta (2009) did not identify academic staff as an influential referent to participate in activities requiring the use of university facilities.

Study 2 found all three referents to correlate with intention and behaviour. However, only two referents predicted intention and were thus identified as key beliefs. The approval of both friends and family members suggests these referents exert significant influence on students' decision to participate in sport. It was previously

stated how the perception of these significant others can exert influence over whether students participate in recreational sport. Doing what family members and friends would approve of appears to be influential in this decision. Additionally, the behaviours of others, specifically that of friends, was also identified as a key belief. Due to the opportunities recreational sport provides for social interactions (Bucholz, 1993; Sturts & Ross, 2013), particularly amongst those students adjusting to life in their first academic year, this suggests students may only participate in this type of sport if they believe friends do also.

It is important to recognise some of the referents not suggested to have influence on students' decision to participate in sport. For example, students did not perceive sports coaches or teammates to neither approve nor disapprove of participation. Thus, rather than being influenced by referents such as teammates or gym users (Sniehotta, 2009), the study suggests that different normative beliefs underpin recreational sport. More specifically, such referents relate to friends and the sense of campus community developed from such recreational sports (Elkins et al., 2011) and the influence of family members.

3.4.3 Control beliefs

With regards to the control beliefs, Study 1 identified four beliefs within the modal set, with two beliefs identified as both facilitators and inhibitors. Study 2 found all four beliefs correlated with intention, although none were predictive of intention or behaviour. This suggests participation in recreational sport is influenced by behavioural and normative factors rather than issues of control. Nevertheless, studies should still ensure students hold positive perceptions of control, particularly related to the specific control beliefs identified in the studies.

Given students making the transition into university are not familiar with their surroundings and are presented with vast amounts of information, it is important students they are aware of the recreational sports on offer (Masmanidis et al., 2009). If the availability of recreational sports is not communicated, students are less likely to participate. Thus, organisers of recreational activities should ensure their programmes are advertised appropriately (Masmanidis et al., 2009). Students felt they lacked the time to participate in recreational sport. This is a common factor within other recreational activities such as using university sports facilities (Sniehotta, 2009) and engaging in PA (Epton et al., 2015; Bellows-Riecken et al., 2013). Study workloads

were also a factor of control in that students believed the volume of work required impedes sports participation. Given students were new to higher education, it could be that this period of time prevents participation. As workloads vary across the time of year and there is likely to be peak times, this may not be an issue at other times. Cowie and Hamilton (2014) found study commitments to be the most salient control belief in new students' decision to participate in PA. Thus, there exists similarities regarding this barrier between behaviours. Finally, the unpredictable nature of first year study and the availability of other activities may lead motivation towards recreational sports participation to fluctuate. Similar to Cowie and Hamilton (2014), it could be that the transition into university leaves students feeling demotivated. Thus, it should be ensured that students' motivation to participate does not decrease (Cowie & Hamilton, 2014).

It is interesting to note that feelings of embarrassment were not identified in Study 1, as was the case within recreational facilities (e.g. Sniehotta, 2009). This may be due to the nature of recreational sports participation, with students not too concerned about how they are perceived. Beliefs regarding the cost of recreational sport were also not elicited, perhaps because this sport is inexpensive.

3.4.4 Can these beliefs be changed?

In addition to identifying the key beliefs, it is also important to establish whether there is scope to change the beliefs (i.e. there is no ceiling effect) and whether it is actually possible to change the beliefs (Hornik & Woolf, 1999). As the behavioural belief related to issues of time showed a low mean score (mean = 2.91 out of 7), there is clear room to improve this belief within interventions. However, the mean score concerning the enjoyable nature of recreational sport was above the scale mid-point (mean = 4.67 out of 7) which perhaps suggests students already hold this belief. Despite this, the belief did demonstrate the lowest mean score when compared to the other behavioural belief advantages. This suggests the belief is a fruitful target for intervention as other advantages of recreational sport are perceived more strongly amongst the population. Regarding the normative beliefs, the low mean score of perceptions of friends' rates of participation (mean = 3.27 out of 7) suggests this belief has scope for improvement within an intervention. Moreover, the approval of both friends and family members demonstrated mean scores around the mid-point, with scores of 4 and 4.25 gained (out of 7), respectively. This suggests that interventions targeting the perceptions of these referents have room to manipulate the key normative beliefs.

Compared to the decision about the scope for change that can be made quantitatively, judging the possibility of changing the beliefs is a decision made subjectively (Hornik & Woolf, 1999). That is, it is a personal decision made by the researcher as to whether the identified beliefs are amenable to change. Changing perceptions of the enjoyable nature of recreational sport may prove possible given students in their first year of study would lack previous experience of participating in this type of sport at university. Thus, given students would not necessarily be aware of the positive experiences that could be achieved from participation and would perhaps equate previous experiences of sport with competitive sport, interventions may find it possible to alter this belief. Given the many responsibilities students have, particularly in the first year of study, it is evident why a lack of time may be a concern. However, due to the fact students are experiencing new situations, these beliefs (potentially inaccurate) may be modifiable, potentially through time management strategies (McDermott, Oliver, Iverson, & Sharma, 2016). Finally, students may be unaware of those who participate in recreational sport, especially given the novelty of this type of sport. The same reasoning can be given for the approval of family members and friends. That is, since recreational sport is novel, students may incorrectly perceive these referents to not approve. Thus, interventions providing normative information about the participation and approval of significant referents could effectively attend to the identified normative beliefs.

3.4.5 Direct constructs

In terms of the direct constructs, attitude, SN, and PBC significantly correlated with intention, with attitude correlating most strongly. The regression analysis showed intention to be significantly predicted by all three variables, with attitude, SN, and PBC explaining 56% of the variance in intention. This finding is slightly higher than previous studies (e.g. Armitage & Conner., 2001; Hagger et al., 2002). SN contributed mostly to the prediction of intention, followed by attitude and PBC. The finding that SN had a larger beta weight and PBC the smallest is somewhat surprising given that PBC, along with attitude, have been found to exert greater influence in health-related behaviours compared to SN (e.g. Armitage & Conner, 2001; Hausenblas et al., 1997), including participation in competitive sport (Gucciardi & Jackson, 2015). There are a number of explanations for this finding. First, it could be that students' participation in recreational sport is influenced more by normative factors than attitude and PBC. Students making

the transition to university are entering unfamiliar environments, forming new behaviours and developing new social bonds. Consequently, these students may be influenced more by what others think they should be doing and what others are doing themselves than their evaluations of the behaviour and perceptions of control. The fact recreational sport promotes informal activities, provides a place for friends to interact and allows new friendships to be formed may elevate the importance of SN. Second, the study utilised both injunctive and descriptive norms, with prior studies having predominantly utilised only the latter. The limited predictive validity of the construct may have been restricted in past studies by only examining what others think one should do (injunctive norms) and not what others do themselves (descriptive norms) (Ajzen, 2002). This would have led to an underestimation of the influence of SN. Finally, the intercorrelations between constructs (Ajzen, 1991) could have reduced the influence of PBC and attitude within the regression analysis

The significant correlation between intention and behaviour suggests the former is a fruitful determinant to target. The variance explained by intention and PBC is in line with prior studies who have typically found the determinants to account for 25%-36% of the variance in behaviour (Armitage & Conner, 2001; Hagger et al., 2002). Although PBC did not predict behaviour and showed a low beta weight, the construct did significantly correlate with behaviour. As such, the correlation between PBC and behaviour suggests there is some influence and this influence within the regression analysis may have decreased due to its moderate correlation with intention.

3.4.6 Study implications

Findings from the studies suggest that intervention promoting students' participation in recreational sport should target attitude, SN, and PBC. Intentions to participate could change more readily if SN is targeted and successfully influenced through intervention. The studies suggest the development of an intention may lead to behaviour, given relevant control. Intervention efforts should therefore seek to alter students' intentions to participate in recreational sport whilst also limiting the number of barriers to participation. More pertinent to behaviour change efforts and the present thesis, the studies identified specific intervention targets through the key behavioural, normative, and control beliefs associated with recreational sports participation. Key beliefs related to the enjoyable nature of sport, the approval of friends and family, and the prevalence of time constraints. Intervention efforts should therefore ensure recreational sport is

enjoyable and that students are aware of this outcome. Furthermore, interventions should also ensure students recognise that friends and family members approve of their participation and efforts should be made to ensure students are aware that other people relatable to them participate. Finally, interventions should ensure students do not perceive participation in recreational sport to consume a significant amount of time. If these beliefs are successfully manipulated, universities could witness an increase in the number of first-year students participating in recreational sport.

3.4.7 Strengths and limitations

There are a number of strengths attached to the two studies. The main strength of the studies was the adoption of a relevant theoretical framework to identify specific belief-based intervention targets. The majority of studies using the TPB to develop behavioural interventions fail to undertake the relevant formative research and thus may not necessarily target appropriate beliefs. This work is vital for the development of behaviour change interventions. Second, the behaviour of interest was one that, despite its many benefits, has received little theoretical attention. Third, the studies targeted a subgroup of the student population that despite often undertaking unhealthy behaviours, are amendable to change. Indeed, students transitioning to university are in the process of developing behavioural habits and interventions intervening during this period can thus have significant health benefits.

Despite these strengths, the studies are not without limitations. First, the designs adopted meant casual statements cannot be made (Weinstein & Rothman, 2005). Experimental work is needed to provide this evidence. Second, the studies identified beliefs within a small number of degree programmes which limits the representativeness. Relatedly, the findings may not generalise to other institutions and it is possible that other universities offering recreational sport have different modal and key beliefs. Third, the studies did not identify whether there were any meaningful differences between the degree programmes studied. As the purpose of the studies was to identify beliefs representative of the student population, analysis of individual degree courses was not of importance. If a specific course of study is of interest (i.e. English), it would be best to undertake the elicitation procedure with that specific population. Fourth, Study 1 used a 30% cut off criteria to identify the modal set which meant the beliefs not meeting this criterion were omitted from the final modal set. There is currently no specific cut-off for selecting the modal set and Study 1 did use a cut-off

commonly used by similar prior studies (i.e. 30%). The beliefs not meeting the modal set could still be used in future research as infrequent beliefs could provide important information regarding sports participation. Fifth, the sample size within Study 2 at T0 was small, with attrition at T1 (53.9%) resulting in a smaller number of participants eligible for full analysis. Nevertheless, the study exceeded the minimum sample size suggested by Francis et al. (2004). Sixth, self-report was used to measure behaviour in Study 2. Discrepancies between self-report and objective measures have been identified (Basterfield et al., 2008), and McEachan et al. (2011) found the TPB explained more variance in studies adopting self-reported measures of behaviour compared to studies using objective measures. Therefore, accurate accounts of recreational sport may not have been gained in Study 2. Seventh, Study 2 only considered the expectancy arm of beliefs, rather than both expectancy and value components. Although the multiplicative approach and expectancies often show no significant difference (Chan et al., 2015), there is the possibility that the value component within some beliefs did not align with the expectancy component. For example, students may be unaware that family members approve of their participation in recreational sports, yet simply do not value their opinion. In this case, interventions encouraging students that such referents support the behaviour would prove ineffective, despite the referent identified as a key target. Finally, it was previously mentioned that there is no definitive way to identify beliefs when using the TPB (Fishbein et al., 2001). Indeed, rather than identifying key beliefs using the correlational and regression approach adopted in Study 2, these beliefs can be identified in different ways. For example, Fishbein and Ajzen (1975) suggest *all* salient beliefs underlying an important determinant should be given attention. In this case, a study identifying intention to be significantly predicted by attitude and PBC would subsequently address the salient underlying behavioural and control beliefs. Further, studies have identified the beliefs that best discriminate between (higher) intenders and (lower) non-intenders or those that perform the behaviour and those that do not. The beliefs discriminating between the two groups are then targeted for intervention. However, these approaches are not without problems. In relation to the first approach, a weak regression may correctly indicate that a determinant does not explain variance in intention, but it may also be a consequence of the intercorrelations among the predictor variables (Fishbein & Cappella, 2006). A determinant not found to significantly correlate or predict intention may still have influential underlying beliefs. In relation to the second approach, the intention variable is required to be split in order for

discriminate analysis to be conducted. However, when the scale is arbitrary dichotomised intention is no longer a continuous variable, and dichotomising a continuous scale also leads to a loss of variance and statistical power (Altman & Royston, 2006). Thus, after considering these limitations, Study 2 adopted an approach that has been recently used (e.g. Bassett-Gunter et al., 2015; Cowie & Hamilton, 2014; Epton et al., 2015; Hamilton et al., 2012; Spinks & Hamilton, 2015; Vayro & Hamilton, 2016; White et al., 2015).

3.5 Conclusion

The purpose of Studies 1 and 2 was to gain an understanding of the psychological mechanisms underlying first-year university students' perceptions towards participation in recreational sport. To achieve this, the studies undertook the formative research suggested within the TPB. This work is important when the theory is adopted to develop an intervention targeting behaviour change. Findings suggest that successfully targeting attitude, SN and PBC could be advantageous in changing intentions to participate in recreational sport. More pertinent to the development of a behaviour change intervention, the studies provide support for the TPB in highlighting specific key belief targets concerning recreational sports participation. Interventions that are developed to target beliefs related to the enjoyable nature of recreational sport, the perceptions of significant referents, and the time constraints towards participation could lead to an increase in the number of first-year students participating in recreational sport.

Chapter 4 **Informing the content of a behaviour change intervention targeting recreational sports participation (Study 3)**

4.1 Introduction

This chapter presents Study 3 which aimed to elicit relevant information for an intervention targeting student participation in recreational sport. More specifically, Study 3 identified the reasons and proposed solutions to changing the key beliefs identified in Study 2. The study also identified BCTs that could be included within an intervention to change these beliefs. Before the study is presented, a study introduction is given which includes limitations of previous studies identifying relevant BCTs and provides an alternative method of obtaining this information. Following this, studies identifying additional information for intervention through eliciting the reasons and solutions to key beliefs are outlined and Study 3 is then presented.

4.2 Study 3: Identifying the reasons, solutions and BCTs applicable to the identified key beliefs

Using the TPB as a theoretical framework for intervention development, Studies 1 and 2 identified the key beliefs underlying students' recreational sports participation. Participation was found to be influenced by five key beliefs (two behavioural beliefs and three normative beliefs). It was noted in Chapter 2 that the TPB provides relatively little guidance on the strategies that could be used to change psychological targets. Thus, despite identifying 'what' to change, the TPB does not provide much in terms of 'how' to do so (Sniehotta et al., 2014). This poses problems for the development of an intervention targeting relevant psychological processes. Specific to the thesis, it is not clear how an intervention should be developed to manipulate the key beliefs underlying students' participation in recreational sport. However, Chapter 2 also outlined how the introduction of BCTs and taxonomies of BCTs has enabled an understanding of the types of ingredients that interventions could incorporate to change psychological processes (Michie et al., 2013). Reference was made to contemporary research attempting to understand the BCTs effective in changing specific psychological mechanisms. The relation between BCTs and psychological processes can be understood using direct (i.e. experimental research and meta-analyses) and indirect (i.e. consensus studies) methods, with research to date predominantly using the latter. For example, through this process it was noted how researchers agreed that 'Beliefs about

consequences' can be influenced by 'Persuasive communication' (Michie et al., 2008). Given that this body of work provides suggestions for the BCTs that interventions should incorporate, it could prove helpful in identifying relevant BCTs targeting the identified key beliefs in Study 2. A persuasive strategy could, for example, be used to alter students' behavioural beliefs (evaluative or likelihood) towards recreational sport (i.e. Enjoyment).

Although these indirect methods have enabled significant developments in health psychology (Michie et al., 2017), they can be questioned for a number of reasons. First, a Delphi-type exercises, rather than an evidence base, may not result in accurate links between BCTs and psychological mechanisms. There could be BCTs suggested to change determinants that are not effective. Conversely, BCTs not suggested to be effective could be relevant. As an example of the former, Prestwich et al. (2014) found no support for the use of setting graded tasks to increase self-efficacy, despite Michie et al. (2008) suggesting this BCT would be effective. Second, the links between BCTs and psychological mechanisms have not always reached consensus within these studies. In fact, Connell et al. (2018) disagreed on the majority of links between BCTs and mechanisms; 1,032 were disagreed, 90 were agreed to exist, and 464 were agreed to not exist. As such, clarity is lacking amongst experts as to which BCTs are effective in altering different psychological processes. Third, many BCTs have been suggested to change each domain within these approaches. For example, Michie et al. (2008) agreed a total of nine BCTs could be used to target the domain "Motivation and goals". Similarly, Carey et al. (2018) found "Beliefs about capabilities" could be targeted using seven BCTs (i.e. "Graded tasks", "Verbal persuasion about capability", "Focus on past success", "Demonstration on the behaviour", "Problem solving", "Behavioural practice/rehearsal", and "Reduce negative emotions"). Although this provides many options for those designing interventions, the availability of many BCTs makes it difficult to identify which should be selected for intervention. Fourth, these links are not specific to behaviours and populations (Carey et al., 2018). Thus, BCTs hypothesised to effectively change psychological mechanisms may be successful in one behaviour (i.e. medication adherence) but not another (i.e. recreational sport). Similarly, a BCT may influence a mechanism in one population (i.e. students) but not another (i.e. the elderly). Finally, these studies used the Theoretical Domains Framework (Cane et al., 2012) to categorise psychological determinants (i.e. Beliefs about consequences), rather than targeting specific beliefs (i.e. Enjoyment).

4.2.1 Understanding the participants' perspective

Given these issues, it is not clear which BCTs should be used to target the key beliefs identified in the previous studies. Establishing the BCTs that could attend to the key beliefs is important to maximise the likelihood of a successful behavioural intervention being developed. Williams, Michie, Dale, Stallard and French (2015) noted that a lack of effect for their intervention could have been a consequence of the BCTs included. Clarity is needed in order for the intervention to include effective strategies. Recent research has suggested that interventions promoting health behaviours should consider the preferences and needs of the target population (Bartholomew et al., 2006; Schoberer, Breimaier, Mandl, Halfens, & Lohrmann, 2016; Whittaker, Merry, Dorey, & Maddison, 2012). Related specifically to BCTs, many studies have identified potentially useful BCTs from the perspective of the population under investigation (e.g. Arnautovska, O'Callaghan, & Hamilton, 2018; Currie, Gray, Shepherd, & McInnes, 2016; Hamilton & White, 2014; Smith, Taylor, & Lavender, 2016; Tombor, Neale, Shahab, Ruiz, & West, 2015; Van Dyck et al., 2019).

The majority of these studies examined PA in different subgroups such as older adults (Arnautovska et al., 2018), parents (Hamilton & White, 2014), adolescents (Van Dyck et al., 2019), and pregnant women (Smith et al., 2016). Hamilton and White (2014) found strategies elicited by parents included 'Persuasive messages', 'Goal setting', and 'Social support'. Van Dyck et al. (2019) found adolescents had preferences towards 'Goal setting', 'Feedback on behaviour', 'Information on consequences of the behaviour' and 'Self-monitoring', amongst others. Smith et al. (2016) elicited the BCTs that influenced postnatal women's PA and eating behaviours. These BCTs included 'Social support', 'Prompts/cues', and 'Self-monitoring'. This type of research provides an understanding of how acceptable an intervention would be received (Currie et al., 2016) as well as relevant BCTs that could be included. Adopting this approach could provide an important step in developing an intervention promoting student participation in recreational sport. More specifically, gaining the opinions of a representative student sample could help identify the BCTs that could effectively target the key beliefs identified in Study 2.

4.2.2 Reasons and solutions

Although this type of research can facilitate in understanding the types of ingredients that should be included within an intervention, little advice is provided in terms of the

content that should be included within the BCTs. For example, “Persuasive communication” can be used to change “Beliefs about consequences” but it is not clear what specific information the message should comprise. That is, the actual content of the persuasive message is lacking. To address this gap and provide avenues for shaping the content of health messages, two studies have identified the “reasons” for and “solutions” to identified key beliefs (e.g. Epton et al., 2015; Vayro & Hamilton, 2016).

Epton et al. (2015) required participants to provide up to three reasons for each of the key beliefs relating to PA and to rate the importance of these responses. A total of 24 reasons were found with nine reasons relating to behavioural and normative beliefs and six reasons relating to control beliefs. Reasons for the health benefits of PA (behavioural belief) included the reduced risk of disease, the improvement in well-being, and the maintenance of a healthy weight, with the former mentioned the most frequently. Regarding the approval of family members (normative belief), reasons related to the health benefits of PA, the potential to improve well-being, and because participation helps avoid unhealthy things. Solutions to the cost of participation included undertaking activities that were free such as running and cycling.

The second study, although not specifically targeting PA or related behaviours, nevertheless identified important information to previously identified psychological targets. Concerning truck drivers’ fruit and vegetable consumption and discretionary choices, Vayro and Hamilton (2016) identified 40 reasons and solutions to the key beliefs underpinning these behaviours. Reasons why wives or partners (normative belief) may approve fruit and vegetable consumption included the possibility to live longer, the health benefits gained and the cost-effectiveness of the foods. Solutions to a lack of organisation (control belief) included purchasing fruit and vegetables whilst shopping, planning in advance, having the items prepared, storing the items in the truck, and ensuring they are accessible. In relation to limiting discretionary choices, reasons why doing so leads to better nutritional intake (behavioural belief) were because less healthy foods would be consumed and one would eat healthy instead. Solutions to a lack of convenience (control belief) included reducing access, preparing and taking healthy food, refraining from purchasing unhealthy food, and increasing healthy food at truck stops.

The purpose of these two pieces of work was to provide additional information to be included within the main intervention. That is, reasons can be used to explain the cognitions underlying the behaviour of interest (Norman, Conner, & Stride, 2012).

Epton et al. (2013) subsequently targeted the normative belief of family members by stating “Your parents think you should exercise as it reduces the risk of developing major chronic diseases”. Similarly, the behavioural belief pertaining to well-being was targeted by stating “Exercise improves well-being - active people are at a lower risk for psychological distress, anxiety and depression”. Although Vayro and Hamilton (2016) did not undertake the main intervention, suggestions were made as to the content of messages. For example, to target the approval of wives (normative belief), a health message was suggested to include “Your wife would want you to eat fruit and vegetables to live longer”. Undertaking a similar study can identify important information for an intervention targeting student participation in recreational sport. More specifically, identifying the reasons and solutions to the key beliefs identified in Study 2 can provide crucial information to supplement the content of a behavioural intervention.

4.2.3 Summary

Taxonomies of BCTs have enabled potentially influential change strategies to be identified. However, recent attempts to map BCTs to psychological processes using indirect approaches are not without problems. For example, there exists discrepancies amongst experts regarding the most useful BCTs and there are many BCTs to select from. It should be noted that some of these issues are a consequence of the early stages of work. Indeed, future research is likely to experimentally test and subsequently gather evidence for the relationship between specific BCTs and psychological mechanisms. Nevertheless, given this evidence is currently lacking, studies have sought to identify potentially relevant BCTs through the gaining opinions of the population of study. This may be particularly relevant to recreational sport given there are no precise suggestions as to the BCTs that should be used to target the key beliefs identified in Study 2. Thus, identifying suitable BCTs associated with recreational sports participation may be facilitated by gaining the opinions of a sample of first-year undergraduate students. BCTs elicited from the student sample may differ to those suggested to change similar psychological processes within the indirect approaches. That is, a BCT or number of BCTs may be suggested to influence the key beliefs identified in Study 2 that the previous indirect approach did not suggest. Even if no new BCTs are suggested, it could be that those identified by the student sample possess a greater likelihood of success, especially given the number of BCTs linked to each domain (i.e. 7 BCTs linked to

'Beliefs about capabilities'; Carey et al., 2018). Additionally, identifying the reasons for and solutions to previously identified psychological targets can facilitate the design of health messages. More specifically, rather than only informing students of the benefits of recreational sport, those who approve of participation, or issues of control, the content of an intervention can be supplemented by the reasons for and solutions to these beliefs. This could lead to an intervention demonstrating greater effectiveness in promoting student participation in recreational sport.

4.3 Purpose of Study 3

The purpose of Study 3 was to identify (1) the reasons and solutions to the previously identified key beliefs underpinning student participation in recreational sport and (2) relevant BCTs to change these beliefs.

4.4 Method

4.4.1 Study design and participants

The study used a qualitative design to examine students' views and experiences of recreational sport at university. Participants were eligible if they were enrolled on a full-time degree course and were in their first year of undergraduate study. This led to 22 participants (n = 8 males, 14 females; age M = 19.8 years, SD = 1.3) on a range of degree courses (Primary/Secondary PE and Sports Coaching (n = 4), Sport and Exercise Sciences/Exercise, Health and Nutrition (n = 3), Film and Television Production (n = 3), Forensic/Counselling Psychology (n = 2), Media and Marketing (n = 3), Early Childhood Studies (n = 4), Business and Management (n = 2), and History and Philosophy (n = 1)) attending one of four focus groups. Two groups consisted of five participants and two groups included six participants. On average, participants had participated in recreational sport at least once per week on 0.9 weeks within the prior month (minimum = 0 weeks; maximum = 4 weeks; mode = 1 week). Ethical approval was gained from the University ethics board (REF: SSHS/2016/023).

4.4.2 Procedure

A purposive sampling strategy was used to recruit participants from various degree courses. Participants were approached within lectures and posters were placed throughout the campus at Leeds Trinity University (see Appendix C1). Participants in

Study 2 were also contacted via email to participate (see Appendix C2). Interested participants contacted the researcher and were provided with a detailed participant information sheet (see Appendix C3) which outlined their potential involvement in the study. Snowball sampling was also used, with interested participants asked to inform others of the study within their cohort. To ensure a varied range of degree subjects within each focus group, participants were arranged under degree programs and assigned to a group based on their time of acceptance (i.e. the first confirmed student from six different degree courses were assigned to focus group one).

Focus groups were used to gain a deeper understanding of the research question (Krueger & Casey, 2014). A quiet room was booked at Leeds Trinity University at a date and time convenient to the participants. Participants read a participant information sheet, gave full consent (see Appendix C4) and completed a self-report questionnaire of demographic characteristics (see Appendix C5). A semi-structured focus group schedule was employed consisting of open-ended questions and specific areas of interest (see Appendix C6 for study materials). The design and content of the schedule was developed based on formative research and the researchers' past experience with qualitative research. For example, in relation to the behavioural belief 'enjoyable', participants were asked "What are some of the reasons university sport is enjoyable?" and "What are some of the ways university sport can be made more enjoyable? How do you think we could get this message across?". Post-it notes and a white board were used to highlight responses and generate further discussions. Participants were probed to reveal more in-depth information throughout the session when appropriate. Upon completion, participants were thanked for their participation, given the opportunity to add any additional information, and provided with a debrief sheet (see Appendix C7). Focus groups were audio-recorded and anonymity was ensured with pseudonyms used both during the focus groups and data transcription.

4.4.3 Analysis

Content analysis was conducted independently by two researchers using NVivo 10. The lead researcher had previous experience with qualitative research and had undergone additional training prior to the analysis. The second researcher, who was employed at another institution at the time of the study, had extensive knowledge and experience in qualitative methodologies. First, data were transcribed verbatim by the lead researcher, printed and read several times over for familiarity. Transcripts were inductively

analysed into initial codes by both researchers independently and these codes were analysed into recurrent categories. For example, phrases such as ‘be with friends’ and ‘hang out with mates’ were placed within the category ‘Socialising’. Categories were then placed deductively under the respective question heading. Comparisons were then made between these categories and those identified initially within the printed copies. Similar to Smith et al. (2016), BCTs were identified using the BCTTv1 (Michie et al., 2013). The lead researcher undertook training on the BCTs using the online website (www.bct-taxonomy.com). Once familiarised with the BCTs, the lead researcher linked participant responses to specific BCTs, when required. This was appropriate given participants lacked knowledge of the BCTs and descriptions were largely provided in lay language. To enable comparisons between study findings and prior mapping approaches, the Theoretical Domains Framework (Cane et al., 2012) was used to organise key beliefs. The beliefs were organised into the following domains; ‘Enjoyment’ = Beliefs about consequences; ‘Time consuming’ = Beliefs about capabilities; ‘Friends’ (injunctive) = Social influences; ‘Family’ (injunctive) = Social influences; ‘Friends’ (descriptive) = Social influences.

4.5 Results

4.5.1 Reasons and Solutions

Fourteen reasons were given as to why recreational sport is enjoyable (see Table 4.1), 11 reasons were given for why friends may approve of participation (see Table 4.2), 13 reasons were given for the approval of family members (see Table 4.3), and 11 reasons were given for why friends might themselves participate in recreational sport (see Table 4.4). With regards to time constraints, 10 solutions were given (see Table 4.5). Participants also identified the most important reasons and solutions to identified beliefs.

4.5.2 BCTs

Twelve distinct BCTs were identified to attend to these beliefs; three influencing enjoyment, two for the approval of friends, one for the approval of family members, two for the participation of friends themselves, and four for time constraints (see Table 4.6).

Table 4.1. *Reasons why recreational sport is enjoyable.*

Reason given	Focus group(s) stating the reason	Example quote
Socialising	1, [(1)]2, *3, [(1)]4	"You'll find it much more enjoyable if you are playing with people that you get on with"
Non-competitive	*1, 3	"is good for those who don't want to play in a competitive environment"
Health & fitness benefits	1, 2, 3, [(2)]4	"perceive it to be enjoyable if you are getting healthier"
Improves mental well-being	[(2)]2, 3, 4	"if you can improve mentally, and by that I mean you just feel better from exercising and playing, then the chances are you'll enjoy it"
Make friends	3, 4	"You might not intend to go and make friends, you might just want to play because you enjoy it but you still end up meeting new people"
Stress relief	1, 4	"relaxes your mind and gives stress relief"
Improve sport-specific skills	1, 4	"If you can improve your sports skills and get better then that will make you enjoy it more"
Low cost	2, 4	"If you pay just a couple of quid then you aren't worrying about money"
No commitment	2, 3	"you aren't tied to anything or you don't have to do it. You have the option of turning up"
Low number due to university size	1, 4	"It's smaller so you know the people who go there"
Avenues to sports teams	3	"a way to maybe get into a team so if that happens or if you feel that it could happen then that could be a reason for making it more enjoyable"
Improves academic performance	4	"improves studies because you're relaxed"
Participate in a new sport	2	"playing a sport that you aren't familiar with, one that you haven't done before"
Opportunity to impress	2	"the opportunity to show off with your skills, like showing people how good you are"

Notes. *represents the most important reason stated by a focus group
[(1)]represents the most important reason when a focus group were not in agreement
[(2)]represents the second most important reason when a focus group were not in agreement

Table 4.2. *Reasons why friends may approve of participation in recreational sport*.

Reason given	Focus group(s) stating the reason	Example quote
Socialising	*1, *2, *3, *4	"want you to play cos you'll be with them"
Health & fitness benefits	1, 3, 4	"They'd want you to get the physical benefits and be fitter"
Perceived happiness	1, 2	"you would be with them whilst you're playing. And from the perspective of your friends, the fact you're with them would make you happy"
Improve sport-specific skills	3, 4	"They might encourage you to play to get better, or want you to play because you can get better"
Competitive environment	1, 4	"I know we're talking about non-competitive sport, but you could make it competitive with your friends"
Study relief	2, 3	"if like playing sport takes the pressure off university work then your friends would like be happy with that"
Sensible activity	2, 4	"approve of you doing something productive, like playing sport"
Cost effective	2, 4	"saving money by playing because it's not expensive"
To win a bet	4	"if I beat you then you owe me a drink or if we beat you then you have to do something"
To meet a partner	1	"They also might want you to meet someone. It's quite a slim chance but they could have that reason"
Opportunity to discuss studies	3	"you have the chance to catch up and maybe talk about work together"

Note. *represents the most important reason stated by a focus group

Table 4.3. *Reasons why family members may approve of participation in recreational sport.*

Reason given	Focus group(s) stating the reason	Example quote
Happy/enjoyment	*1, *2, 3	"would want you to be happy and enjoying yourself"
Socialising	3, *4	"you'd be with your friends socialising"
Make friends	1, *3	"If they think that you're playing with mates or making new mates then that's another reason for them to approve of it"
Health & fitness benefits	1, 2, 3, 4	"They will encourage it because you are becoming healthier, that's a positive reason"
Productive/sensible activity	2, 3	"you could be doing other social activities like going out drinking or on the sesh. I reckon family members would approve of you more playing sport"
Safety of location	3	"They want you to be safe. They wouldn't be worrying in a way"
Cost effectiveness	4	"would want you to have money to use and not waste"
Develop a competitive edge	1	"you might not be competitive at the start but this might develop and from the perspective of the family member this might be seen as good. They might want this competitive edge to you"
Develop a sporting habit	4	"could be happy if you develop sport into like a habit"
Make them proud	4	"If you aren't active and then all of a sudden you are then you could make them proud"
Study relief	1	"it's taking the pressure off studying"
Aware of location	3	"they know where you are"
To meet a partner	1	This reason was stated on a post-it note but not discussed. Therefore, there is no direct quote for this reason.

Note. *represents the most important reason stated by a focus group

Table 4.4. *Reasons why friends may themselves participate in recreational sport*.

Reason given	Focus group(s) stating the reason	Example quote
Socialising	*1, *2, *3, *4	As these reasons had already been covered within prior belief questions, participants were just asked to rate the most important reason. As such, there are no quotes relating to the participation of friends.
Health & fitness benefits	1, 2, 4	
Enjoyment	1, 2, 4	
Improve sport-specific skills	1, 3, 4	
Improve mental well-being	3, 4	
Study relief	2, 3	
To be active	3, 4	
Make new friends	1, 3	
Something to do	2	
To meet a partner	1	
Non-competitive	4	

Note. *represents the most important reason stated by a focus group

Table 4.5. *Solutions to time constraints influencing participation in recreational sport*.

Solution given	Focus group(s) stating the solution	Example quote
Organisation	*1, *2, *3, [(1)]4	"Better organisation or preparation"
Prioritise	1, [(2)]4	"This relates to the priorities of social activities in that we might say we will but we don't because we get distracted or convinced into doing something else"
Commit to decision	1, 2, 3	"we sometimes go into things like this not fully committed and then make out like we don't have enough time"
Plan in advance	3, 4	"planning your time can help"
Set reminders	1, 4	"Having a reminder would make sure you don't forget"
Organise with friends	2	"can organise it to go as a collective"
Reduce the number of social activities	4	"the number of social activities, reducing how many you get involved in"
Complete university work quickly	2	"If we do our work quicker then we can free up time to play sport"
Allow greater flexibility	2	"sometimes don't let ourselves enjoy things because we think that we have work to do but if we did then we would have more time for sport"
Be encouraged	3	"if we have friends who play and almost force us to go with them. If they are going and drag you along then you almost make the time for it"

Notes. *represents the most important solution stated by a focus group
[(1)]represents the most important solution when a focus group were not in agreement
[(2)]represents the second most important solution when a focus group were not in agreement

Table 4.6. *Potential BCTs to target the key beliefs*.

Targeted belief	Focus group response concerning potentially effective BCTs	Focus group(s) stating the BCT	Related technique from the BCTTv1 (Michie et al. 2013)
Enjoyment	Convince students	1	Information about emotional consequences [5.6]
	Use posters	3	Information about emotional consequences [5.6]
	Use flyers	4	Information about emotional consequences [5.6]
	Use friends and members of the sports development team	1, 2	Credible source [9.1]
	Experience participation	2	Behavioural experiments [4.4]
Friends (injunctive)	Inform students of approval	1, 2, 3, 4	Information about others' approval [6.3]
	Experience participation as a group	2, 3	Social support (practical) [3.2]
Friends (descriptive)	Use friends themselves	1, 2, 3	Social comparison [6.2]
	Provide facts and figures	1, 4	Social comparison [6.2]
	Observe friends participating	4	Demonstration of the behaviour/Modelling [6.1]
Family (injunctive)	Inform students of approval	1, 2, 3, 4	Information about others' approval [6.3]
Time constraints	Commit to the decision	1, 2, 3	Commitment [1.9]
	Make use of planning	1, 3, 4	Action planning [1.4]
	Greater organisation	2, 3, 4	Action planning [1.4]
	Manage time more effectively	1	Time management (within the CALO-RE taxonomy)
	Successfully participate in the behaviour	4	Self-monitoring of behaviour [2.3]

4.6 Discussion

The purpose of Study 3 was to provide additional information to the key behavioural, normative, and control beliefs identified in Studies 1 and 2. This information can be used to provide explanations for the key beliefs (Norman et al., 2012). The study also identified relevant BCTs that could be effective in targeting these beliefs if included within a behaviour change intervention.

4.6.1 Reasons and Solutions

To persuade students that recreational sport is enjoyable, a theory-based message should include some of the reasons presented in Table 4.1. These messages could emphasise the lack of commitment required to participate in this type of sport. Indeed, students are able to play without committing themselves to a certain period. This is in contrast to gymnasiums that usually require sign up and deposit fees, and competitive sport which consists of weekly training and competitions. For this particular institution (Leeds Trinity University), it may be beneficial to emphasise the small number of students participating in this type of sport. Participants felt that this leads to a more enjoyable experience of recreational sport. As one focus group identified 'Socialising' as being the most important reason (focus group 3) and with the majority of participants within two focus groups agreeing (focus groups 2 and 4), providing this reason within a health message could offer the greatest influence. Additionally, including the reason pertaining to the non-competitiveness of recreational sport may also be an appropriate avenue due to one group stating it as the most important reason (focus group 1). This reason provides further evidence for the distinction between recreational and competitive sport; students may prefer to engage in recreational sport as it provides a non-competitive environment (Tsigilis et al., 2009). Finally, one group believed the health and fitness benefits of sports participation to be the most important reason (focus group 4) and another group suggested the potential improvements in mental well-being made it more enjoyable (focus group 2). Although these suggestions were in the minority within both groups, they may also be suitable reasons to promote the enjoyable nature of recreational sport.

In relation to the approval of friends, the reasons outlined in Table 4.2 could provide valuable information for an intervention promoting recreational sport. Participants outlined a number of reasons why friends would approve of their participation in sport including study distractions, the health and fitness benefits that can

be achieved, and the cost effectiveness of participation. Including such benefits within health messages could persuade students that friends are supportive of them participating in sport. All four groups stated the opportunity to socialise as being the main reason why friends would approve of participation. That is, friends would approve of their participation because it enables them to be sociable. This is not surprising given participation in recreational sport provides students with an ideal social opportunity (Miller, 2011). This message may have greater effectiveness compared to the other reasons.

Concerning the approval of family members, Table 4.3 shows the many reasons elicited from the focus groups that could be included within an intervention targeting this belief. For example, it was suggested that such referents would approve due to the safety of the location, the sensible nature of the activity, and the potential to develop a sporting habit. One focus group stated family members would approve because it allows them to make friends (focus group 3) and one group stated it was because of the opportunities to socialise (focus group 4). Perhaps the reason offering the greatest potential is the happiness and enjoyment that can be experienced through participation (focus groups 1 and 2). These reasons could all be included within a theory-based message persuading students that family members approve of their participation.

A total of eleven reasons were suggested as to why friends may themselves participate in recreational sport (see Table 4.4). These reasons included the potential to meet a new partner or friends, the ability to improve sports skills, and the non-competitive nature of recreational sport. Incorporating these reasons within a theory-based message may provide students with appropriate reasons for them to also engage in recreational sport. All four focus groups were in agreement of the most important reason for friends' participation. Specifically, it was suggested that the potential to socialise was the main reason why friends may participate in recreational sport themselves. This reason may thus offer the greatest utility in altering this belief.

Finally, Table 4.5 shows the ten solutions offered to address time constraints. These included setting reminders, planning in advance, and committing to the decision to participate. All four groups suggested a solution relating to greater organisation or preparation as the most important. This suggests that participants felt being better at organising their time would enable them to participate in recreational sport. Although the majority of participants within each group agreed with this solution, the minority of participants within one group stated 'Prioritise' as being the most important (focus

group 4). The implications are that a number of solutions can be used to attend to issues of time. These solutions, as is highlighted below, can be attended to using a number of BCTs.

Although only two studies have examined the reasons and solutions to previously identified key beliefs and these studies examined behaviours different to the present study, there are some similarities with the PA study conducted by Epton et al. (2015). In their study, participants stated that friends would want them to engage in the behaviour because they could 'Do it together'. This shares similarities with the present study where participants felt the opportunities to socialise were an important reason for this referent. Similarly, a solution to time constraints identified by Epton et al. (2015) was 'Plan it into your day'. Participants in the current study also supported the use of planning to circumvent time constraints. These similarities suggest that, with regards to similar health behaviours (i.e. PA and recreational sport), first-year students have similar explanations for similar beliefs (i.e. the approval of friends and time constraints). There were, however, some explanations attributed to recreational sport that did not apply to PA, and vice versa. Participants in the current study stated that family members would approve of participation in recreational sport due to perceptions of enjoyment. This was not a reason shared by Epton et al. (2015) where the reasons provided by these referents concerned the health and fitness benefits of PA. This is not surprising given the enjoyable reason of recreational sport and the health benefits gained from PA. Although PA can be perceived as being enjoyable and recreational sport has the potential to positively influence health, these are not the beliefs commonly associated with these activities. Consequently, not only are there differences in the key beliefs underpinning these similar behaviours but even when beliefs are similar amongst the behaviours, there are sometimes different explanations for them. Developing the content of an intervention would therefore require the inclusion of different content. In relation to the example provided above, targeting recreational sports participation would emphasise that family members would approve of the behaviour because they would believe them to be having fun. However, targeting the same belief relating to PA would emphasise the health benefits that family members would be mostly approval of. These distinctions attest to the importance of not only eliciting the key behavioural, normative and control beliefs underlying different behaviours, but also identifying the reasons and solutions to these beliefs.

4.6.2 BCTs

With regards to the BCTs that could be used to effectively attend to each belief, a number of strategies were identified by the focus groups (see Table 4.6). Throughout the following discussion, the label of the stated BCT is provided in parenthesis in accordance with the BCTTv1 (Michie et al., 2013).

According to the focus groups, 'Information about emotional consequences [5.6 in the BCTTv1]' could be used to promote the important reasons regarding the enjoyable nature of recreational sport. More specifically, it was suggested that the consequences of participation could be promoted using posters and flyers. Participants also suggested that such messages could be delivered by friends and the sport development team within the university. BCT specific, this relates to a 'Credible source [9.1]' as the information provided (i.e. that sport is enjoyable) is presented by those identified as being trustworthy. It was also suggested that experiencing participation could facilitate the enjoyment of sport. The BCT 'Behavioural experiments [4.4]', whereby individuals' knowledge is shaped by testing beliefs, could be applied here. In this way, positive experiences could result in the realisation that sports participation is enjoyable.

Concerning friends' approval, participants suggested that friends should explicitly communicate the message that they approve of their participation. This response can relate to the BCT 'Information about others' approval [6.3]' whereby information is provided about what others think. To increase the likelihood of this BCT being effective, the most important reason identified could be included within these messages (i.e. socialisation). Participants also suggested that experiencing participation with their friends could convey the message of approval. This suggestion can be linked with the technique 'Social support (practical) [3.2]' whereby practical help is provided by significant others.

Similar to the approval of friends, responses relating to the approval of family members primarily concerned the BCT 'Information about others' approval [6.3]'. To improve its effectiveness, this message should include the reasons elicited from the focus groups. For example, encouraging students that family members would want them to play because they would be happy, making friends and socialising could increase the effectiveness of the message.

To communicate the message that friends participate in recreational sport themselves, focus groups suggested this message could come from both friends

themselves and facts and figures of participation rates. These suggestions can relate to ‘Social comparison [6.2]’, which draws attention to the behaviour of others to allow comparison with their own behaviour. Including the most important reason could improve the effectiveness of these messages. For example, friends informing students that they participate to socialise may incentivise them to do the same. Participants also suggested that actually observing friends participating could provide the relevant information regarding their actual behaviour. BCT specific, this can relate to ‘Demonstration of the behaviour: modelling [6.1]’ whereby the behaviour is performed and observed directly (i.e. in person) or indirectly (i.e. using pictures).

Finally, a number of BCTs were elicited relating to time constraints. First, focus groups stated that committing to the decision to play recreational sport could negate issues of time. Relating to the BCT ‘Commitment [1.9]’, this could involve students affirming or reaffirming their behavioural decision. Second, participants suggested that the ability to plan their time more effectively could help with time constraints. ‘Action planning [1.4]’, which has been found to be highly successful in facilitating behaviour change (Webb & Sheeran, 2008), could be a useful BCT to prompt participation in sport. The same BCT could also be used to develop greater organisation. Specifically, if/then plans could provide students with relevant skills that foster organisation. Next, participants suggested that successfully engaging in recreational sport could convince them that time constraints can be overcome. The BCT ‘Self-monitoring of behaviour [2.3]’ could be of use here whereby the individual records when the behaviour has been performed. Thus, successfully engaging in sport could result in the belief that issues of time are not necessarily barriers that cannot be overcome. Finally, participants suggested that being able to manage their time more effectively could be beneficial. Although there is no explicit mention of time management within the BCTTv1 (Michie et al., 2013), the BCT is included within the CALO-RE taxonomy. The BCT attempts to free up times when the behaviour could be performed by teaching individuals how to manage their time.

When comparing the BCTs suggested in this study to those identified within studies adopting the mapping approach, there are similarities. That is, Michie et al. (2008), Cane et al. (2015) and Connell et al. (2018) identified similar BCTs to be influential in changing these types of psychological processes. For example, Michie et al. (2008) agreed that the domain ‘Social influences’ could be influenced through ‘Modelling/demonstration of the behaviour by others’. Similarly, Cane et al. (2015)

suggested the same domain could be influenced through BCTs such as ‘Information about others’ approval’ and ‘Social support (practical)’. The present study therefore provides support for the accuracy of these mapping approaches. More importantly, given many BCTs are theorised to influence each domain, the present study identified specific BCTs that could prove to be effective. Therefore, although suggested within prior mapping approaches, the BCTs elicited from the focus groups may demonstrate greater utility if integrated within an intervention. Some of these BCTs may also yield further benefits if the reasons and solutions outlined above are integrated within them.

4.6.3 Study implications

There are a number of implications from this study. Interventions promoting recreational sports participation could include the specific reasons identified in the study to target the key beliefs identified in Study 2. Regarding the belief ‘enjoyment’, rather than merely stating ‘recreational sport is enjoyable’, a health-related message should justify this statement with the social and health and fitness benefits. This could be undertaken through using the BCTs ‘Information about emotional consequences’ and ‘Credible source’. The social nature of recreational sport should be emphasised to provide evidence of friends’ approval. A health message could comprise ‘Friends may support your decision to play sports because it provides you with an opportunity to socialise’, rather than merely stating ‘Friends may support your decision to play sports’. This could be implemented using the BCT ‘Information about others’ approval’. It may also be beneficial to provide ‘Social support (practical)’. The enjoyable nature of recreational sport could be provided as an argument for family members’ approval. Rather than ‘Family members would want you to play recreational sport’, a more effective health message could be ‘Family members would want you to play sport because you would be enjoying yourself’. The social aspects of recreational sports participation should be emphasised as a reason for why friends may participate themselves. For example, instead of stating that friends participate in recreational sport, a theory-based message could include ‘your friends participate in recreational sport because it provides them with an opportunity to socialise’. This may be more beneficial within the BCT ‘Social comparison’. Modelling the behaviour could also provide evidence for friends’ participation. Finally, to attend to issues of time, students could be taught better organisational skills. Students may also attend to the issue of time and subsequently participate in recreational sport if they prioritised it. In addition, the BCTs

‘Commitment’, ‘Action planning’, ‘Time management’, and ‘Self-monitoring of behaviour’ may negate issues of time.

In addition to utilising the information gained from the study, future work should examine the effectiveness of interventions informed by the population of interest. If interventions are effective, other studies should then involve the target population in developing the intervention. This could include identifying specific BCTs and relevant information regarding its content. Future research should also continue to suggest which BCTs map onto psychological constructs and, most importantly, evidence should be gathered to determine the accuracy of these suggestions. With empirical evidence validating the effectiveness of BCTs on psychological mechanisms, behavioural interventions would be better equipped to alter behaviour through manipulating such mechanisms.

4.6.4 Strengths and limitations

The study has a number of strengths. First, important information was identified that could inform the content of an intervention. The reasons and solutions to key beliefs may help increase the effectiveness of interventions promoting student participation in recreational sport, as opposed to interventions only targeting the key beliefs. Second, the study identified relevant BCTs that may be appropriate for changing psychological processes, particularly from the participant perspective. Considering the suggestions of the population of study may lead to greater intervention utility rather than relying on expert opinion. Third, the study used focus groups to gain this information, rather than questionnaires as done within previous studies. This method allowed for greater introspection and catered for the participants’ context. Finally, the study was informed by two pieces of formative research which were, in turn, underpinned by a prominent theory of behaviour change.

Despite these strengths, the study also has some limitations. First, due to the number of psychological processes influencing behaviour, BCTs have been linked to domains rather than specific beliefs. As such, key beliefs found in Study 2 were placed within these domains to allow comparisons with prior mapping studies. Nevertheless, beliefs were positioned within the domains deemed appropriate, which were then used to highlight relevant BCTs. Second, though participants were enrolled on different degree courses, it could be that those recruited had a preference towards the behaviour. Of the 22 participants recruited, 13 had participated in recreational sport at least once

within the previous month. Furthermore, the use of a single institution may restrict the generalisability of study findings. For example, other universities may charge a higher cost to participate in recreational sport meaning the reason pertaining to low cost would not contribute to perceptions of enjoyment in these instances. Next, BCTs were identified by interpreting the meaning behind participant responses. Thus, it is possible that some of the BCTs identified may not have accurately represented participants' views. Finally, it is not certain that those BCTs identified by participants would actually demonstrate effectiveness. Indeed, other BCTs linked to domains but not stated may also successfully alter the mechanisms. It is also not guaranteed that providing reasons and solutions will lead to belief change, particularly when compared to classic psychological approaches. Interventions adopting the classic approach would directly target the belief through providing evidence on either the behaviour to outcome link or the evaluation to behaviour link. For example, one may simply provide information on inaccurate descriptive norms rather than provide reasons for such norms. Thus, it is not certain that the additional information would lead to greater belief change than if the belief was directly targeted.

4.7 Conclusion

The purpose of Study 3 was to provide additional information for a behaviour change intervention targeting student participation in recreational sport. More specifically, the study identified the reasons and solutions to the key beliefs previously identified in Studies 1 and 2. These reasons and solutions can help develop the content of a theory-based intervention targeting student participation in recreational sport. The study also identified a number of BCTs that could be adopted to alter these beliefs. These BCTs, in combination with the suggested reasons and solutions, may demonstrate effectiveness within an intervention promoting recreational sport. Specifically developing an intervention targeting one of the critical beliefs previously identified (i.e. Enjoyment) with these BCTs, reasons and solutions could prove particularly effective in increasing the number of students participating in recreational sport.

Chapter 5 **A text messaging intervention targeting student participation in recreational sport (Study 4) and PA (Study 5)**

5.1 Introduction

Study 3 identified some potentially useful BCTs that could be included within an intervention to promote student participation in recreational sport. Additionally, the study identified several reasons and solutions to the key beliefs identified in Studies 1 and 2. Chapter 5 presents Studies 4 and 5 which are text messaging interventions adopting the findings gained from the formative Studies 1-3. Study 4 is a pilot intervention targeting students' participation in recreational sport and the intervention is refined in Study 5 and targets PA.

5.2 Background to the study

It was noted in Chapter 2 that there is a gap between what people intend to do and what subsequently occurs (Webb & Sheeran, 2006). Thus, changing intentions via changing beliefs may be insufficient to change behaviour given the intention-behaviour gap. It was also suggested that goal priority is a potentially useful strategy to overcome this gap. Goal priority refers to the prioritisation of one goal over another and has been shown to strengthen the intention-behaviour in many health-related behaviours (Conner et al., 2016). To date, goal priority has not been tested in relation to recreational sport, despite the fact that prioritising the behaviour could be effective given the number of intentions and goals first-year students may possess (Arzu, Tuzun, & Eker, 2006). Targeting beliefs plus prioritising participation in recreational sport may prove to be effective in increasing the number of first-year students participating in sport.

It was also outlined in Chapter 2 that many modes exist for delivering an intervention targeting health behaviours and that interventions delivered through SMS have demonstrated positive affects (Armanasco et al., 2017; Fanning et al., 2012). Though effect sizes are relatively small for SMS interventions, the high reach of this delivery mode means potentially significant impact can be achieved across a large number of participants (Armanasco et al., 2017). This is particularly relevant given the vast number of students in possession of a mobile phone (Statistica, 2019). As Conner et al. (2016) only tested the goal priority strategy using face-to-face delivery modes, it is not clear whether goal priority can also be effective within the text messaging delivery mode. Including the goal priority strategy within an SMS intervention could prove

effective in increasing the number of first-year students participating in recreational sport thereby improving healthy behaviour.

5.3 Purpose of Study 4

The purpose of Study 4 was to examine the effectiveness of a SMS intervention targeting first-year students' participation in recreational sport. More specifically, the pilot study tested the effectiveness of attitude and goal priority text messages in manipulating key psychological determinants and recreational sports behaviour. It was hypothesised that (1) attitude messages would have a main effect on attitude, intention and behaviour, (2) the influence of attitude messages on behaviour would be mediated through attitude and intention, (3) goal priority messages would have a main effect on goal priority and behaviour, (4) the influence of goal priority messages on behaviour would be mediated through goal priority, and (5) goal priority messages would augment the effects of attitude messages on behaviour.

5.4 Method

5.4.1 Design and procedure

A 2 (attitude: yes vs. no) by 2 (goal priority: yes vs. no) by 2 (time: immediately post-intervention, four weeks post-intervention) randomised control trial was used. The study was again undertaken at Leeds Trinity University. Students were approached within lectures and were provided with a participant information sheet (see Appendix D1). In addition to outlining the study, the sheet included a link to an online screening survey. Posters were also distributed at various locations within the university (see Appendix D2) and announcements were made on the university intranet (see Appendix D3). Those completing the screening process and whom were eligible to participate in the study were then provided with consent forms (see Appendix D4). Participants were then given a three-day period to complete the online baseline questionnaire (T0), with those doing so randomised into one of four intervention conditions using an online generator; attitude only, goal priority only, attitude and goal priority, and control. Immediately following the two-week intervention, participants were asked to complete the first follow-up questionnaire (T1) online. All participants completing T0 measures were then asked to complete the second follow-up questionnaire four weeks later (T2) online. Prompts were made to encourage questionnaire completion. Participants' email

addresses were used to match data across all three time-points. Once completed, participants were provided with debrief information (see Appendix D5). The study received full ethical approval from the University ethics board (Ref: SSHS/2017/083) and was registered with Current Controlled Trials (ISRCTN13035021). The study was named 'SPILTS'; Sports Participation in Leeds Trinity Students.

5.4.2 Participants

Participants were eligible to participate if they were; (1) aged between 18-25 years, (2) a first-year student at the university, and (3) owned a mobile phone. Participants were excluded if they had ever taken medication for a heart condition. A total of 163 participants were eligible to participate and provided consent. Of these, 70 participants (n = 41 males, 29 females; M = 18.96 years, SD = 1.04) completed the baseline questionnaire (42%) and were enrolled onto the study. The number of participants randomised into each condition was as follows: attitude only (n = 18), goal priority only (n = 18), attitude and goal priority (n = 16), and control (n = 18) (see Figure 5.1).

5.4.3 The intervention

Text messages were distributed to participants using an online text messaging service (Fast SMS) which enabled messages to be scheduled and sent automatically. All intervention conditions received a total of six messages that were sent on various days (i.e. Sunday, Tuesday, Wednesday) and at various times (i.e. 8am, 2pm) throughout the two-week intervention period (see Appendix D6 for all dates and times). Regardless of the condition participants were allocated, each condition received text messages at the same time. Participants reported receiving an average of 6.63 (1.06) text messages (minimum = 5 (n = 1); maximum = ≥ 10 (n = 1); mode = 6 (n = 17)). All messages can be seen in Appendix D6 but they are briefly discussed here.

Attitude only condition. The attitude construct was used to represent motivation due to its importance within many health behaviours (McEachan et al., 2011; Plotnikoff et al., 2013). Moreover, the findings from Study 2 suggested attitude was a construct exerting significant influence on rates of recreational sports participation. Text messages specifically targeted the behavioural belief "Enjoyment" because this was found to be a key behavioural belief within Study 2. To facilitate the content of these messages, the messages included the reasons given for the enjoyable nature of recreational sport identified in Study 3. For example, one of the reasons related to the opportunity to

socialise and so a text message stated “Did you know that playing recreational sport here at LTU is a great way to socialise! Why not plan to play sport here at uni!”.

Goal priority only condition. Similar to that used by Conner et al. (2016), text messages within the goal priority condition asked participants to prioritise their goal (e.g. Prioritising a goal can help you achieve it! Try writing down how you will prioritise playing sport at LTU).

Attitude and goal priority condition. Participants in the attitude and goal priority condition received text messages combining those delivered to the separate attitude and goal priority conditions (e.g. Did you know that playing recreational sport here at LTU is a great way to socialise! Why not plan to play sport here at uni! Prioritising a goal can help you achieve it! Try writing down how you will prioritise playing sport at LTU).

Control condition. Participants in the control condition received text messages relating to the recreational sport at the university. These text messages comprised general information about the sports available (e.g. At LTU, you can play recreational sport).

5.4.4 Measures

All measures can be seen in Appendix D7 but are briefly discussed below. Participants were asked to give their views on participating in university recreational sport at least once per week.

Psychological constructs. Five items measured attitude (e.g. For me, participating in university sport at least once per week would be, Bad-Good, Cronbach’s α = T0: .91, T1: .87. T2: .90), three items measured goal priority (e.g. I would be prepared to give up many other goals and priorities to participate in university sport at least once per week, Strongly disagree-Strongly agree, Cronbach’s α = T0: .95, T1: .88, T2: .94), and three items measured intention (e.g. I intend to participate in university sport at least once per week, Strongly disagree-Strongly agree, Cronbach’s α = T0: .93, T1: .91, T2: .94). To ensure there were no differences between participants’ other motivational properties, SN and PBC were also measured using three (e.g. People who are like me will participate in university sport at least once per week, Completely false-Completely true, Cronbach’s α = .94) and four items (e.g. For me, participating in university sport at least once per week would be, Very difficult-Very easy, Cronbach’s α = .88), respectively.

Sports participation. Two items measured behaviour (e.g. I have participated in university sport at least once per week within the past four weeks, False-True, and On

how many weeks have you performed university sport at least once within the past four weeks, Cronbach's α = T0: .98, T1: .96, T2: .94).

5.5 Results

Data were analysed in IBM SPSS (version 21) to an alpha level of .05. When necessary, items were reverse scored, meaning lower scores represented negative perceptions and higher scores represented positive perceptions. Scores for each of the scale items were summed and averaged, giving one score per construct. Responses to the two recreational sports behaviour items were standardised, before being summed and averaged into a single z-score.

5.5.1 Randomisation checks

To check adequate randomisation between intervention conditions at baseline, a MANOVA was conducted with age, attitude, SN, PBC, intention, goal priority and behaviour at T0 as the dependent variables and condition (attitude only, goal priority only, attitude and goal priority, and control) as the independent variable. There were no significant differences between conditions, $F(21, 172) = .83$; Wilks' $\Lambda = .75$, $p = .67$; $\eta p2 = .08$. Chi-square tests also revealed no significant differences in gender between conditions, $\chi^2(3, N = 70) = 1.08$, $p = .78$.

5.5.2 Attrition analyses

From the 70 participants completing T0 assessments, 32 participants responded at T1, (45.71%), 30 participants at T2 (42.85%), and 27 participants completed all three assessments (38.57%). To check whether there were differences in demographics, psychological constructs and behaviour at T0 between those completing all three assessments and those who did not, a MANOVA was conducted with T0 age, attitude, SN, PBC, intention, goal priority, and behaviour as the dependent variables and status of participation (completers and non-completers) as the independent variables. There were no significant differences between study participants who completed or did not complete all time points, $F(7, 62) = .864$; Wilks' $\Lambda = .91$, $p = .54$; $\eta p2 = .08$. A series of chi square tests also revealed no significant differences in attrition between gender ($\chi^2(1, N = 70) = .34$, $p = .55$), condition ($\chi^2(3, N = 70) = 7.98$, $p = .60$), those receiving attitude messages (yes vs. no) ($\chi^2(1, N = 70) = 5.76$, $p = .32$), and those receiving goal priority messages (yes vs. no) ($\chi^2(1, N = 70) = 2.01$, $p = .15$).

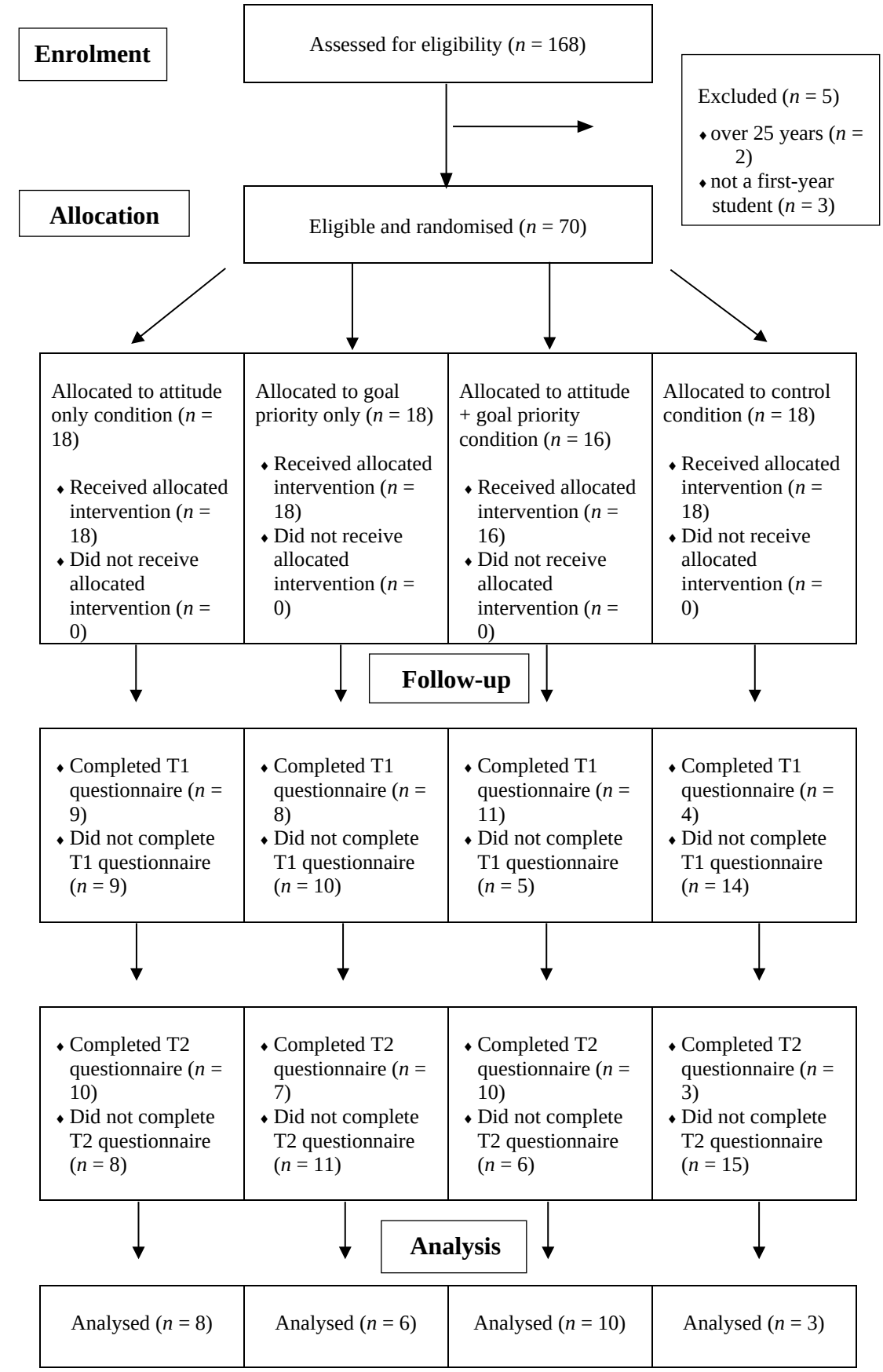

Figure 5.1. CONSORT flow diagram of Study 4 participants.

5.5.3 Main analyses

Impact of attitude and goal priority messages. To examine the impact of the messages on the psychological variables and behaviour, a 2 (attitude: yes vs. no) by 2 (goal priority: yes vs. no) by 2 (time: immediately post-intervention, four weeks post-intervention) mixed MANCOVA was conducted. Attitude, goal priority, intention, and behaviour assessed immediately post-intervention (T1) and four weeks post-intervention (T2) were the (repeated-measures) dependent variables and T0 attitude, goal priority, intention, behaviour, age, and gender were covariates. Results showed no significant main effects for attitude messages (F (4, 14) = 1.50, p = .25, $\eta 2$ = .30) and goal priority messages (F (4, 14) = 1.14, p = .37, $\eta 2$ = .24) (hypotheses 1 and 3) (see Table 5.1). There were also no interactions (hypothesis 5) and no need to undertake mediation analyses (hypotheses 2 and 4).

5.6 Discussion

Study 4 tested the effectiveness of attitude and goal priority messages to increase student participation in recreational sport. The pilot study found no significant effects for attitude and goal priority messages. However, the study had trouble in recruiting participants from only one University cohort and there were high rates of attrition at each measurement time point. Indeed, only 70 participants completed baseline assessments and listwise deletion resulted in only 26 participants eligible for analyses. Consequently, a post hoc power analysis was conducted with the G*Power programme (Erdfelder, Faul, & Buchner, 1996) to examine statistical power. As such in order to detect a small effect (f = .10) with an alpha level of .05 and a sample size of 27, this test revealed only 6% power. The lack of statistical power meant predictions could not be adequately tested.

Nevertheless, the pilot study informed several important amendments in developing a further study. These amendments primarily attended to participant numbers. First, it was decided that recreational sport had limited reach with regards to recruitment and that a change in health behaviour could lead to a greater number of participants enrolling. This led to the target behaviour changing to PA as it was felt that compared to recreational sport, which is specific, students were more likely to be aware of and interested in a study relating to PA. It was hoped that this would result in a greater number of participants enrolled onto the study. Second, this change in

Table 5.1. *Means of attitude, goal priority, intention and behaviour assessed by message condition (N = 27).*

	Attitude only (n = 8)	Goal priority only (n = 6)	Attitude & goal priority (n = 10)	Control (n = 3)	Total (n = 27)
Attitude					
T0	5.22 (1.83)	5.20 (1.46)	5.46 (1.24)	6.06 (1.61)	5.40 (1.45)
T1	5.12 (2.02)	5.63 (1.22)	5.70 (1.24)	6.06 (1.00)	5.55 (1.45)
T2	5.27 (2.04)	6.03 (1.12)	6.04 (1.32)	6.46 (0.92)	5.85 (1.48)
Goal priority					
T0	3.91 (1.86)	3.33 (1.67)	4.10 (1.75)	5.66 (2.30)	5.40 (1.45)
T1	4.12 (2.03)	4.55 (1.37)	4.73 (1.34)	4.77 (1.92)	4.51 (1.57)
T2	2.58 (1.99)	3.88 (1.40)	3.36 (1.14)	5.00 (2.08)	3.43 (1.67)
Intention					
T0	3.70 (2.14)	4.61 (2.03)	4.56 (1.90)	5.11 (3.27)	4.38 (2.08)
T1	3.62 (2.02)	4.66 (0.78)	4.70 (1.57)	4.88 (2.00)	4.49 (1.63)
T2	2.20 (1.20)	4.27 (0.87)	3.36 (1.20)	4.00 (2.60)	3.29 (1.48)
Behaviour					
T0	-0.03 (0.90)	0.14 (1.20)	0.27 (1.02)	0.76 (1.49)	0.21 (1.04)
T1	-0.49 (0.53)	0.42 (1.06)	-0.02 (1.03)	0.51 (1.30)	-0.00 (.97)
T2	-0.46 (0.50)	0.69 (1.35)	-0.16 (0.86)	0.50 (1.23)	0.01 (1.00)

behaviour enabled a greater number of universities to be included within the study, rather than a single institution as was used in the pilot study. Again, the definitional understanding of PA was judged to be easier for prospective participants compared to recreational sport, thus enabling student participation in the behaviour to be suitably studied within other institutions. Finally, once participants' eligibility was established, they were then required to complete the baseline questionnaire immediately and the intervention commenced soon after. Given the significant number of participants eligible and consenting to participate in the pilot study but not subsequently enrolling, this was assumed to prevent dropout between these timepoints. Participants were then randomised into intervention conditions following enrolment (this is outlined in the Study 5 methodology section). Previous attempts to change PA will now be discussed.

5.6.1 PA and rates of participation

Despite the importance of regular participation in PA, a large proportion of the population is physically inactive (Rhodes, Janssen, Bredin, Warburton, & Bauman, 2017). Rates of PA decrease through adolescence and into adulthood (Dumith, Gigante, Domingues, & Kohl, 2011; Telama, 2009) which is problematic because those adopting PA during adolescence are more likely to continue participating in the future (Lee & Loke, 2005). Students are also insufficiently physically active (Haase et al., 2004; Keating et al., 2005), particularly those making the transition to university (Bray & Kwan, 2006; Pullman et al., 2009; Sinclair, Hamlin, & Steel, 2005). Bray and Kwan (2006) identified this transitional period as the time when students demonstrate the lowest levels of PA. This also extends to students that were previously physically active prior to entering higher education. Bray and Born (2004) identified a 22% decrease in the number of students who performed PA before starting university compared to the first two months in higher education (66% were physically active prior to university compared to 44% during the first two months). There are even problems within those students intending to participate in PA. Kwan et al. (2009) found no differences in rates of PA between first-year students possessing intentions towards the behaviour and those without intentions to participate. New experiences that first-year students encounter, such as negotiating unfamiliar environments (Bray & Born, 2004), have already been outlined. However, similar to the studies pertaining to recreational sports participation, the first year of university provides a teachable moment for intervention to intervene on PA rates (Allom et al., 2016; Suminski & Petosa, 2002).

5.6.2 Behaviour change interventions using technology and the role of attitude

Interventions have targeted improvements in PA using different technologies. A recent review conducted by Rhodes et al. (2017) found 20% of studies within reviews and meta-analyses of PA interventions adopted technology. Technologies used to target PA include websites (Franko et al., 2008), monitors (Lewis, Lyons, Jarvis, & Baillargeon, 2015), gaming (Foley & Maddison, 2010; Rhodes et al., 2017), podcasts (Turner-McGrievy & Tate, 2011), social media (Napolitano, Hayes, Bennett, Ives, & Foster, 2013), DVD's (McAuley et al., 2013), videoconferences (Mascarenhas, Chan, Vittinghoff, Van Blarigan, & Hecht, 2018), and telephone (Goode, Reeves, & Eakin, 2012). The use of mobile phones to deliver health interventions are the most commonly adopted technological tool (Hakala, et al. 2017), with the most popular being text messages (Agboola et al., 2016; Griffin et al., 2018; Kinnafick et al., 2016; McCoy et al., 2017; Mistry, Sweet, Rhodes, & Latimer-Cheung, 2015; Prestwich et al., 2010; Sirriyeh et al., 2010). A systematic review conducted by Buchholz et al. (2013) reported all SMS interventions targeting PA to have an effect size greater than $d = 0.20$. Thus, the text messaging modality appears useful in changing rates of PA.

The influence of attitude has received particular attention in relation to PA (Biddle & Mutrie, 2008) and a number of studies have found the construct to exert the greatest impact on intentions to be physically active (e.g. Hagger et al., 2002; Kwan et al., 2009; Plotnikoff et al., 2013). For example, Plotnikoff et al. (2013) found attitude ($r = .70$) but not SN ($r = .00$) and PBC ($r = .13$) to significantly predict PA intentions. Targeting attitude towards PA thus appears to have great potential in altering participation rates. Studies have also used text messages to target attitudes towards PA (e.g. Mistry et al., 2015; Sirriyeh et al., 2010). For example, Sirriyeh et al. (2010) found text messages targeting affective attitude (i.e. feelings towards PA) to increase PA rates. Thus, not only is attitude important for PA behaviour change, but the SMS delivery mode appears to have utility in targeting attitude towards the behaviour.

5.7 Purpose of Study 5

PA is an important health behaviour for first-year university students to undertake and research has established participation in PA to be influenced by the attitude construct (Kwan et al., 2009; Plotnikoff et al., 2013; Sirriyeh et al., 2010). Research has also identified a gap between intention and PA behaviour and the goal priority strategy has

demonstrated success in strengthening this relationship. Despite this, no study has targeted first-year students' participation in PA using text messages targeting attitude and goal priority. Thus, the purpose of the study was to test the effectiveness of attitude and goal priority text messages in promoting first-year students' participation in PA. It was hypothesised that (1) attitude messages would have a main effect on attitude, intention and behaviour, (2) the influence of attitude messages on behaviour would be mediated through attitude and intention, (3) goal priority messages would have a main effect on goal priority and behaviour, (4) the influence of goal priority messages on behaviour would be mediated through goal priority, and (5) goal priority messages would augment the effects of attitude messages on behaviour.

5.8 Method

5.8.1 Design and procedure

A 2 (attitude: yes vs. no) by 2 (goal priority: yes vs. no) by 2 (time: immediately post-intervention, four weeks post-intervention) randomised control trial was used. Contact lists of departmental, school and faculty offices from 104 higher education institutions within the UK were generated. Emails including study information (see Appendix E1) and a recruitment poster (see Appendix E2) were sent, and they were asked to circulate the latter to their first-year students. Participants then accessed the survey by either clicking the hyperlink on the poster or manually inserting the URL. Once accessed, further information on the study was provided (see Appendix E3) and those willing to participate were screened for eligibility and provided consent (see Appendix E4). Participants then completed the baseline questionnaire (T0) and once complete, were informed when the intervention would commence for them. All interventions started on a Tuesday, but the precise date depended on the time of enrolment. A computer-generated random number sequence was used to allocate participants to one of four conditions at the point of enrolment; attitude only, goal priority only, attitude and goal priority, and control. Immediately after undertaking the intervention, participants were asked to respond to the first follow-up questionnaire (T1). Participants were then required to respond to the second follow-up questionnaire four weeks later (T2). Participants were provided with some debrief information after T2 assessments (see Appendix E5). All assessments were completed online, and participants were sent text messages with links to the relevant questionnaires. Participants could either click the

link or insert the URL to gain access. To match data across all three time-points, participants responded to three personal questions and provided their mobile phone number. Ethical approval was granted by the University ethics board prior to study recruitment (REF: SSHS-2018-024).

5.8.2 Participants

Participants were eligible to participate in the study if they were; (1) aged between 18-25 years, (2) a first-year undergraduate student, and (3) owned a mobile phone. Participants were excluded if; (1) they were currently, or had ever, taken medication for a heart condition or (2) had any medical conditions that may have affected their participation in PA. A total of 289 participants from 57 universities were enrolled to participate (n = 106 males, 183 females; M = 18.7 years, SD = 1.17). These were randomised into one of the four intervention conditions; attitude only (n = 71), goal priority only (n = 72), attitude and goal priority (n = 73), and control (n = 73) (see Figure 5.2).

5.8.3 SMS intervention

As with the pilot study, an online text messaging service was used to distribute messages to participants, although the service changed from that used in Study 4 (Voodoo SMS). Participants again received six messages on various days (i.e. Monday, Thursday) and at various times (i.e. midday, 9am) throughout the two-week intervention period (see Appendix E6). Participants reported receiving an average of 5.82 (1.35) text messages (minimum = 1 (n = 2); maximum = 9 (n = 3); mode = 6 (n = 82)) and 25 participants stated ‘Don’t know’. The messages used for the intervention can be seen in Appendix E6 but they are briefly discussed here.

Attitude only. Messages targeting attitude were based on previous attempts to change perceptions towards PA (e.g. Conner, Rhodes, Morris, McEachan, & Lawton, 2011; Morris, Lawton, McEachan, Hurling, & Conner, 2016; Sirriyeh et al., 2010). More specifically, participants in the attitude condition received messages concerning the benefits of PA and how participation can be particularly beneficial to them as a university student. For example, participants were sent messages including “Physical activity can reduce the risk of a number of chronic diseases such as type 2 diabetes. Why not perform physical activity?” and “Participating in physical activity throughout

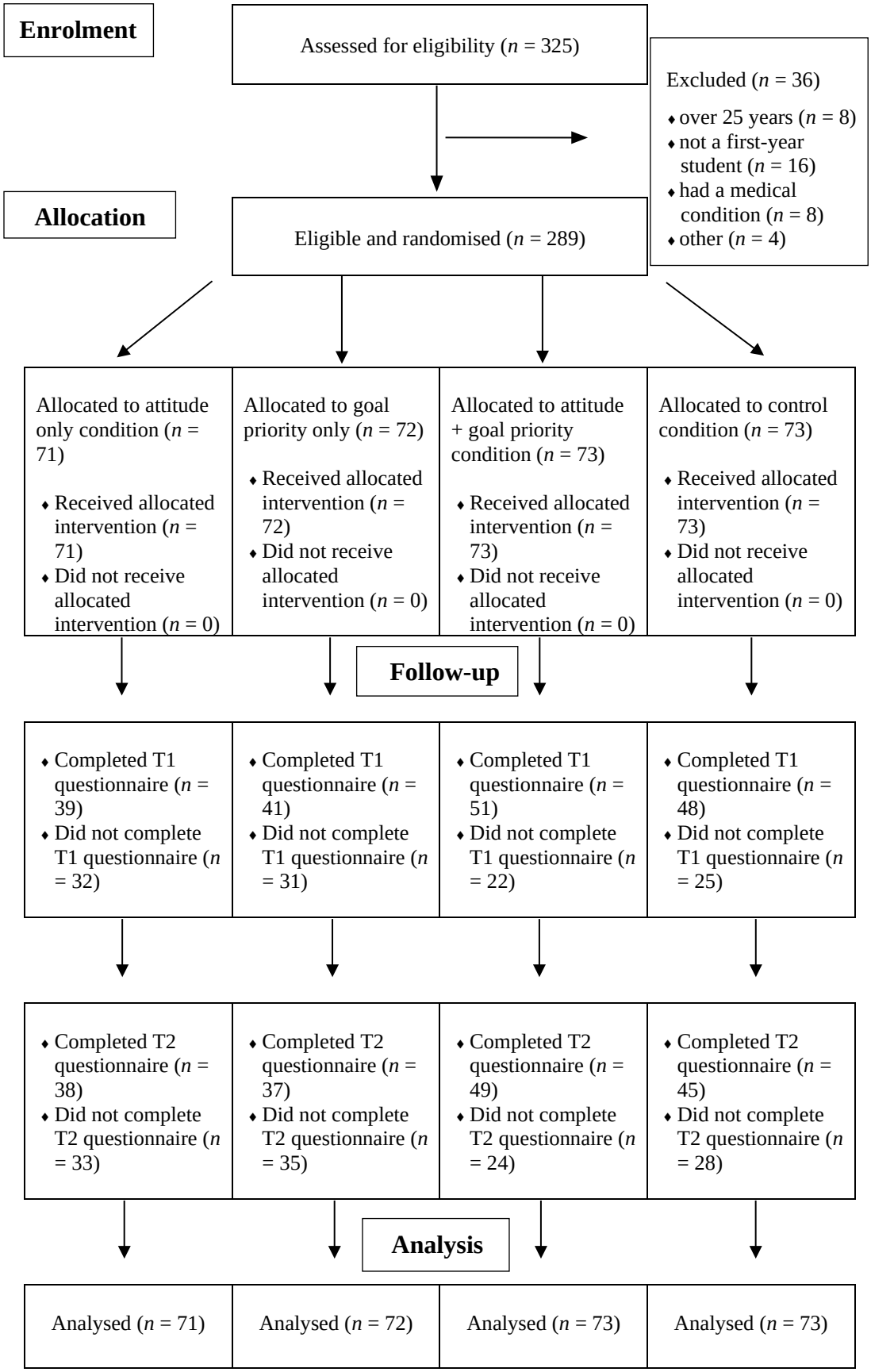

Figure 5.2. CONSORT flow diagram of Study 5 participants.

your period of study provides opportunities to make friends & socialise. Why not get involved in physical activity?".

Goal priority only. Corresponding to Conner et al. (2016), participants in the goal priority condition were asked to prioritise PA. Examples of goal priority messages included "It has been found that writing down how you will prioritise a goal can help you achieve it. Make an attempt at writing down how you will prioritise physical activity" and "Realise your goal by prioritising it. Have a go at writing down how you will prioritise physical activity".

Attitude and goal priority. Those participants in the combined attitude and goal priority condition received a combination of the messages sent to the individual attitude and goal priority conditions. An example of a text message was "Physical activity can reduce the risk of a number of chronic diseases such as type 2 diabetes. Why not perform physical activity? It has been found that writing down how you will prioritise a goal can help you achieve it. Make an attempt at writing down how you will prioritise physical activity".

Control. Participants in the control condition received text messages with generic information relating to PA (i.e. definitions of PA and recommended participation guidelines). Examples of a messages sent to the control condition include "Current guidelines suggest adults should perform physical activity at least 5 days per week for 30 minutes" and "Physical activity is defined as any bodily movement produced by skeletal muscles that require energy expenditure".

5.8.4 Measures

To ensure the definition of PA was understood and consistent throughout, participants were provided with the following description at each assessment time point; "Please note that we are defining physical activity as those moderate to vigorous exercise activities such as jogging, running, and cycling. We also include sports within this definition (e.g. football, rugby, tennis) and anaerobic exercises (e.g. swimming lengths), but not light exercises (e.g. walking or golf). We are referring to such activities being performed in bouts of at least 30 minutes on at least 5 days of the week over the next 2 weeks". All measures can be seen in Appendix E7 but they are briefly stated below.

Psychological constructs. Five items measured attitude (e.g. For me, participating in physical activity would be, Unenjoyable-Enjoyable, Cronbach's α = T0: .81, T1: .80,

T2: .85), three items measured goal priority (e.g. Other goals and priorities will be set aside in order for me to participate in physical activity, True-False, Cronbach's α = T0: .79, T1: .81, T2: .83), and three items measured intention (e.g. I plan to take part in physical activity, Strongly agree-Strongly disagree, Cronbach's α = T0: .78, T1: .82, T2: .83). SN and PBC were also measured at T0 using three (e.g. People who are important to me would disapprove/approve of me participating in physical activity, Would disapprove-Would approve, Cronbach's α = .75) and four items (e.g. How confident are you that you can participate in physical activity, Not very confident-Very confident, Cronbach's α = .81), respectively. All items were measured using 7-point Likert scales which varied in direction.

Physical activity. PA was measured using three items (e.g. A typical week within the past 4 has consisted of physical activity being performed on at least 5 days, True-False, Cronbach's α = T0: .90, T1: .93, T2: .93).

5.9 Results

The analyses used an updated version of IBM SPSS (version 26.0). Items were again reverse scored, when necessary, with lower scores representing negative perceptions and higher scores representing positive perceptions. Similarly, the average of the items measuring each psychological construct and PA behaviour was computed, with the latter converted into a single z-score.

5.9.1 Randomisation checks

To check adequate randomisation between intervention conditions at baseline, a MANOVA was conducted with age, attitude, SN, PBC, intention, goal priority and behaviour at T0 as the dependent variables and condition (attitude only, goal priority only, attitude and goal priority, and control) as the independent variable. There were no significant differences between conditions, $F(21, 801) = 1.18$; Wilks' $\Lambda = .91$, $p = .25$; $\eta p2 = .02$. Chi-square tests also revealed no significant differences in gender between conditions, $\chi^2(3, N = 289) = 1.68$, $p = .64$.

5.9.2 Attrition analyses

From the 289 participants completing T0 assessments, 179 participants responded at T1 (61.94%), 169 at T2 (58.48%), and 135 participants completed all three assessments (46.71%). To check whether there were differences in demographics, psychological

constructs and behaviour at T0 between those completing all three assessments and those not, a MANOVA was conducted with T0 age, attitude, SN, PBC, intention, goal priority, and behaviour as the dependent variables and status of participation (completers and non-completers) as the independent variables. There were no significant differences between study participants who completed or did not complete all time points, $F(7, 281) = 1.8$; Wilks' $\Lambda = .95$, $p = .07$; $\eta p2 = .04$. A series of chi square tests also revealed no significant differences in attrition between gender ($\chi^2(1, N = 289) = .72$, $p = .59$), condition ($\chi^2(3, N = 289) = 5.21$, $p = .15$), those receiving attitude messages (yes vs. no) ($\chi^2(1, N = 289) = .59$, $p = .44$), and those receiving goal priority messages (yes vs. no) ($\chi^2(1, N = 289) = .28$, $p = .59$). Additionally, patterns of missing data were analysed and were found to be missing at random ($p = .17$ for Little's missing completely at random test). Consequently, multiple imputation was conducted on all missing values using SPSS. Five new datasets were created using regression models including relevant baseline and post-intervention variables. Analyses were computed separately on each of the five imputed datasets. Similarities were apparent on each of the five analyses and generated values were within expected ranges. Rubin's rules were then used to combine *F*, *p* and η2 values from each of the datasets. These again represented similarities with each of the individual datasets and so results are presented from the first imputation.

5.9.3 Main analyses

Impact of attitude and goal priority messages. To examine the impact of the messages on the psychological variables and behaviour, a 2 (attitude: yes vs. no) by 2 (goal priority: yes vs. no) by 2 (time: immediately post-intervention, four weeks post-intervention) mixed MANCOVA was conducted. Attitude, goal priority, intention, and behaviour assessed immediately post-intervention (T1) and four weeks post-intervention (T2) were the (repeated-measures) dependent variables and T0 attitude, goal priority, intention, behaviour, age, and gender were covariates. Results showed a significant multivariate main effect for attitude messages (F (4, 276) = 5.76, $p = .00$, $\eta 2 = .07$). Specifically, attitude messages had a significant main effect on attitude (F (1, 279) = 4.12, $p = .04$, $\eta 2 = .01$), intention (F (1, 279) = 11.54, $p = .00$, $\eta 2 = .04$), and behaviour (F (1, 279) = 17.06, $p = .00$, $\eta 2 = .05$) (hypothesis 1). Marginal means showed participants receiving attitude messages had more positive attitudes (received = 5.64, did not receive = 5.35), intentions (received = 5.04, did not receive = 4.62), and

behaviour (received = 0.14, did not receive = -0.08) than those that did not receive attitude messages. Goal priority messages had no main effect on the psychological constructs and behaviour (F (4, 276) = 1.85, p = .11, η2 = .02) (hypothesis 3) and there were no interactions between messages (F (4, 276) = .99, p = .70, η2 = .00) (hypothesis 5). Pooled imputed means of study variables by condition can be seen in Table 5.2 and significant main effects in Figures 5.3, 5.4 and 5.5. The results were similar in the per protocol analyses with a significant multivariate main effect found for attitude messages (F (4, 122) = 5.09, p = .00, η2 = .14) on attitude (F (1, 125) = 9.06, p = .00, η2 = .06), intention (F (1, 125) = 7.44, p = .00, η2 = .05), and behaviour (F (1, 125) = 10.30, p = .00, η2 = .07). Similarly, there was no main effect for goal priority messages (F (4, 122) = 1.44, p = .22, η2 = .04) and no interactions between messages (F (4, 122) = .54, p = .70, η2 = .01).

Mediation analyses. Mediation was undertaken to establish whether changes in attitude and intention at T1 mediated the effects of attitude messages on behaviour at T2. The serial multiple mediator model (model 6) within the SPSS macro PROCESS was used to examine the causal chain linking the mediators (Hayes, 2018). More specifically, the analyses examined the influence of (a) attitude messages on T2 behaviour through T1 attitude (indirect effect 1), (b) attitude messages on T2 behaviour through T1 intention (indirect effect 2) and (c) attitude messages on T2 behaviour through T1 attitude and T1 intention, with T1 attitude influencing T1 intention (indirect effect 3). Attitude messages were entered as the independent variable, T2 behaviour the dependent variable, and T1 attitude and T1 intention the mediators. Thus, in accordance with the TPB, the model tested the model—attitude messages > T1 attitude > T1 intention > T2 behaviour. As recommended by Hayes (2018), a bootstrapping method was used to examine indirect effects with data resampled 5,000 times and 95% bias-corrected confidence intervals provided. An indirect effect and the difference between two indirect effects is established when the confidence interval does not contain zero. This procedure was undertaken separately on all the five imputed datasets. Results were similar across all five imputations and so the findings from one imputation are presented here.

Results showed attitude messages significantly predicted T1 attitude (a_1), T1 intention (a_2) and T2 behaviour (c). T1 attitude significantly predicted T1 intention (d_{21}) and T1 intention significantly predicted T2 behaviour (b_2). Attitude messages did not significantly predict T2 behaviour when controlling for T1 attitude and T1 intention

(c'_1) and T2 behaviour was not significantly predicted by T1 attitude (b_1). A statistical diagram of the serial multiple mediator model is shown in Figure 5.6.

The mediation analyses showed the indirect effect of attitude to be nonsignificant as the 95% bias-corrected bootstrap CI straddled zero ($a_1b_1 = 0.0223$, CI = -0.0125 to 0.0705). The indirect effects of both intention ($a_2b_2 = 0.0925$, CI = 0.0237 to 0.1727) and attitude and intention ($a_1d_{21}b_2 = 0.0614$, CI = 0.0220 to 0.1057) were significantly positive as the 95% bias-corrected bootstrap CI did not straddle zero. Thus, the impact of attitude messages was mediated by the intention (indirect effect 2) and the attitude and intention (indirect effect 3) paths (hypothesis 2).

Table 5.2. *Pooled descriptive means of attitude, goal priority, intention and behaviour assessed by message condition (N = 289).*

	Attitude only (n = 71)	Goal priority only (n = 72)	Attitude & goal priority (n = 73)	Control (n = 73)	Total (N = 289)
Attitude					
T0	5.82 (0.97)	5.41 (1.14)	5.68 (1.19)	5.65 (1.02)	5.64 (1.09)
T1	5.90 (0.88)	5.43 (1.02)	5.71 (1.05)	5.51 (1.07)	5.63 (1.02)
T2	5.64 (1.04)	5.13 (1.20)	5.56 (1.17)	5.09 (1.23)	5.36 (1.19)
Goal priority					
T0	3.91 (1.28)	3.62 (1.34)	3.80 (1.31)	3.72 (1.30)	3.76 (1.31)
T1	4.09 (1.27)	3.88 (1.25)	4.15 (1.32)	3.78 (1.47)	3.97 (1.34)
T2	4.23 (1.22)	3.98 (1.33)	4.11 (1.30)	3.73 (1.39)	4.01 (1.32)
Intention					
T0	5.36 (1.22)	4.73 (1.76)	5.21 (1.52)	5.02 (1.46)	5.08 (1.52)
T1	5.26 (1.32)	4.72 (1.48)	5.27 (1.28)	4.48 (1.63)	4.93 (1.47)
T2	5.11 (1.32)	4.49 (1.51)	5.00 (1.21)	4.32 (1.54)	4.73 (1.44)
Behaviour					
T0	0.12 (0.89)	-0.10 (0.94)	0.03 (0.90)	-0.05 (0.90)	0.00 (0.91)
T1	0.21 (0.85)	-0.07 (0.85)	0.24 (0.87)	-0.19 (0.90)	0.04 (0.89)
T2	0.11 (0.88)	-0.15 (0.83)	0.23 (0.81)	-0.17 (0.88)	0.00 (0.87)

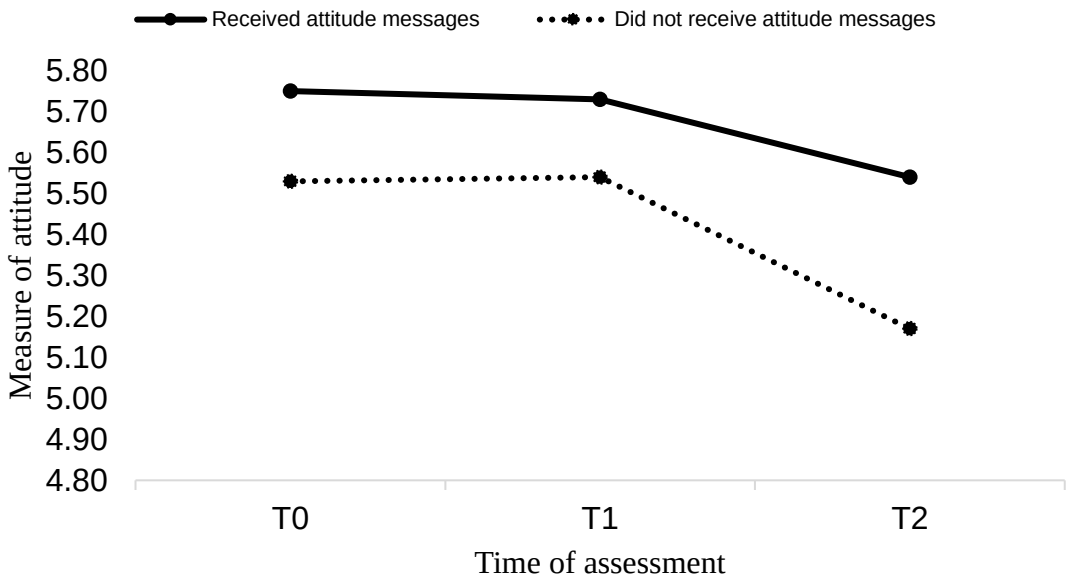

Figure 5.3. Main effect of attitude messages on attitude (N = 289).

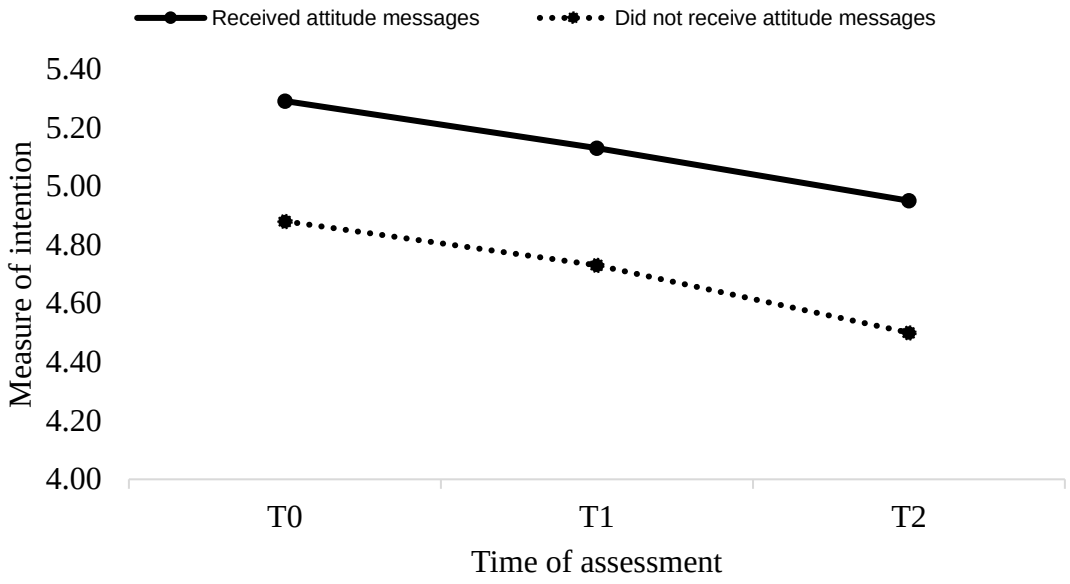

Figure 5.4. Main effect of attitude messages on intention (N = 289).

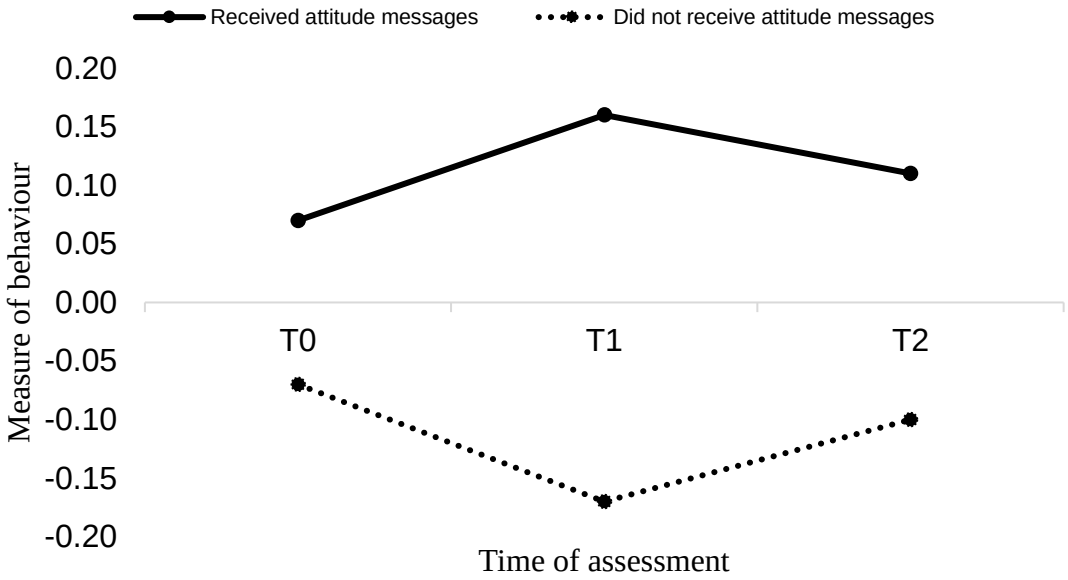

Figure 5.5. Main effect of attitude messages on behaviour (N = 289).

Note. There were no significant differences between conditions at baseline.

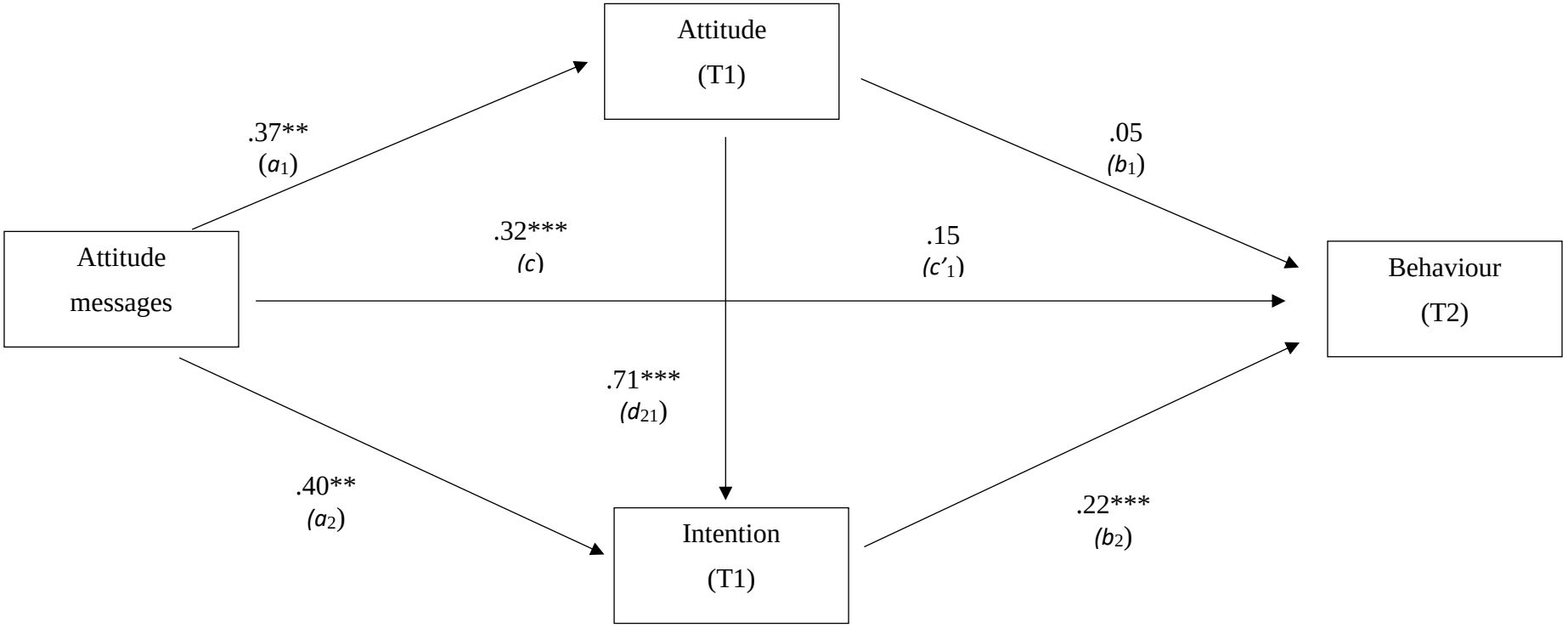

Figure 5.6. A statistical diagram of the serial multiple mediator model for the impact of attitude messages on behaviour through attitude and intention.

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

5.10 Discussion

The purpose of Study 5 was to examine the effectiveness of a SMS intervention including attitude messages and goal priority messages targeting students' participation in PA.

5.10.1 Attitude messages

In line with hypothesis 1, attitude messages had a significant influence on attitude, intention and behaviour and in accordance with hypothesis 2, the effects of the messages on behaviour were mediated by attitude and intention. Changes in the psychological constructs are not surprising given participants were students undergoing significant lifestyle transitions and adapting to university life. Indeed, this transitional period represents an ideal opportunity for health interventions as students' perceptions towards behaviours are yet to be formed and are more amenable to change (Allom et al., 2016). Changes in attitude were also unsurprising given the text messages targeting this construct were tailored towards PA. Providing the benefits of PA have been shown to influence attitudes towards the behaviour within text messages (Sirriyeh et al., 2010) and other modalities (Conner et al., 2011; Morris et al., 2016). Text messages have also been used to successfully change attitudes towards other health behaviours (Carfora et al., 2016; Carfora, Caso, Palumbo, & Conner, 2018; Carfora, Catellani, Caso, & Conner, 2019). The study therefore provides evidence that the SMS delivery mode can also be adopted to manipulate attitudes towards PA and other key TPB determinants within a university sample. The mediation analyses suggested the influence of attitude messages on behaviour was fully mediated by the attitude and intention path. This is in accordance with the TPB which states changes in attitude leads to changes in intention which results in behaviour change (Ajzen, 1985). Thus, the study also supports the TPB's causal mechanisms through which interventions exert influence on behaviour and suggests attitude to be particularly important in influencing PA behaviour.

5.10.2 Goal priority messages

Contrary to hypotheses 3-5, the study found no evidence for goal priority messages. There are a number of potential explanations for the lack of success for goal priority manipulations. Text messaging interventions targeting some health behaviours and psychological mechanisms have not always demonstrated effectiveness (e.g. Naughton et al., 2014; Shapiro et al., 2012; Thomas et al., 2018). Thus, it could be that goal

priority manipulations are less suited to interventions delivered through SMS. Alternatively, null findings could be attributed to the various characteristics involved within text messaging interventions. There is no one-size-fits-all approach to delivering SMS interventions and message effectiveness can vary depending on the frequency, duration, and timing of messages as well as the levels of interactivity (Muntaner, Vidal-Conti, & Palou, 2016). For example, although participants received three messages per week in the current study, text messages delivered more frequently have demonstrated greater effectiveness (e.g. Franklin et al., 2006; Orr & King, 2015). It could be that messages were too infrequent to change priorities. Moreover, the intervention period lasted two weeks and messages were not tailored to participants. Armanasco et al. (2017) found interventions conducted over a longer period of time (i.e. 6-12 months) to be more effective and Head et al. (2013) showed the effectiveness of tailored text messages in changing health behaviours, although this was not feasible with the cohort size in Study 5. Future research is needed to ascertain the optimal characteristics of SMS interventions to change the goal priority construct. This would enable tests to be undertaken that ascertain the importance of goal priority in transferring positive intentions into behaviour.

5.10.3 Study implications

There are a number of recommendations from the study. First, research promoting PA in first-year university students could adopt similar text messages to the attitude manipulations used here. Providing the benefits of PA and how participation in the behaviour can be beneficial to students may lead to changes in psychological determinants and behaviour. Adopting the SMS delivery mode is also highly useful for interventions promoting students' rates of PA given the ease at which SMS can be distributed and the vast number of students in possession of a mobile phone (Horner et al., 2017; Leung, 2007). Second, the study suggests further research is needed to identify the most effective ways to increase goal priority (Conner et al., 2016), particularly within the SMS delivery mode. For example, there could be an optimal number of text messages required to be distributed or the timing or the messages could be relevant. The length, tailoring, direction, and frequency of the messages could also be important. Third, future research should seek to understand the effectiveness of goal priority within other modalities. This could include other uses of mobile phones (i.e. mobile applications, email, voice notes) or alternative delivery modes (i.e. websites,

printed materials). It would be useful to understand which mode is most effective. Fourth, as the study only targeted the attitude construct to tap into motivational processes, research could also undertake manipulations of SN and PBC (either independently or in combination) along with goal priority manipulations. Finally, SMS studies with longer follow-up periods and objective assessments of PA should be undertaken.

5.10.4 Strengths and limitations

There are a number of strengths accorded to the study. First, the intervention adopted health psychological theory and sought to address both motivation and intention translation. Due to the importance of adopting such theory and recent attention afforded to bridge the intention-behaviour gap, the study was thus timely and important. Second, the study utilised a simple, yet novel implemental strategy that has received little attention to date. Indeed, goal priority had only been investigated by Conner et al. (2016). Third, the intervention was undertaken using a relevant, contemporary delivery method. Utilising text messages meant the intervention was cost effective, well suited to students, and able to reach a considerable number of participants. Fourth, the intervention targeted an important health behaviour within a population where declines are often seen (Bray & Kwan, 2006). The benefits of PA render it important for university students to meet current recommendations of activity. Fourth, the study recruited from many universities within the UK and may therefore be generalisable to other institutions. Finally, the study adopted imputation methods on missing data which led to an increase in statistical power (McCleary, 2002). Results from the imputations were also similar to the per protocol analyses.

Despite these strengths, the study was not without limitations. First, although a significant number of universities were targeted for recruitment, the response rate for participation was low. Second, the study had low rates of retention throughout each assessment timepoint. To decrease rates of attrition, tailored text messages could be used (Fjeldsoe et al., 2009). Third, although the studies tracked whether the messages had been delivered, it could not be determined whether participants had read them. Given students are prevalent users of mobile phones, the volume of information the device potentially receives could have led to intervention messages getting lost within the stored data. Although this issue is common amongst studies adopting the SMS delivery mode to promote health behaviours (e.g. Kim & Glanz, 2013; Kinnafick et al.,

2016), it is problematic when explaining message effectiveness. Fourth, there was a lack of involvement from the target population in the development of the text messages. Researchers involving participants in co-producing text messaging interventions can ask for feedback on different characteristics of the messages such as the frequency, tone, and content (Abroms, Whittaker, Free, Van Alstyne, & Schindler-Ruwisch, 2015; Wright, Dietze, & Lim, 2017). Thus, such an approach enables an understanding of what specific components may be acceptable and effective (Fitts & Furberg, 2015). For example, first-year students may have suggested the text messages were not delivered at an optimal time or on preferred days. Fifth, a relatively short follow-up period was used and changes may not have been maintained over time. Indeed, it has been recently acknowledged that initial behaviour change is not synonymous with behaviour maintenance (Kwasnicka, Dombrowski, White, & Sniehotta, 2016) and that different strategies may be needed to ensure change is sustained (Murray et al., 2017). Studies with longer follow-ups could establish the effectiveness of the intervention in maintaining behaviour change. Sixth, time constraints meant the study did not undertake the TPB's necessitated formative research to identify important salient beliefs (Ajzen, 1991). Thus, the beliefs targeted within the intervention may not have been those most relevant to PA in this sample. Finally, self-report was used to measure behaviour and due to recall and social desirability bias (Althubaiti, 2016), this method of assessment may not have provided accurate accounts of PA.

5.11 Conclusion

The purpose of Study 4 was to examine the effectiveness of attitude and goal priority SMS in changing key psychological mechanisms and student participation in recreational sport. The pilot study found no effects for text messages but was underpowered to detect any significant differences. Consequently, Study 5 replicated the intervention and targeted PA. The study found a main effect for attitude messages on attitude, intention and behaviour. Furthermore, changes in behaviour were mediated by changes in attitude and intention, with attitude influencing intention. The findings from Study 5 therefore supports the TPB's causal mechanisms through which interventions exert influence on behaviour and suggests attitude to be a prominent driver of intention and subsequent PA behaviour change. Future interventions targeting student participation in PA should adopt similar text messages. The study did not find evidence for goal priority manipulations. Future research should make use of the SMS

delivery method in addressing motivational and implemental issues towards PA whilst also considering different delivery characteristics influencing its effectiveness.

Chapter 6 **General discussion**

6.1 Introduction

Chapter 6 provides a general discussion of the thesis. To achieve this, the aims of the thesis are revisited and a summary of the studies undertaken are provided. Subsequently, the strengths and limitations of the studies will be outlined and the novel contributions of the thesis both theoretically and practically are offered. Finally, the discussion provides a number of suggestions for future research and the chapter will end with a conclusion.

6.2 Thesis aims

First-year students making the transition to university tend to decline in their participation in many health-related behaviours (Goldstein et al., 2015) and instead undertake unhealthy behaviours (Cameron et al., 2015; Wengreen & Moncur, 2009). Students transitioning to university are acclimatising to new environments and making significant lifestyle changes (Arnett, 2000). However, this period of transition represents a teachable moment to intervene on the types of health behaviours that are undertaken (Allom et al., 2016; Lawson & Flocke, 2009). Participation in PA and sport provide many benefits for students. Recent investments were made by Sport England (2012) to increase the number of university students participating in recreational sport. However, interventions within the projects only demonstrated moderate changes in participation rates. These interventions were not underpinned by health psychological theory, despite evidence suggesting theory can enhance the likelihood of intervention success (Bluethmann et al., 2017; Taylor et al., 2012). Theory is also needed to identify the relevant psychological determinants influencing behaviour and this information can then be used to inform the development of an intervention. The TPB offers guidance on the formative work required to identify such determinants, specifically the relevant behavioural, normative and control beliefs (Ajzen, 1988). However, research to date had not identified the motives of students towards recreational sports participation using the TPB. Thus, there was a clear need to identify the psychological factors underlying first-year students' decision to participate in recreational sport using the theory.

The TPB, like the majority of theories of social cognition, provides information on identifying what to change (i.e. beliefs, determinants) but lacks guidance on how to change such determinants (Sniehotta et al., 2014). The manipulation of psychological

determinants can be achieved using many strategies, also known as BCTs. BCTs are the specific ingredients used to change psychological determinants and recent efforts have been made to relate BCTs with psychological determinants (e.g. Cane et al., 2015; Carey et al., 2018; Connell et al., 2018; Michie et al., 2008). However, the infancy of such work meant clarity was lacking in terms of which BCTs could have been adopted to change the identified psychological determinants underlying students' participation in recreational sport. Thus, there was a need to identify relevant BCTs that could be included within an intervention to target the identified key behavioural, normative and control beliefs. In addition to this, BCTs do not provide information on the specific content that should be included within interventions adopting them. Recent studies had addressed this problem through identifying the reasons and solutions to identified key beliefs (Epton et al., 2015; Vayro & Hamilton, 2016). This was also needed with regards to the key beliefs underpinning students' participation in recreational sport.

Many modalities for delivering an intervention promoting health behaviours exist and interventions adopting the SMS delivery mode have demonstrated success in changing a number of health behaviours (Griffin et al., 2018; Kinnafick et al., 2016; Kim & Glanz, 2013). However, it was not clear whether text messages could be a useful tool for changing recreational sports participation. In addition to this, a gap between intention and behaviour has been established (Rhodes, Plotnikoff, & Courneya, 2008) and the goal priority strategy has shown promise in strengthening the intention-behaviour relationship (Conner et al., 2016). However, it was not clear whether this strategy could be effective within the SMS delivery mode. Thus, there was also a clear need to understand whether changes in first-year students' recreational sports participation could occur through integrating text messages and the goal priority strategy.

Finally, another health behaviour providing many benefits when regularly undertaken is PA (Conn et al., 2009; Warburton et al., 2010). However, similar to recreational sport, research has established participation to decline when students make the transition to university (Bray & Kwan, 2006; Sinclair et al., 2005). Interventions promoting PA have demonstrated success using the SMS delivery mode (Griffin et al., 2018; Kinnafick et al., 2016; Kim & Glanz, 2013). However, it was not clear whether attitudes towards PA amongst first-year students could be manipulated using SMS. Furthermore, research had not established whether the SMS delivery mode could manipulate priorities towards PA. Thus, there was also a clear need to understand

whether changes in first-year students' PA could occur through integrating text messages and the goal priority strategy.

The thesis aimed to: (1) identify the psychological processes underlying first-year students' participation in recreational sport, (2) provide additional content for an intervention targeting recreational sports participation, (3) test a novel intervention promoting students' recreational sports participation, and 4) test a refined intervention targeting students' participation in PA.

6.3 Summary of studies undertaken

Study 1 adopted the TPB to identify the salient beliefs relating to students' recreational sports participation. More specifically, the study identified first-year students' modal salient behavioural, normative, and control beliefs underlying the behaviour. Participants were required to respond to a theory-based questionnaire examining the advantages and disadvantages of recreational sport (behavioural beliefs), those who would approve and disapprove of participation (normative beliefs), and factors that would make it easier and more difficult to participate (control beliefs). The study elicited a total of 53 beliefs; 18 behavioural beliefs, 11 normative beliefs, and 24 control beliefs. The modal set was gained by identifying the beliefs stated by at least 30% of participants and revealed 17 beliefs; six behavioural beliefs, five normative beliefs, and six control beliefs. The modal salient behavioural beliefs (advantages) related to the health benefits of recreational sports participation, the enjoyable nature of recreational sport, the potential for improving mental well-being, and the opportunities that recreational sport provides for developing new friendships. The disadvantages of recreational sports participation related to the time required to participate and the potential distractions from academic study. Referents identified within the modal salient normative beliefs approving of participation in recreational sport included family members and friends. Those perceived to disapprove of participation also included family members and friends in addition to academic staff. The modal salient control beliefs related to time constraints, study workloads, awareness of the sports available, and a lack of motivation to participate in recreational sport. The beliefs identified in Study 1 provided vital information concerning the psychological foundations underlying first-year students' participation in recreational sport. As recommended by Ajzen (1988), these modal salient beliefs can be used to inform the second piece of formative

work. Thus, Study 1 enabled the identification of more specific psychological intervention targets in a subsequent study.

Study 2 identified the key beliefs and determinants associated with students' recreational sports participation. Participants responded to a TPB-informed questionnaire at baseline which included the modal salient beliefs identified in Study 1. The questionnaire also measured attitude, SN, PBC, intention, and past behaviour. Four-weeks later participants responded to a second questionnaire assessing participation in recreational sport. To understand the influence of determinants, correlations and regressions between TPB constructs, intention and behaviour were undertaken. To identify the key beliefs associated with recreational sport, the modal salient beliefs were firstly correlated with intention and behaviour. Following this, the beliefs significantly correlating with intention and behaviour were regressed onto these variables. Results showed attitude, SN and PBC accounted for 56% of the variance in intention, with past behaviour adding an additional 14% of the variance. Intention and PBC explained 27% of the variance in behaviour. With regards to the beliefs, all behavioural, normative and control beliefs correlated with intention and two behavioural and five normative beliefs correlated with behaviour. The key beliefs that predicted intention were; 'Enjoyable' *(β* = .58), 'Time consuming' *(β* = -.23), 'Friends' (injunctive; *β* = .21), 'Family' (injunctive; *β* = .33), and 'Friends' (descriptive; *β* = .17). Two key beliefs predicted behaviour; 'Enjoyable' *(β* = .28) and 'Time consuming' *(β* = -.27). Study 2 provided support for the TPB in explaining first-year students' participation in recreational sport. More importantly, the study identified the key beliefs underlying the behaviour which should be targeted within interventions developed to promote the behaviour.

Study 3 identified additional information for an intervention developed to promote students' recreational sports participation. The study identified the reasons and solutions to the key beliefs found in Study 2. This information can be used to provide explanations for the key beliefs, which can then be applied to change them. The study also identified relevant BCTs that could successfully attend to these beliefs. Four focus groups were conducted with first-year students enrolled on a number of degree programmes at the university. Content analysis identified 14 reasons relating to the key belief 'Enjoyment' (i.e. recreational sport is non-competitive), 11 reasons for the key belief 'Friends (injunctive)' (i.e. socialising), 11 reasons for friends' own participation (i.e. socialising), 14 reasons for the approval of family members (i.e. enjoyment), and 10 solutions to the key belief 'Time constraints' (i.e. prioritising). With regards to the

BCTs, 12 distinct strategies were suggested to attend to the key beliefs. These included 'Information about emotional consequences', 'Information about others' approval', and 'Commitment'. Through identifying the reasons and solutions to the key beliefs identified in Study 2 and relevant BCTs, Study 3 provided useful information for the content of a behaviour change intervention targeting first-year students' participation in recreational sport. Including this information within an intervention could lead to a greater number of students participating in sport.

Study 4 undertook a novel SMS intervention targeting students' participation in recreational sport. The intervention comprised text messages targeting attitude and goal priority. Participants were randomised into one of four conditions (attitude only, goal priority only, attitude and goal priority, and control) and received six text messages over a two-week period. At baseline (T0), immediately after intervention completion (T1) and four weeks after intervention completion (T2), measures of attitude, goal priority, intention and behaviour were taken. The study did not find any effects for attitude and goal priority messages. However, the small number of participants meant the study was underpowered to yield any main effects. It was therefore decided that the behaviour of target should be altered from recreational sport to PA. The comparable decline in PA rates to those of recreational sport in university students (Bray & Born, 2004; Sport England, 2014) provided a sound basis for this transition. Study 5 therefore replicated Study 4, with a focus on students' participation in PA. The study found a main effect for attitude messages on attitude, intention and behaviour. Participants receiving attitude messages scored higher on these measures compared to those that did not receive attitude messages. Serial mediation analyses established the impact of attitude messages on behaviour at T2 to be mediated by the intention path and the attitude and intention path at T1. The study found no main effect for goal priority messages and no interactions. Thus, the study provided evidence for: (1) the SMS delivery mode in changing key psychological determinants, (2) the importance of attitudes, and (3) the causal model of the TPB.

6.4 Strengths and limitations of the work

There are a number of strengths and limitations attached to the studies within the thesis. Some of these strengths and limitations are applicable to all of the studies undertaken whilst others apply to specific studies. These will be outlined accordingly.

6.4.1 Strengths

First, a major strength of the work was the focus on behaviours that yield significant health benefits when undertaken, particularly for the population studied. Students participating in recreational sport and PA are likely to experience many academic (Haines, 2001; Huesman et al., 2009), physiological (Warburton et al., 2006), psychological (Iso-Ahola, 1989; Kanters, 2000), and social (Byl, 2002; Elkins et al., 2011) benefits. Given first-year students are making significant life transitions when starting university, it is particularly important that such behaviours are adopted during this period. Students undertaking these behaviours during the early stages of higher education are likely to achieve the aforementioned benefits. Moreover, if students can be encouraged to engage in these behaviours during this teachable moment, they are more likely to be undertaken in the future (Huang et al., 2007). Thus, the specific health behaviours addressed within each of the studies was a major strength of the thesis.

Second, the thesis examined a health behaviour that has received little attention to date within health psychological literature. Compared to the research addressing health behaviours such as alcohol consumption (Hagger, Lonsdale, & Chatzisarantis, 2012; Norman et al., 2018), diet (Deshpande, Basil, & Basil, 2009; Louis, Davies, Smith, & Terry, 2007), and smoking (Flett, Grogan, Clark-Carter, Gough, & Conner, 2017; Müssener et al., 2016) within the student population, university sports participation has been examined less. This is unfortunate given both the lack of students participating and the many benefits that can be attained through participation. Thus, the focus on students' participation in recreational sport was another strength of the thesis.

Third, health psychological theory was used throughout the thesis to inform the studies. The importance of theory has been outlined within recent frameworks and planning models including the MRC (Campbell et al., 2000; Craig et al., 2008), IM (Bartholomew et al., 2006), and PRECEDE-PROCEED (Green & Kreuter, 2005). Adopting theory to promote health behaviours enables the identification of relevant intervention targets (Michie et al., 2008), increases the likelihood of intervention success (Taylor et al., 2012; Webb et al., 2010) and enables explanations of intervention findings (Michie et al., 2008). However, despite the importance of health psychological theory, many health promotion attempts do not utilise the insights of health psychology when developing interventions (Dombrowski et al., 2007). Indeed, it was demonstrated how the projects funded by Sport England (2012) were not required to adopt health

psychological theory in their development. Thus, the use of health psychological theory within each of the studies was another strength of the thesis.

Fourth, and following on from the previous strength, the studies within the thesis adopted a prominent behaviour change theory. The TPB is one of the most widely cited behaviour change theories and has been applied to understand many health-related behaviours. One of the major strengths of the TPB is the explicit guidance on how to identify relevant psychological intervention targets through undertaking belief elicitation and predictive studies, respectively. Despite the importance of this formative work, the number of studies undertaking both procedures have been surprisingly few (Ajzen, 2015). Indeed, the majority of studies adopting the theory have undertaken predictive studies to explain the behaviour of interest (Downs & Hausenblas, 2005). Although such studies usefully provide an understanding of the variance explained by and the importance of psychological determinants (i.e. attitude, SN, PBC), they are insufficient for intervention development because the specific beliefs underlying the behaviour are not identified (Ajzen & Fishbein, 1980). Through undertaking the recommendations outlined within the TPB, Studies 1 and 2 identified the relevant behavioural, normative and control beliefs underpinning first-year university students' participation in recreational sport. Given no study had used the TPB to identify the underlying beliefs related to recreational sport, this is another strength of the thesis. More specifically, this work enabled the identification of relevant factors that should be used for targets within interventions promoting first-year students' participation in recreational sport.

Fifth, Study 3 provided important additional information relating to the psychological processes identified in Studies 1 and 2. More specifically, the study gained the thoughts and opinions of the student population to provide explanations for the identified key behavioural, normative and control beliefs. The study also identified potentially useful BCTs to attend to the beliefs. This additional information was important given the TPB offers little guidance in how to change relevant beliefs (Sniehotta et al., 2014). Moreover, there is no consensus in the literature regarding the most effective ways to alter the identified beliefs and including relevant others in the design process can help shape the content of an intervention and increase its effectiveness (Bartholomew et al., 2011). Thus, rather than directly developing and undertaking an intervention to promote recreational sport based on the identified psychological information, Study 3 provided important information that could inform

the content of an intervention. Thus, the inclusion of the student sample in Study 3 to both explain the identified key behavioural, normative, and control beliefs and identify suitable BCTs to be included within an intervention was another strength of the thesis.

Sixth, the thesis included experimental studies to understand the effects of manipulating key psychological constructs on behaviour. As was mentioned, a large proportion of studies within health psychology, especially those adopting the TPB, have been undertaken to predict the behaviour of interest (Rhodes & Nigg, 2011). These studies adopting cross-sectional or prospective designs cannot provide causal explanations of psychological determinants nor test the theoretical assumptions of a theory (Weinstein & Rothman, 2005). This requires adopting an experimental design or, to a lesser extent, undertaking longitudinal research. Studies 4 and 5 were behavioural interventions that manipulated psychological variables and examined the effects on subsequent behaviour. Study 5 found the attitude text messages to successfully influence attitude, intention and behaviour. Mediation analyses was then undertaken which enabled the causal influence of TPB constructs to be understood. It was found that the effects of attitude messages on PA was mediated through attitude and intention, with attitude influencing intention. The inclusion of behaviour change interventions experimentally manipulating psychological mechanisms and understanding the causal role of determinants was another strength of the thesis. Thus, Studies 4 and 5 concluded a coherent programme of research informed by psychological theory from each of the preceding studies.

Seventh, the intervention studies were delivered using a contemporary delivery mode. Many modalities can be used to deliver interventions promoting health behaviours, but health psychology has seen a recent surge in the use of mHealth (Fjeldsoe et al., 2009). The use of mHealth to deliver the intervention was highly relevant to the thesis given the vast number of university students in possession of a mobile phone (Fowler & Noyes, 2015). In addition to the use of mHealth, the intervention specifically adopted SMS which had many additional benefits over other uses of mobile phones (i.e. email, social media, apps). Text messages are available on all mobile devices, are the primary means of communication within students (Leung, 2007), and are relatively cost-effective (Horner et al., 2017). Thus, the use of mHealth and the SMS delivery mode to communicate the interventions in Studies 4 and 5 was another strength of the thesis.

The final strength of the thesis related to the behaviour change strategy adopted in the interventions. It was outlined that researchers have established a gap between intention and behaviour (Webb & Sheeran, 2006) and many theories and strategies have been developed to address this discrepancy and facilitate intention translation (e.g. Gollwitzer, 1999; Schwarzer, 2008). The goal priority strategy, where the individual prioritises one goal over another, has received less attention despite Conner et al. (2016) demonstrating the usefulness of the strategy. More specifically, goal priority was found to strengthen the intention-behaviour relationship in different health behaviours (Conner et al., 2016). Studies 4 and 5 advanced this work through examining the effectiveness of the strategy within the SMS delivery mode. Although no effects were found for goal priority, the intervention studies were able to identify several recommendations for its future use in promoting health behaviours. For example, it was suggested that several delivery characteristics should be examined, especially when the text messaging delivery mode is used. Thus, the intervention studies testing the effects of a novel and contemporary strategy focusing on intention translation was another strength of the thesis.

6.4.2 Limitations

Despite these strengths, the thesis is not without limitations. First, the generalisability of some of the studies within the thesis may be limited. Studies 1-4 were focussed on recreational sports participation which may not be offered to all students within other universities. For example, some universities may only provide participation in competitive sport or gymnasiums. Moreover, even if recreational sport is offered within other universities, results taken from the single institution used within the thesis may not be relatable to these universities. For example, participation in recreational sport at other universities may be underpinned by different modal salient behavioural, normative and control beliefs, or may be influenced by alternative key beliefs. Similarly, the strategies suggested by participants in Study 3 to attend to the key beliefs may not be applicable to other universities. Despite these concerns, the university of study was representative of the wider student population in terms of age and gender. Moreover, the recreational sports offered at the institution are popular amongst universities that provide similar sporting opportunities.

Second, self-report was used to assess behaviour throughout the thesis. This method of assessment was used to measure students' recreational sports participation

(Studies 2 and 4) and engagement in PA (Study 5). Due to recall errors and social desirability bias (Althubaiti, 2016), this method of assessment may not have provided valid accounts of behaviour. Indeed, research has shown discrepancies between behaviour measured through self-reports and behaviour assessed using objective measures (e.g. Jakicic et al., 2015; Liu, Eaton, Driban, McAlindon, & Lapane, 2016), with the former providing inflated rates of participation. To address this issue, Studies 2 and 4 could have adopted objective or other indirect measures to assess recreational sports behaviour (e.g. swipe cards, registers) and Study 5 could have assessed PA using pedometers or accelerometers. The inclusion of these measures was considered at the experimental design stage but were excluded on the basis of logistics and resource. Moreover, these measures also have limitations attached to their use. For example, the swiping of a card does not necessarily guarantee the behaviour was undertaken (Meslot, Gauchet, Allenet, François, & Hagger, 2016) and pedometers and accelerometers come at a considerable cost thus making it difficult to allocate to all study participants (Sliepen, Brandes, & Rosenbaum, 2017). Nevertheless, the use of self-report to measure behaviour was another limitation of the thesis, despite being the main stay of research in this area.

Third, the studies relating to recreational sport recruited first-year students in general when motives may have differed in relation to students' nationality, gender, and residency. This is important since some research suggests that international students experience participation in activities at university differently to those home-based students (Guo & Ross, 2014). Having potentially relocated for the purpose of academic study, international students may subsequently feel greater pressure to perform academically (Mori, 2000) and thus engage less in recreational sport (Li & Stodolska, 2006). With regards to residence, the proximity of facilities is likely to influence participation rates (Watson, Ayers, Zizzi, & Naoi, 2006). For example, Milton and Patton (2011) found students living in the university's halls of residence were more likely to enter the recreation centre than those that commuted to university. In relation to gender, females have been shown to participate in sport for social reasons compared to males who have been shown to be motivated more so by competition and aspects of appearance (Kelder, Perry, Peters, Lytle, & Klepp, 1995; Tsai, Lo, Yang, Keller, & Lyu, 2015). Within all of these examples, students' motivations towards participation in recreational sport may have differed. With that said, the university of interest only had a

small number of international students (n = 39 in 2016) and the majority of first-year students lived on the university campus.

Fourth, and following from the third limitation, recreational sport was only broadly examined and there could be discrepancies in motives to participate in specific types of recreational sports. Although research has been lacking with regards to the determinants to participate in different sports (Breuer, Hallmann, & Wicker, 2011), differences in motives towards specific recreational sports would have implications for the sports that students undertake. For example, if a student prefers racquet sports, they are less likely to participate in a touch rugby session. To promote participation in specific recreational sports, these motivational differences would require tailored behavioural interventions. For example, an intervention targeting participation in rugby may be required to emphasise the competitive atmosphere whereas promoting badminton may emphasise the relaxed atmosphere. The investigation of motives towards different recreational sports may also be necessitated due to the timetabling of such activities. The schedule for recreational sport is generally static in that the sports are offered repeatedly at the same time and on the same day on a weekly basis. Thus, if a specific sport has lower rates of participation compared to others, it is important to identify the distinctive psychological determinants influencing participation. Thus, not considering the motives towards and the participation in specific recreational sports was a limitation of the thesis. Despite this, there existed a lack of research in relation to the psychological foundations underpinning recreational sport in general, especially with regards to the behavioural, normative and control beliefs. It was therefore important to firstly examine perceptions towards recreational sport in general and future research may look to examine the psychological mechanisms underlying participation in specific recreational sports.

Fifth, the studies within the thesis only targeted students in their first year of undergraduate study. Although addressing these students was important given the critical period of behavioural patterns being developed during this time (Stewart-Brown et al., 2000), students outside of the first year would have benefited from the studies (i.e. second, third year undergraduate students). Similarly, the studies only examined undergraduate students, despite the potential for postgraduate students to engage in the investigated behaviours. Studying these different student populations may have led to different elicited modal salient behavioural, normative and control beliefs and, subsequently, different key beliefs. For example, Henchy (2013) reported one of the

reasons for differences between undergraduate and graduate students' use of campus recreational facilities related to housing arrangements. More specifically, the availability of the facilities to undergraduate students living on campus led to these students engaging with the recreational facilities more than graduate students. Similar to the distinctions between specific recreational sports, different behavioural interventions may be required to target participation rates of students outside of the first year of study. Thus, the focus on undergraduate students, specifically those within the first year of study, may represent another limitation of thesis, should the findings be extrapolated to the general population.

Sixth, the studies examining recreational sport did not account for whether the students were participating in other types of sport. It was previously mentioned that universities typically provide additional versions of sport for students to undertake such as the competitive BUCS leagues. Not accounting for such sports makes it possible that students recruited to the studies were not 'inactive' students or 'new' students to sport. Indeed, Milton and Patton (2011) found students participating in competitive sport were more likely to enter the recreation centre than students that did not compete in competitive sport. Although it was decided that due to the small size of the institution it would be more appropriate not to exclude participants undertaking other versions of sport, it cannot be certain that the participants recruited for the studies were not participating in other types of available sports. This may have potentially led to inactive students being missed. Despite being a limitation of the thesis, recreational sport still provides many benefits, many of which would still be gained irrespective of whether students also engaged in other versions of sport. For example, students competing in BUCS competitions are still able to develop new friendships and gain the physiological benefits afforded by recreational sport. If feasible to do so, research should strive to recruit students that are wholly inactive from sport and attempt to promote participation in them.

Seventh, the sample size of study participants within some studies was low. Only 95 participants responded to the follow-up questionnaire in Study 2 which was a 53.8% decrease from those completing baseline assessments. Similarly, Study 4 only managed to recruit 70 participants and expectations were not met for Study 5, despite efforts to attend to this issue. For example, instead of recruiting from the single institution used in Studies 1-4, 104 universities within the UK were contacted to distribute recruitment materials to their first-year students. In addition to this, the

behavioural focus of investigation was changed from recreational sport to PA. It was expected that this change to a familiar behaviour would have resulted in greater interest in the study. Despite these efforts, only 289 participants were eligible to participate in the study and the number of students completing all three assessments was low (n = 135). Although issues of recruitment and retention are common amongst studies investigating the behaviours of first-year university students (Kwan, Cairney, Faulkner, & Pullenayegum, 2012), the low response rates did not contribute to a lack of power within the analyses as the statistical results confirmed sufficient power to enable our hypotheses to be interrogated. Nevertheless, to prevent the inflated risk of type 2 errors, future research could ensure a greater number of participants are recruited and retained within interventions promoting health behaviours. In relation to the former, evidence has been provided for the use of relevant people in recruitment (O'Connor et al., 2016) and through contacting participants by phone (Balmford, Borland, Benda, & Howard, 2013). With regards to attrition, the characteristics of a SMS intervention could contribute to retaining participants (i.e. message duration, frequency, and timing) (Grutzmacher et al., 2019) and it is important participants perceive the intervention to be beneficial (O'Connor et al., 2016).

Eighth, the thesis only examined initial behaviour change and assessments of follow-up behaviour were relatively short. For example, the impact of text messages on behaviour in Studies 4 and 5 was assessed four weeks after the intervention had been completed. Given this short follow-up period, it cannot be certain that changes in behaviour were maintained after the study was completed. Indeed, there are difficulties in maintaining behaviour change (Rothman, Baldwin, Hertel, & Fuglestad, 2011), and successfully doing so is more problematic than making an initial change (Kwasnicka et al., 2016). This is concerning given discontinuing participation in health behaviours, such as PA, can minimise the initial benefits gained (Mujika & Pandilla, 2000). Research has demonstrated the mechanisms underlying behavioural maintenance to be separate to the mechanisms underlying initial change (Howlett, Trivedi, Troop, & Chater, 2019; Kwasnicka et al., 2016). The issue of maintaining behaviour is discussed in more depth within the 'Suggestions for future research' section, but not considering this was another limitation of the thesis.

Ninth, the interventions in Studies 4 and 5 did not use students in the development of the text messages. Pretesting messages with the target audience can provide important information in relation to certain characteristics of the intervention

(Wright et al., 2017). This information may then lead to revisions of the original messages, with this procedure potentially being undertaken many times (Abroms et al., 2015). This iterative process may have been useful for the development of the goal priority messages. More specifically, first-year students may have commented on the phrasing of the messages and the likelihood of prioritising given the information. Similarly, important information regarding the preferred frequency, duration, and timing of the text messages may have been gained through pretesting. Although time constraints prevented the pretesting of text messages, failure to do so may have had consequences for the interventions.

Finally, the thesis only examined two health-related behaviours and there are many additional behaviours that students could undertake to positively influence health (e.g. fruit and vegetable consumption, diet). Moreover, students' health can be improved by reducing their engagement in detrimental behaviours (e.g. smoking, alcohol consumption). Thus, in addition to the behaviours studied in the thesis, it is also important to increase students' rates of other health enhancing behaviours and decrease rates of detrimental health behaviours. Furthermore, it does not necessarily follow that improving students' participation in PA and recreational sport leads to positive health. For example, Marzell, Morrison, Mair, Moynihan and Gruenewald (2015) found students participating in intramural sports also demonstrated high rates of alcohol consumption. Therefore, it is also important to attend to multiple health behaviours and understand how they interact to influence health. Although it was beyond the scope of the thesis to examine the influence of multiple health behaviours, the findings do provide the foundation for the study of other health behaviours using this type of intervention.

6.5 Novel implications of the thesis

There are a number of key and novel contributions this thesis has made to the area of health psychology. These contributions can be separated into those that provide avenues from a theoretical perspective and those that offer practical advancements.

6.5.1 Theoretical

From a theoretical perspective the thesis offers support for the TPB as a useful theory for identifying the psychological foundations of behaviour. The thesis demonstrates that the formative work outlined within the theory can be applied to recreational sports

participation. More specifically, Studies 1 and 2 successfully identified relevant behavioural, normative and control beliefs. Future work attempting to change behaviour should ensure that the specific psychological processes underlying the behaviour of interest are identified through undertaking similar formative work. This would be particularly important for studies investigating behaviours receiving less research to date, as was the case here with regards to recreational sport. That is because the relevant psychological targets underlying such behaviours would not be known. Nevertheless, it has been repeatedly mentioned that the majority of studies adopting the TPB have failed to undertake the belief elicitation procedure. This is crucial, especially if the purpose of the research is to not only understand behaviour but to change it. Interventions should then ensure these psychological mechanisms are targeted within the intervention. Thus, the thesis provides support for the assertions of Ajzen (1991) in understanding the behaviour of interest and also suggests a greater number of studies should also undertake this formative work in the future.

The thesis provides support for the causal influences of determinants within the TPB. More specifically, Study 5 found attitude messages successfully influenced attitude and intention towards PA. Moreover, changes in PA were found to be mediated by the attitude and intention path, with attitude influencing intention. The study therefore supported the causal influence of attitude and intention on behaviour, something which is specified within the TPB. This finding suggests future work attempting to change first-year students' participation in PA should target the determinants within the theory. More significantly, the study identified the importance of manipulating the attitude construct, especially as the construct led to changes in intention. The implication of this finding is that efforts to change participation rates would be better inclined to change attitude towards the behaviour. Successfully changing this construct could then lead to changes in intentions which, ultimately, would lead to successful participation in PA. Thus, another implication of the thesis related to the causal influences of the TPB determinants.

The thesis provides an alternative method of identifying potentially useful BCTs. Research to date has sought to identify relevant BCTs by mapping BCTs onto psychological mechanisms. Through various indirect approaches, suggestions are then made as to the psychological mechanisms that can be influenced by specific BCTs. As research has not yet validated these suggestions through experimental work, Study 3 utilised a representative sample to obtain this information. More specifically, the study

used focus groups comprising first-year students to identify relevant BCTs that could be adopted to target the previously identified key beliefs associated with recreational sports participation. This alternative way of identifying relevant BCTs could provide a useful means of establishing important links between psychological mechanisms and BCTs. From such links, behavioural interventions could then be developed to target the relevant psychological processes. This work provides two main implications for future research from a theoretical perspective. First, interventions informed by and subsequently developed on the thoughts and opinions of the target population could improve the likelihood of effective change. Second, this approach could be used to supplement the indirect approaches currently being used to understand the relationship.

6.5.2 Practical

Campaigns developed with the purpose of promoting recreational sport at university should ensure the interventions include the insights from health psychological theory. These theories provide important information for intervention development and can enhance the effectiveness of the campaign. Applications for the projects funded by Sport England (2012) were not required to demonstrate how health psychological theory would be used to guide the development and implementation of the intervention. Rather, proposals were required to demonstrate how recreational sport would be targeted (as opposed to competitive sport), and how students would benefit from the funding. Despite the considerable investment into the interventions, only a moderate increase in participation rates was achieved and there was a lack of an understanding why this was the case. It is therefore important to ensure that practical interventions are underpinned by health psychological theory because this enables interventions to be understood, refined and, ultimately, to increase the number of students participating in recreational sport.

Interventions relating to recreational sport should promote the behaviour through specifically targeting the beliefs identified in Studies 1 and 2. More specifically, promotion efforts should target the enjoyable nature of recreational sport at university and the approval of significant others such as family members and friends. Interventions should also target the perception of time constraints towards participation and ensure students are aware that recreational sport is available to them. Given the beliefs identified in the thesis are unlikely to apply to all universities, as previously mentioned, studies may be required to be undertaken to identify those most relevant to the

university of interest. These studies should specifically comprise elicitation and predictive studies to determine the key underlying behavioural, normative and control beliefs. Nevertheless, some of the beliefs outlined within the thesis could be relatable to other institutions and thus should be targeted.

Universities attempting to promote recreational activities, such as sport, have a number of resources available to increase rates of participation. Of particular relevance to recreational sport, participation may be increased successfully through utilising some of the BCTs identified in Study 3. Interventions could promote recreational sport using persuasive messages throughout the university campus. Students could be taught time management skills to ensure they have enough time to participate in the activities or be asked to self-monitor their behaviour. The effectiveness of promotion attempts may be increased through including the reasons and solutions also gained from the focus groups in Study 3. For example, promotion efforts could emphasise that university recreational sport is enjoyable due to its non-competitive nature or that friends and family members would be supportive of their decision to participate due to the opportunities to socialise. Thus, efforts to promote recreational sport within first-year students at university should seek to include the identified BCTs, reasons and solutions outlined within the thesis.

There are many modalities for delivering a behaviour change intervention targeting health behaviour. Study 5 provided evidence for the effectiveness of adopting the SMS delivery mode to change key psychological determinants and PA behaviour. More specifically, the study found attitude messages to influence attitude, intention and behaviour. To change first-year students' attitudes and intentions towards PA, interventions may therefore find it beneficial to adopt similar text messages to those used in the study. Adopting such messages may then lead to a greater number of students participating in PA. This delivery mode is particularly appealing for many reasons. From the perspective of the students, text messaging is a popular communication tool (Perry & Lee, 2007) and requires minimal effort. From the researchers' perspective, text messages are able to reach a vast number of students at a relatively low cost. Thus, there exists a great opportunity to target first-year students' participation in PA through undertaking SMS interventions. Specifically adopting the messages used in Study 4 may demonstrate increases in participation rates.

Although Studies 4 and 5 did not find the goal priority strategy to be effective, efforts to promote university students' rates of recreational sport and PA could still include the strategy within text messages. These promotion attempts could examine

whether the strategy is effective when certain delivery SMS characteristics are manipulated. For example, text messages sent more frequently or at a specific time of the day may find the strategy to be effective. Such efforts should still ensure students have the requisite motivation to engage in the behaviours because the strategy is unlikely to be effective if motivation is absent. That is, an intention to engage in recreational sport and PA is needed if prioritising the behaviours is going to be effective. It may therefore be useful to include text messages targeting motivation, such as those yielding success in the thesis, with the goal priority strategy. Therefore, although integrating attitude and goal priority SMS was not effective in the intervention studies, attending to relevant message characteristics of the latter may ultimately prove to be beneficial in improving students' rates of recreational sport and PA.

6.6 Suggestions for future research

There are a number of avenues for future research developing from the thesis. First, there is a need for a greater number of experimental studies testing the determinants outlined within the TPB. There has been a vast number of predictive studies in relation to the TPB's determinants but the number of studies experimentally manipulating them has been low (Conner, 2015). These tests should firstly identify appropriate psychological targets through formative work and then randomised control trials undertaken to understand the causal influence of the determinants. Confirming the causal relations of the TPB's determinants would provide an advancement in psychological theorising regarding the theory.

Second, experimental studies should seek to validate the mapping of BCTs to mechanisms of change through establishing whether the suggested techniques exert influence on the respective psychological processes. Testing the theorised relations would yield valuable information for future interventions in health psychology. For example, if the mapping of 'Information about health consequences' theorised to influence 'Knowledge' is experimentally validated, interventions targeting 'Knowledge' would be best suited to adopt the BCT 'Information about health consequences'. Once a consensus is reached on the BCTs influencing mechanisms, studies may then seek to map BCTs onto specific health behaviour change theories. Current work uses the Theoretical Domains Framework (Cane et al., 2012) to represent mechanisms, but considerable advances in individual behaviour change theories would be made if BCTs are mapped onto the determinants. For example, establishing which BCTs can be

adopted to change attitude, SN and PBC would advance work relating to the TPB. Preliminary work has been undertaken in relation to some theories, including Self Determination Theory (i.e. Gillison, Rouse, Standage, Sebire, & Ryan, 2019), and factors of motivation and maintenance (Howlett et al., 2019; Murray et al., 2017). For example, Murray et al. (2017) found the BCTs 'Prompt self-monitoring of behavioural outcome' and 'Use of follow-up prompts' to be the most effective in maintaining PA. Understanding which BCTs map onto and successfully influence TPB determinants would provide a significant theoretical development.

Third, research should establish how first-year university students' participation in recreational sport and PA is maintained. The maintenance of behaviour change has been defined as either the sustainment of behaviour over a period of time (Fjeldsoe, Neuhaus, Winkler, & Eakin, 2011) or the moment at which behaviour becomes automatic (Rothman, 2000). Regardless of the definition used, it is evident that the psychological processes underlying initial change are different to maintenance (Rothman et al., 2011). An interesting development in the field relates to habits and habitual behaviour. These are behaviours that are automated without conscious awareness when cues are repeatedly paired with stimulus (Gardner, 2015). Research has identified the development of habits and cue activation to maintain initial change (Gardner, Phillips, & Judah, 2016). Variance in intention and behaviour accounted for by the TPB is suggested to be high when habit strength is low. In this instance, behaviour is driven by deliberative social cognitive variables such as intentions and self-efficacy. However, when a behaviour is habitual the action is induced through non-conscious processes instead of prior reflective states (Gardner, 2015). In this instance, the variance explained by the TPB is reduced and behaviour is driven by contextual cues (Allom et al., 2016). Targeting participation in health behaviours, such as PA and sport, through habits may be a fruitful avenue for future research (Allom et al., 2016). This could examine the formation and enactment of habits, the mostly relevant habitual cues, and the time required for habit formation (Kaushal & Rhodes, 2015). Other avenues for maintenance research could comprise mediation analyses to identify the specific mechanisms that underlie behavioural maintenance (Murray et al., 2018) and examining the usefulness of combining theories of motivation, volition and maintenance (Kwasnicka et al., 2017).

Fourth, health psychological theory should be adopted to modify the health behaviours of students within different years at university, especially as poor rates of

participation are not exclusive to first-year students (Racette, Deusinger, Strube, Highstein, & Deusinger, 2008). Similar to the many studies promoting students' health behaviours, transitioning first-year students were targeted within the thesis given the opportunity and importance of intervening during this period. It is nevertheless important for students outside of the first year of study to be physically active and participate in recreational sport. Such students are likely to face different challenges to that of a first-year student. Moreover, students at the later stages of undergraduate study would have presumably spent considerably more time at the university meaning patterns of behaviour may be well formed. Given these issues, interventions that are more disruptive to unhealthy behaviours may be required to alter perceptions towards and participation in the behaviours. Relatedly, research should adopt health psychological theory to examine the motives of postgraduate students towards these behaviours. Similar to differences between levels of undergraduate students, those undertaking graduate study are likely to hold different behavioural, normative, and control beliefs towards recreational sport. Thus, greater attention should be given to promoting the health behaviours of a wide range of university students.

Fifth, interventions should continue to adopt novel delivery modes to enhance students' participation in health behaviours. Given that the use of text messages was found to be effective within the thesis, future research should seek to further enhance the use of SMS or similar delivery mechanisms. This should be undertaken to identify the characteristics influencing intervention effectiveness. Research is currently unclear as to the optimal duration (i.e. 2 weeks), frequency (i.e. six messages) and timing (i.e. afternoon) of interventions adopting text messages. Moreover, some studies have found evidence for bidirectional text messages (e.g. Finitsis, Pellowski, & Johnson, 2014; Fjeldsoe et al., 2009; Wald et al., 2015) whereas others have not (e.g. Armanasco et al., 2017; Head et al., 2013). Thus, research should seek to validate which of these characteristics are mostly influential in determining intervention effectiveness. Identifying the optimal characteristics of SMS interventions promoting health behaviours would shed light on important issues relating to the delivery mode that could enhance the likelihood of future interventions being successful.

Sixth, there are many avenues future research should explore in relation to the goal priority strategy. First, research should examine the effectiveness of the strategy in changing other health-related behaviours, especially as goal priority has only been experimentally tested in relation to PA. Conner et al. (2016) provided correlational

evidence concerning many health behaviours (i.e. binge drinking, sunscreen use) but experimental manipulations are required to examine whether such behaviours can be altered though prioritisation. Second, research should examine the specific characteristics and conditions contributing to the efficacy of goal priority manipulations. For example, prioritising at a specific time (i.e. in the morning) or a specific number of times (i.e. twice) may exert greater influence on behaviour. Third, research should establish the influence of goal priority manipulations over time. Prioritising a goal may, eventually, lead to the behaviour becoming habitual. Behaviour guided nonconsciously through contextual cues may then rely less on the strategy. Fourth, research should examine whether goal priority can be integrated with other BCTs to lead to behaviour change. It could be that goal priority leads to greater behaviour change when combined with the effective BCTs identified by Michie et al. (2009) (i.e. self-monitoring, intention formation, specific goal setting, review of behavioural goals and feedback on performance). For example, those prioritising and monitoring their behaviour may demonstrate greater behaviour change than those either only prioritising or only monitoring. As a strategy to facilitate intention translation, it may be that goal priority is more effective when combined with motivational BCTs (e.g. intention formation) than volitional BCTs (e.g. action planning). The integration of BCTs and goal priority warrants further investigation. Fifth, future research is needed to understand the influence of the strategy within text messaging interventions. This should examine how the effectiveness of the strategy is influenced by certain message characteristics (i.e. tailoring, frequency, timing). Finally, the usefulness of the strategy within other delivery modes should be examined. The thesis adopted SMS and prior research has used face-to-face manipulations but other uses of mobile phones (e.g. WhatsApp, Facebook), eHealth (e.g. websites, emails), and printed materials (e.g. leaflets, posters) could lead to successful priorities being formed.

Finally, as previously mentioned, students have many goals and intentions that could be pursued and changes in a single health behaviour rarely occurs without considering the other behaviours. Although the thesis attended to this issue through goal priority, an alternative approach is through undertaking multiple health behaviour change interventions (Prochaska, Spring, & Nigg, 2008). These interventions enable the exploration of behaviours sharing common underlying psychological mechanisms (Evers & Quintiliani, 2013) and may have greater impact compared to intervention targeting a single behaviour (Prochaska & Prochaska, 2011). Investigating multiple

behaviours provides opportunities for research relating to both recreational sport and PA. Research should ascertain how undertaking one of these behaviours (i.e. PA) influences other health behaviours concurrently (i.e. healthy eating). For example, interventions targeting PA may demonstrate positive associations with healthy eating. Conversely, as was identified earlier, participation in sport could lead to greater rates of alcohol consumption (Marzell et al., 2015). It should be noted that interventions attempting to change multiple health behaviours have shown varied success. Webb et al. (2010) found that targeting multiple health behaviours had less effect than targeting single behaviours. However, others have found health outcomes to be successfully addressed within multiple health interventions (e.g. Conn et al., 2008; Spring et al., 2012). A meta-analysis undertaken by Wilson et al. (2015) found interventions recommending changes in a moderate number of behaviours to be more effective than those including a high number. Further investigation is needed on these issues.

6.7 Conclusion

To conclude, the purpose of the thesis was to develop and undertake interventions targeting improvements in first-year university students' participation in recreational sport and PA. The transition to university offers a teachable moment for interventions to intervene on the types of health behaviours undertaken. To facilitate this, the thesis adopted health psychological theory throughout, specifically the TPB. The thesis identified the salient behavioural, normative and control beliefs related to recreational sports participation and the key beliefs associated with the behaviour. Following this, the reasons and solutions to these beliefs were identified and a number of potentially useful BCTs attending to these beliefs were highlighted. The thesis then presented two experimental studies that targeted students' participation in recreational sport and PA. The final study of the thesis successfully manipulated attitude, intention and PA behaviour using the SMS delivery mode. The thesis thus provides support for the use of health psychological theory in designing and implementing theory-based interventions targeting university students' participation in recreational sport and PA.

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Appendices

APPENDIX A: Study 1 materials

Appendix A1. Participant Information Sheet

Title of research: A belief elicitation study to identify salient beliefs concerning university students' decision to participate in sport.
Researcher Name: Thomas St Quinton
Researcher contact details: T.StQuinton@leedstrinity.ac.uk
Supervisor's name at Leeds Trinity University: Dr Julie Brunton
Supervisor's contact details: J.Brunton@leedstrinity.ac.uk 01132 837364

My name is Thomas St Quinton and I am a PhD student at Leeds Trinity University. I am devising an intervention to increase university students' participation in sport. As part of this research, I first need to understand some of the motives that may inhibit or enhance the likelihood of students taking part in sport. As such, I would like to invite you to partake in this questionnaire which aims to understand your thoughts concerning university sport. Before you decide to take part, you need to understand why the research is being done and what it would involve for you. Please read the following information carefully.

You have been invited to take part in this research investigating student participation in university sport. The research will facilitate in devising an intervention to address this concern. The questionnaire is one taken from an established behaviour change theory and therefore addresses the fundamental psychological processes theorised to influence behaviour. The questions relate to the advantages/disadvantages of sporting behaviour, people you believe would approve/disapprove of the behaviour, and the factors that would make performing sport easy/difficult. Please note that here university sport refers to sport that the university provides and is **NOT** focussed on competitive sport such as BUCS teams.

Please answer the open-ended questions as honestly as possible and try to express your thoughts in as much detail as you can. Please be assured that there are no right or wrong answers. Please try to answer all questions, however leave blank if you feel that you cannot give a response. There is also a spare page at the end of the questionnaire should you not have enough space.

Please note that your participation is entirely voluntary. The questionnaire will not be given to anyone other than the researcher. Therefore, please be assured of complete confidentiality. If you feel that any aspect is unclear, do not hesitate to ask questions or request further information. Please take your time to decide if you would like to take part.

What will happen to me if I take part?
The study involves answering open-ended questions addressing your thoughts around university sport. You will be given a questionnaire and sufficient time to answer the questions. You can refrain from answering any of the questions or can withdraw at any point. You may also ask questions if you feel the need to do so. This should roughly take between 25-30 minutes.

What are the disadvantages of taking part?
You may find that some of the questions are boring and sound similar. Please note that the questions are addressing specific psychological beliefs and so have been previously validated.

What are the possible benefits of taking part?
You may enjoy answering questions concerning university sports participation. These results will help me greatly in identifying key motives to change during intervention.

Will my taking part in the study be kept confidential?

Any information you give during the questionnaire will be kept completely confidential. This means that only I will know your name, that you have taken part, and your answers. Although the information may be shared between myself and the supervisory team, be assured that your confidentiality will remain. Any information disclosed which indicates a law has been broken may result in the information being passed to the relevant authorities therefore breaking confidentiality. If you have any further questions, please ask me either before or during the questionnaire process.

Will my data be anonymous?

A code will be attached to both the consent form and questionnaire. This will be used to ensure that personal data is not used, and anonymity will remain. Moreover, this code is utilised if withdrawal is wanted (see the question regarding participant withdrawal). Only I will read the questionnaires and whilst people at the university will read my project report, they will not know any names or other personally identifying information of people who participated. The words from your questionnaire may be used in the study report or for presentation purposes; however, you will be referred to as 'participant X' and quotes will be non-identifiable. Again, the participant you will be referred to will depend on the coded number allocated. With this said, the information received will be analysed and themes will be drawn. As such, individual responses are not of great concern for this study; it is group responses that are useful. If you have any further questions, please ask me either before or during the questionnaire process

What will happen if I don't want to carry on with the study?

You may refuse to answer any questions within the questionnaire or withdraw from the study at any point.

What will happen to the results of the study?

The results from the questionnaire will be content analysed and arranged into different themes. The analysed findings will be reported in my project. The researcher will follow the Data Protection Act and adhere to the university and trust policies/procedures on ensuring confidentiality of personal data is maintained at all times. Paper copies with identifiable information on participants such as contact details forms and consent forms will be locked securely in the researcher's university office desk drawer which is located in a locked office. The university regulations state that research data has to be kept for a period of 10 years. They will then be destroyed by the researcher. The research data will be kept on the Leeds Trinity University server which is password protected. Only the researcher will have access to this password. The entire process of data collection and analysis will only be completed by the researcher. Anonymised transcripts may be kept for further publication purposes and stored in line with the Data Protection Act (1998). The study will be published in relevant academic journals. The study may also be presented at academic conferences. There will be no feedback of the results.

What if I want to withdraw the data I have given?

If you wish to withdraw your questionnaire data, please do so within 14 days of the study. In doing so, the data obtained from the questionnaire will be destroyed and will not be included in the study. Please contact me via my email stated at the bottom of this sheet if you would like to withdraw.

What if I have a complaint?

If you have any complaints or are unhappy with any aspect pertaining to the study then please contact the chair of the school ethics board, Dr Alison Torn - 0113 283 7110 or a.torn@leedstrinity.ac.uk

Further information

Email- Thomas St Quinton: T.St.Quinton@leedtrinity.ac.uk
Supervisor- Dr Julie Brunton: J.Brunton@leedstrinity.ac.uk

Appendix A2. Participant Consent Form

Title of Project: A belief elicitation study to identify salient beliefs concerning students' decision to participate in sport

Name of Researcher: Thomas St Quinton

	Please tick to confirm
• I have been given the opportunity to ask questions about the research and address any concerns I may have	
• I understand that I can withdraw myself from the study at any point up until the analysis has been completed and do not need to provide a reason	
• I understand I can refuse to answer a question in the questionnaire	
• I understand I can withdraw my information at any time before analysis and know how to do this	
• I understand that the information I provide will be kept confidential and anonymous	
• I agree to take part in this study	

Name of Participant

_____

Signature of Participant Date

_____ _____

Appendix A3. Participant Debrief Sheet

Thank you for partaking in the study titled: A belief elicitation study to identify salient beliefs concerning university students' decision to participate in sport.
As part of PhD research, the study sought to identify students' beliefs concerning their decision to engage in sport.

If you wish to withdraw your questionnaire data, please do so within 14 days of the study. In doing so, the data obtained from the questionnaire will be destroyed and will not be included in the study. Please contact me via my email stated at the bottom of this sheet if you would like to withdraw.

If you find that the questionnaire has caused any distress or worry, then please contact the Leeds Trinity University counselling team can be contacted on +44 (0) 1132 837192 or via email to s.jack@leedstrinity.ac.uk.

If you have any complaints or are unhappy with any aspect pertaining to the study then please contact the chair of the school ethics board, Dr Alison Torn – 01132 837110 or a.torn@leedstrinity.ac.uk

If you require any further information, would like to know the outcome of the study, or have any questions whatsoever, then please do not hesitate and contact me on t.stquinton@leedstrinity.ac.uk

Thank you very much for taking part.

Thomas St Quinton
Department of Sport, Health and Nutrition
Leeds Trinity University
Email: t.stquinton@leedstrinity.ac.uk

Appendix A4. Belief Elicitation Questionnaire

1) What is your- Age? _____ Years Gender? Male / Female / Other

   and degree subject? _____

2) What do you see as the advantages of you participating in sport at University for at least 30 minutes, once a week for the next month?

_____

_____

_____

3) What do you see as the disadvantages of you participating in sport at University for at least 30 minutes, once a week for the next month?

_____

_____

_____

4) What else comes to mind when you think about participating in sport at University for at least 30 minutes, once a week for the next month?

_____

_____

_____

When it comes to your participation in sport at University for at least 30 minutes, once a week for the next month, there might be individuals or groups who would think you should or should not perform this behaviour.

5) Please list the types of individuals or groups who would approve or think you should participate in sport at University for at least 30 minutes, once a week for the next month.

_____

_____

_____

6) Please list the individuals or groups who would disapprove or think you should not participate in sport at University for at least 30 minutes, once a week for the next month.

_____

_____

_____

7) Are there any other individuals or groups who come to mind when you think about participating in sport at University for at least 30 minutes, once a week for the next month?

_____

_____

_____

8) Please list any factors or circumstances that would make it easy or enable you to participate in sport at University for at least 30 minutes, once a week for the next month.

_____

_____

_____

9) Please list any factors or circumstances that would make it difficult or prevent you from participating in sport at University for at least 30 minutes, once a week for the next month?

_____

_____

_____

10) Are there any other issues that come to mind when you think about the difficulty of participating in sport at University for at least 30 minutes, once a week for the next month?

_____

_____

_____

Please write the question number(s) and additional answer(s) that you were unable to fit on the main questionnaire;

_____

_____

_____

_____

Appendix A5. Belief Elicitation Coding Sheet

Behavioural beliefs			
Category	**Belief**	**Participant**	**Total**
Advantages	Offers a distraction from study		
	Socialise with friends		
	Opportunities to meet new people		
	Enjoyment		
	Improves health and fitness/ Physical benefits/Helps lose weight		
	Improve skills		
	Increases confidence		
	Prevents boredom		
	Improves mental well-being/mood/Reduces stress		
Disadvantages	Time consuming		
	Study distractions		
	Requires motivation/effort		
	Leads to fatigue/tiredness		
	Cost/money concerns		
	Causes injury		
	Not enjoyable		
	Competitive nature of sport		
	Causes frustration		

Normative beliefs			
Category	**Belief**	**Participant**	**Total**
Approve	Doctor		
	Sporty people		
	Partner		
	Coach/team mates outside of Uni		
	Friends		
	The organisers		

	Family		
Disapprove	Family		
	Academic staff		
	Friends		
	Partner		

Control beliefs			
Category	**Belief**	**Participant**	**Total**
Easier	Time constraints		
	Awareness		
	Study related		
	Cost/money		
	Motivation		
	Improved/access to facilities		
	People/friends to go with		
	More enjoyable		
	More sports available		
	Less hobbies/commitments		
	Weather		
Difficult	Study related		
	Time restrictions		
	Motivation		
	Awareness		
	Money/cost		
	Weather		
	Lack of others to partake with		
	Other priorities/ commitments		
	Lack of confidence		
	Forgetting		
	Illness		
	Influence of friends		
	Access to facilities		

Appendix A6. All elicited behavioural, normative and control beliefs

Table A1. *All elicited behavioural beliefs*

Category	Belief	*n*	%
Advantages	Improves health and fitness/ Physical benefits/Helps lose weight	24	80
	Enjoyment	18	60
	Opportunities to meet new people	9	30
	Improves mental well-being/mood/Reduces stress	9	30
	Offers a distraction from study	6	20
	Socialise with friends	5	16.7
	Increases confidence	4	13.3
	Prevents boredom	3	10
	Improve skills	2	6.7
Disadvantages	Time consuming	22	73.3
	Study distractions	10	33.3
	Requires motivation/effort	7	23.3
	Leads to fatigue/tiredness	6	20
	Cost/money concerns	5	16.7
	Causes injury	5	16.7
	Not enjoyable	4	13.3
	Competitive nature of sport	3	10
	Causes frustration	1	3.3

Table A2. *All elicited normative beliefs*

Category	Belief	*n*	%
Approve	Friends	24	80
	Family	19	63.3
	Doctor	5	16.7
	Coach/team mates outside of University	3	10
	Partner	2	6.7
	The organisers	2	6.7
	Sporty people	1	3.3
Disapprove	Friends	16	53.3
	Academic staff	12	40
	Family	11	36.7
	Partner	3	10

Table A3. *All elicited control beliefs*

Category	Belief	*n*	%
Easier	Time constraints	23	76.7
	Awareness	11	36.7
	Study related	10	33.3
	Cost/money	7	23.3
	Motivation	6	20
	Improved/access to facilities	5	16.7
	People/friends to go with	5	16.7
	More enjoyable	2	6.7
	More sports available	2	6.7
	Less hobbies/commitments	1	3.3
	Weather	1	3.3
Difficult	Study related	17	56.7
	Time restrictions	14	46.7
	Motivation	13	43.3
	Awareness	8	26.7
	Money/cost	5	16.7
	Weather	5	16.7
	Lack of others to partake with	4	13.3
	Other priorities/ commitments	3	10
	Lack of confidence	2	6.7
	Forgetting	2	6.7
	Illness	1	3.3
	Influence of friends	1	3.3
	Access to facilities	1	3.3

APPENDIX B: Study 2 materials

Appendix B1. Participant Information Sheet

Title of research: Identifying belief-based targets for the promotion of participation in University sport
Researcher Name: Thomas St Quinton
Researcher contact details: T.StQuinton@leedstrinity.ac.uk
Supervisor's name at Leeds Trinity University: Dr Julie Brunton
Supervisor's contact details: J.Brunton@leedstrinity.ac.uk 01132 837364

My name is Thomas St Quinton and I am a PhD student at Leeds Trinity University. I am devising an intervention to increase university students' participation in sport. As part of this research, I first need to understand some of the motives that may inhibit or enhance the likelihood of students taking part in sport. As such, I would like to invite you to partake in this questionnaire which aims to understand your thoughts concerning university sport. Before you decide to take part, you need to understand why the research is being done and what it would involve for you. Please read the following information carefully.

You have been invited to take part in this research investigating student participation in university sport. The research will facilitate in devising an intervention to address this concern. The questionnaire is one taken from an established behaviour change theory and therefore addresses the fundamental psychological processes theorised to influence behaviour. The questions relate to the advantages/disadvantages of sporting behaviour, people you believe would approve/disapprove of the behaviour, and the factors that would make performing sport easy/difficult. Please note that here university sport refers to sport that the university provides and is **NOT** focussed on competitive sport such as BUC's teams.

Please answer the closed-ended questions as honestly as possible and be assured that there are no right or wrong answers. Please try to answer all questions, however leave blank if you feel that you cannot give a response.

Please note that your participation is entirely voluntary. The questionnaire will not be given to anyone other than the researcher. Therefore, please be assured of complete confidentiality. If you feel that any aspect is unclear, do not hesitate to ask questions or request further information. Please take your time to decide if you would like to take part.

What will happen to me if I take part?
The study involves answering closed-ended questions addressing your thoughts around university sport. You will be given a questionnaire and sufficient time to answer the questions. You can refrain from answering any of the questions or can withdraw at any point. You may also ask questions if you feel the need to do so. This should roughly take between 15-20 minutes.

What are the disadvantages of taking part?
You may find that some of the questions are boring and sound similar. Please note that the questions are addressing specific psychological beliefs and so have been previously validated.

What are the possible benefits of taking part?
You may enjoy answering questions concerning university sports participation. These results will help me greatly in identifying key motives to change during intervention.

Will my taking part in the study be kept confidential?
Any information you give during the questionnaire will be kept completely confidential. This means that only I will know your name, that you have taken part, and your answers. Although

the information may be shared between myself and the supervisory team, be assured that your confidentiality will remain. Any information disclosed which indicates a law has been broken may result in the information being passed to the relevant authorities therefore breaking confidentiality. If you have any further questions, please ask me either before or during the questionnaire process.

Will my data be anonymous?

A code will be attached to both the consent form and questionnaire. This will be used to ensure that personal data is not used, and anonymity will remain. Moreover, this code is utilised if withdrawal is wanted (see the question regarding participant withdrawal). Only I will read the questionnaires and whilst people at the university will read my project report, they will not know any names or other personally identifying information of people who participated. The words from your questionnaire may be used in the study report or for presentation purposes; however, you will be referred to as 'participant X' and quotes will be non-identifiable. Again, the participant you will be referred to will depend on the coded number allocated. The questionnaire is interested in the perceptions of the student population and, as such, individual responses are not of great concern for this study. If you have any further questions, please ask me either before or during the questionnaire process

What will happen if I don't want to carry on with the study?

You may refuse to answer any questions within the questionnaire or withdraw from the study at any point.

What will happen to the results of the study?

The results from the questionnaire will be analysed to determine the strength of each belief. The analysed findings will be reported in my project. The researcher will follow the Data Protection Act and adhere to the university and trust policies/procedures on ensuring confidentiality of personal data is maintained at all times. Paper copies with identifiable information on participants such as contact details forms and consent forms will be locked securely in the researcher's university office desk drawer which is located in a locked office. The university regulations state that research data has to be kept for a period of 10 years. They will then be destroyed by the researcher. The research data will be kept on the Leeds Trinity University server which is password protected. Only the researcher will have access to this password. The entire process of data collection and analysis will only be completed by the researcher. Anonymised transcripts may be kept for further publication purposes and stored in line with the Data Protection Act (1998). The study will be published in relevant academic journals. The study may also be presented at academic conferences. There will be no feedback of the results.

What if I want to withdraw the data I have given?

If you wish to withdraw your questionnaire data, please do so within 14 days of the study. In doing so, the data obtained from the questionnaire will be destroyed and will not be included in the study. Please contact me via my email stated at the bottom of this sheet if you would like to withdraw.

What if I have a complaint?

If you have any complaints or are unhappy with any aspect pertaining to the study then please contact the chair of the school ethics board, Dr Alison Torn – 01132 837110 or a.torn@leedstrinity.ac.uk

Further information

E-mail- Thomas St Quinton – T.St.Quinton@leedtrinity.ac.uk
Supervisor- Dr Julie Brunton – J.Brunton@leedstrinity.ac.uk

Appendix B2. Participant Consent Form

Title of Project: Identifying belief-based targets for the promotion of participation in University sport

Name of Researcher: Thomas St Quinton

	Please tick to confirm
• I have been given the opportunity to ask questions about the research and address any concerns I may have	
• I understand that I can withdraw myself from the study at any point up until the analysis has been completed and do not need to provide a reason	
• I understand I can refuse to answer a question in the questionnaire	
• I understand I can withdraw my information at any time before analysis and know how to do this	
• I understand that the information I provide will be kept confidential and anonymous	
• I agree to take part in this study	

Name of Participant

_____

Signature of Participant Date

_____ _____

Email Address

_____

Appendix B3. Participant Debrief Sheet

Thank you for partaking in the study titled: Identifying belief-based targets for the promotion of participation in University sport.

As part of PhD research, the study sought to highlight the most influential beliefs and determinants relating to University sports participation.

If you wish to withdraw your questionnaire data, please do so within 14 days of the study. In doing so, the data obtained from the questionnaire will be destroyed and will not be included in the study. Please contact me via my email stated at the bottom of this sheet if you would like to withdraw.

If you find that the questionnaire has caused any distress or worry, then please contact the Leeds Trinity University counselling team can be contacted on +44 (0) 1132 837192 or via email to s.jack@leedstrinity.ac.uk.

If you have any complaints or are unhappy with any aspect pertaining to the study then please contact the chair of the school ethics board, Dr Alison Torn – 01132 837110 or a.torn@leedstrinity.ac.uk

If you require any further information, would like to know the outcome of the study, or have any questions whatsoever, then please do not hesitate and contact me on t.stquinton@leedstrinity.ac.uk

Thank you very much for taking part.

Thomas St Quinton
Department of Sport, Health and Nutrition
Leeds Trinity University
Email: t.stquinton@leedstrinity.ac.uk

Appendix B4. Measures

T0 (baseline)

Behavioural beliefs:

For me, participating in sport at university would improve my health and fitness

1 2 3 4 5 6 7
Strongly disagree Strongly agree

For me, participating in sport at university would be enjoyable

1 2 3 4 5 6 7
Strongly disagree Strongly agree

Participating in sport at university would enable me to meet new friends

1 2 3 4 5 6 7
Strongly disagree Strongly agree

Participating in sport at university would improve my mental well-being

1 2 3 4 5 6 7
Strongly disagree Strongly agree

Participating in sport at university would be time consuming

1 2 3 4 5 6 7
Strongly disagree Strongly agree

Participating in sport at university would take attention away from my studies

1 2 3 4 5 6 7
Strongly disagree Strongly agree

SN:

People who are important to me would disapprove/approve of me participating in sport at university

1 2 3 4 5 6 7
Would disapprove Would approve

People who are like me will participate in sport at university

1 2 3 4 5 6 7
Completely false Completely true

People who are important to me think I should participate in sport at university

1 2 3 4 5 6 7
Disagree Agree

How many people similar to you perform sport at university

1 2 3 4 5 6 7
Virtually none Almost all

People close to me think I definitely should not/should participate in sport at university

1 2 3 4 5 6 7
Definitely should not Definitely should

Attitude:

For me, participating in sport at university would be:

1 2 3 4 5 6 7
Bad Good

1 2 3 4 5 6 7
Pleasant Unpleasant

1 2 3 4 5 6 7
Unhealthy Healthy

1 2 3 4 5 6 7
Desirable Undesirable

1 2 3 4 5 6 7
Unenjoyable Enjoyable

Intention:

I intend to participate in sport at university

1 2 3 4 5 6 7
Strongly disagree Strongly agree

How likely is it that you would participate in sport at university

1 2 3 4 5 6 7
Very unlikely Very likely

How often do you intend to take part in regular sport at university

1 2 3 4 5 6 7
Never Frequently

PBC:

For me, participating in sport at university would be

1 2 3 4 5 6 7
Very difficult Very easy

How confident are you that you will be able to participate regularly in sport at university

1 2 3 4 5 6 7
Not very confident Very confident

Participating in sport at university is beyond my control

1 2 3 4 5 6 7
Strongly disagree Strongly agree

I believe I have the ability to participate in sport at university

1 2 3 4 5 6 7
Definitely do not Definitely do

Whether I participate in sport at university is totally up to me

1 2 3 4 5 6 7
Strongly disagree Strongly agree

I would be comfortable participating in sport at university

1 2 3 4 5 6 7
Strongly disagree Strongly agree

Factors outside my control will influence whether or not I play sport at university

1 2 3 4 5 6 7
Strongly disagree Strongly agree

Control beliefs:

How much would a lack of time make you more or less likely to participate in sport at university

1 2 3 4 5 6 7
Less likely More likely

How much would a lack of knowledge about the sports on offer make you more or less likely to participate in
sport at university

1 2 3 4 5 6 7
Less likely More likely

How much would a lack of motivation or energy make you more or less likely to participate in sport at university

1 2 3 4 5 6 7
Less likely More likely

How much would studying make you more or less likely to participate in sport at university

1 2 3 4 5 6 7
Less likely More likely

Normative beliefs:

My friends think that I should participate in sport at university

1 2 3 4 5 6 7
Strongly disagree Strongly agree

My family think that I should participate in sport at university

1 2 3 4 5 6 7
Strongly disagree Strongly agree

Academic staff think that I should participate in sport at university

1	2	3	4	5	6	7
Strongly disagree						Strongly agree

Most of my friends participate in sport at university

1	2	3	4	5	6	7
False						True

Most of academic staff participate in sport at university

1	2	3	4	5	6	7
False						True

Behaviour:

Please indicate the number of weeks you have performed sport at university for at least 30 minutes, once a week, within the past month

None	One	Two	Three	On all four weeks

T1 (4 weeks post T0)

Behaviour:

The aim of this questionnaire is to assess the extent to which you performed the behaviour under investigation. As a reminder, the behaviour is defined as participation in university sport for at least 30 minutes, once a week, during the past month.

Please answer the following questions by highlighting the response that accurately reflects your participation in sport at university.

Please indicate the number of weeks you have performed sport at university for at least 30 minutes, once a week, within the past month.

0	1	2	3	4

During the past month, how often did you perform sport at university at least once per week, for 30 minutes?

1	2	3	4	5	6	7
Never						Almost always

I have participated in sport at university for at least 30 minutes, once a week, within the past month

1	2	3	4	5	6	7
True						False

APPENDIX C: Study 3 materials

Appendix C1. Recruitment Poster

PhD research study!

Leeds Trinity University

University recreational sport focus groups

Do you want to participate in a research study?

What is the study about?

- We are currently recruiting students to participate in focus group discussions relating to university recreational sport
- Questions relate to the motivations towards recreational sport and what we can do to promote it at LTU

What will you need to do?

- You will be asked to attend a focus group on campus
- Date and time to be arranged once participants are recruited
- Focus group will last roughly 40-60 minutes
- All data will be confidential and anonymous

Who can participate?

- Students in their first year of undergraduate study are eligible

What to do next?

If you are interested in participating or have any questions, then please contact me through email: t.stquinton@leedstrinity.ac.uk.

A participant information sheet is available upon request

Ethical approval has been granted for the study (ref: SSHS/2016/023)

Appendix C2. Recruitment Email

Dear student,

Thank you for taking part in my study last semester. I would like to invite you to take part in another study relating to recreational sport. This study is a focus group asking you about your thoughts about recreational sport and how we could attend to some of the information I found from the earlier study. Please see the attached participant information sheet for detailed information on the study.

If you would like to take part in this study or have any questions, then please contact me via email: t.stquinton@leedstrinity.ac.uk.

Thank you,

Tom St Quinton
Department of Sport, Health and Nutrition
Leeds Trinity University

Appendix C3. Participant Information Sheet

Title of research: A qualitative investigation of belief-based targets for the promotion of participation in University sport
Researcher Name: Thomas St Quinton
Researcher contact details: T.StQuinton@leedstrinity.ac.uk
Supervisor's name at Leeds Trinity University: Dr Julie Brunton
Supervisor's contact details: jabrunton12@gmail.com

My name is Thomas St Quinton and I am a PhD student at Leeds Trinity University. I am devising an intervention to increase university students' participation in sport. As part of this research, I first need to understand some of the reasons that may inhibit or enhance the likelihood of students taking part in sport. As such, I would like to invite you to partake in this focus group which aims to understand your thoughts concerning university sport. The focus group will basically involve a total of six participants (including yourself) who will contribute and provide input to the discussion. Before you decide to take part, you need to understand why the research is been done and what it would involve for you. Please read the following information carefully.

You have been invited to take part in this research investigating student participation in university sport. The research will facilitate in devising an intervention to address this concern. The questions that will be asked will relate to an established behaviour change theory and therefore addresses the fundamental psychological processes theorised to influence behaviour. Research that has been carried out myself previously will inform the content of such questions. Please note that here that 'university sport' refers to sport that the university provides and is **NOT** focussed on competitive sport such as BUC's teams. As such, please give responses based on this consideration. Please answer the questions as honestly as possible and be assured that there are no right or wrong answers. The focus group will be audio-recorded and then transcribed. Please note that your participation is entirely voluntary. Your responses will not be shared with anyone other than the researcher. Therefore, please be assured of complete confidentiality. If you feel that any aspect is unclear, do not hesitate to ask questions or request further information. Please take your time to decide if you would like to take part.

What will happen to me if I take part?
The study involves participating in a focus group with five other participants (students) addressing your thoughts around university sport. You will be asked to attend a mutually agreed time and location. I will give you a brief reminder of the study purpose and you will be given the opportunity to ask any questions if you feel the need to do so. You can refrain from answering any of the questions within the focus group and can withdraw at any point during the focus group. You will be given the opportunity to contribute as fully as you would like. Responses will be audio-recorded. In total, this should roughly take between 40-60 minutes.

What are the disadvantages of taking part?
You may find that some of the questions are boring, sound similar, or are quite simplistic. Please note that the questions are addressing specific psychological beliefs that have been highlighted and therefore your thoughts are crucial.

What are the possible benefits of taking part?
You may enjoy answering questions and giving your opinion concerning university sports participation. You may particularly enjoy discussing this topic with fellow students. These results will help me greatly in identifying key motives to change during intervention.

Will my taking part in the study be kept confidential?

Any information you give during the focus group will be kept completely confidential. This means that only I will know your name, that you have taken part, and your answers. Although the information may be shared between myself and the supervisory team, be assured that your confidentiality will remain. I will also state to fellow participants that discussions should not be spoken about after completion. Any information disclosed which indicates a law has been broken may result in the information been passed to the relevant authorities therefore breaking confidentiality. If you have any further questions, please ask me either before or during the process.

Will my data be anonymous?
Only I and the fellow participants will listen to the responses given and whilst people at the university will read my project report, they will not know any names or other personally identifying information of people who participated. Some passages from the focus group may be used in the study report or for presentation purposes; however, you will be referred to as 'participant X' and quotes will be non-identifiable. If you have any further questions, please ask me either before or during the process.

What will happen if I don't want to carry on with the study?
You may refuse to answer any questions within the focus group or withdraw from the study at any point. Please feel free to exit the room if you feel uncomfortable in any way. Please note that any data given up and until the point of departure will be retained during the analysis.

What will happen to the results of the study?
The results from the focus group will be analysed and, combined with other data, be used to inform the development of an intervention. The analysed findings will be reported in my project. The researcher will follow the Data Protection Act and adhere to the university and trust policies/procedures on ensuring confidentiality of personal data is maintained at all times. Paper copies with identifiable information on participants such as contact details forms and consent forms will be locked securely in the researcher's university office desk drawer which is located in a locked office. The university regulations state that research data has to be kept for a period of 10 years. They will then be destroyed by the researcher. The research data will be kept on the Leeds Trinity University server which is password protected. Only the researcher will have access to this password. The entire process of data collection and analysis will only be completed by the researcher. Anonymised transcripts may be kept for further publication purposes and stored in line with the Data Protection Act (1998). The study will be published in relevant academic journals. The study may also be presented at academic conferences. There will be no feedback of the results.

What if I want to withdraw the data I have given?
Although you are free to leave the focus groups at any point, the data that you give cannot be deleted. Therefore, all information provided during the focus groups will be used within the analysis.

What if I have a complaint?
If you have any complaints or are unhappy with any aspect pertaining to the study then please contact the chair of the school ethics board, Dr Alison Torn - 01132 837110 or a.torn@leedstrinity.ac.uk

What to do next?
If you are interested in participating, then please contact myself via the email address below. I will then provide you with more detailed information and will answer any questions you may have.

Further information
Email- Thomas St Quinton – T.St.Quinton@leedtrinity.ac.uk
Supervisor- Dr Julie Brunton – jabrunton12@gmail.com

Appendix C4. Participant Consent Form

Title of Project: A qualitative investigation of belief-based targets for the promotion of participation in university sport

Name of Researcher: Tom St Quinton

	Please tick to confirm
• I have been given the opportunity to ask questions about the research and address any concerns I may have	
• I understand I can refuse to answer questions within the audio-recorded focus group	
• I understand that I can withdraw myself from the focus group and do not need to provide a reason	
• I understand that the information I provide cannot be deleted, even if I decide to leave the focus group or wish to retrospectively withdraw data from the study	
• I understand that the information I provide will be kept confidential and anonymous	
• I agree to take part in this study	

Name of Participant

_____

Signature of Participant Date

_____ _____

Email Address

_____

Appendix C5. Demographic Questionnaire

Please answer the following questions concerning your personal characteristics. Note that this information is taken to understand the demographics of the sample; therefore, individual responses are not of concern.

1) **Age:** (please write in the space provided)

_____ Years

2) **Gender:** (please circle as appropriate)

Male / Female / Other

3) **Year of study:** (please circle as appropriate)

First / Second / Third / Other

4) **Degree subject:** (please write in the space provided)

_____

5) Please circle the number of weeks you have performed sport at university for at least 30 minutes, once a week, within the past month.

0 1 2 3 4

Appendix C6. Focus Group Materials

Focus Group:
Date:

Focus Group Procedure

Initial requirements	• Hand out the consent and demographic forms • Ask participants to fill in both forms • Collect questionnaires once complete • Ask participants to write their names on a sticky label and place this on their person
Pre-discussion	• Introduce yourself to the group. Include your name, affiliation, department and student status • State the purpose of the research and the aims of the discussion • Thank the participants for agreeing to take part
Focus group	• Follow the focus group guide • Probe responses when appropriate • Try to ensure equal participation • Use post-it notes and the whiteboard to facilitate discussions
Closing	• Ask if there are any final questions • Hand out debrief forms • Thank the participants for their involvement • End the session

Focus group guide

Instructions

- The purpose of the focus group is to gain your perceptions of university sports participation. Participation in sport decreases when students enter higher education. It is therefore important to understand how to develop interventions to increase participation rates.

- As it is crucial for a definition of the behaviour to be followed, the following definition should be used throughout; *participation in university sport for at least 30 minutes, once a week during the next month.*

- Please note that the study refers to 'sport' as the recreational activities the university offers. Therefore, the discussion will not concern some of the competitive sports that you may participate in or be aware of. For example, the BUCS competitions that usually take place on a Wednesday afternoon does not meet the criteria of recreational sport. An example of recreational university sport is 'No Strings Badminton' and 'Cardio Tennis'.

- When I ask a question, please feel free to contribute as much or as little as possible.

- I will probe some of the responses given to gain a greater understanding of the answer. Note that this is not a reflection of what you are saying as there are no right or wrong answers.

- As I will be audio-recording the discussion, please try to not speak at once or talk over another participant. Please wait until the other participant has finished speaking and I will ensure that you have the opportunity to express your views.

- Although I cannot provide a specific time, I would expect the discussion to last roughly one hour.

Questions

(1) General questions

It would be good to start with an introduction of yourself, an overview of your perceptions on sport in general and also the sport that is provided at this university.

- Can you briefly introduce yourself. You may want to include your name, age and the degree programme you are enrolled on.
- Can you explain your thoughts around sport as a whole (not necessarily restricted to campus sport).
- In your opinion, what are the good and bad things about sport?

Using post-it notes to facilitate discussion, participants to respond to the following;

- Describe what you think about the recreational sport that the university offers.
- *What are the good and bad things about recreational sport here at university?
- How do you think the provision of sport could be improved?

(**different coloured post-it notes to be used for the good and bad points raised*)

(2) Belief specific questions

The following questions concern some of the thoughts that have been raised in the research I have undertaken previously. The next few questions are to gain an understanding of these beliefs.

- *What are some of the reasons university sport is enjoyable?
- **Which of these reasons do you think are the most important?
- *What are the reasons your friends would want you to participate in university sport?
- **Which of these reasons do you think are the most important?
- *What are the reasons your friends participate in university sport themselves?
- **Which of these reasons do you think are the most important?
- *What are the reasons your family would want you to participate in sport?
- **Which of these reasons do you think are the most important?
- *What are some of the solutions to sport being time consuming?
- **Which of these solutions do you think are the most important?

(**post-it notes to be used for this question. The researcher to then write the responses on the white board. Participants to be given equal opportunity to comment; ** a frequency count to be taken to establish the most common*)

(3) Technique questions

The following questions will be based around strategies to attend to the beliefs just discussed. I will use my knowledge of behaviour change techniques to probe responses when appropriate.

- What are some of the ways university sport can be made more enjoyable? How do you think we could get this message across?
- Describe how you think support from friends could be given? Is there anything that can be done within a message to emphasise this?
- What are some of the ways we can get the message across that friends participate in sport themselves? How can this message be delivered?
- What are the ways support and approval from family members could be given? How do you think we could get this message across?
- What are some of the ways time constraints can be overcome? Can you name some strategies that can be used to attend to the issues of time?
- *Can you list which of these strategies you think would be most effective.

(**A white board to be used to link certain responses to techniques. Participants to be given equal opportunity to elaborate on responses*)

(4) Other

We have covered quite a lot of information within this focus group. I would now like to offer you the opportunity to add any relevant information that you feel you either haven't managed to put across or that wasn't covered within the discussion.

- Describe any other things that could be done to increase participation rates?
- Are there any other things that you think should be included within an intervention to increase participation rates?
- Is there anything else that you would like to add?

Appendix C7. Participant Debrief Sheet

Thank you for partaking in the study titled: A qualitative investigation of belief-based targets for the promotion of participation in university sport

As part of PhD research, the study sought to identify suitable ways to develop an intervention based on prior research findings.

If you find that the focus group has caused any distress or worry, then please contact the Leeds Trinity University counselling team can be contacted on +44 (0) 1132 837192 or via email to s.jack@leedstrinity.ac.uk.

If you have any complaints or are unhappy with any aspect pertaining to the study then please contact the chair of the school ethics board, Dr Alison Torn – 01132 837110 or a.torn@leedstrinity.ac.uk

Please not that data provided cannot be deleted. If you require any further information, would like to know the outcome of the study, or have any questions whatsoever, then please do not hesitate and contact me on: t.stquinton@leedstrinity.ac.uk

Thank you very much for taking part, it really is appreciated.

Tom St Quinton
School of Social and Health Sciences
Leeds Trinity University
Email: t.stquinton@leedstrinity.ac.uk

APPENDIX D: Study 4 materials

Appendix D1. Participant Information Sheet

Title of research: A text messaging factorial design targeting motivation and goal priority to increase student participation in university recreational sport

Study name: The SPILTS study (**S**ports **P**articipation **i**n **L**eeds **T**rinity **S**tudents)

Researcher Name: Thomas St Quinton

Researcher contact details: T.StQuinton@leedstrinity.ac.uk

Supervisor's name at Leeds Trinity University: Dr Ben Morris

Supervisor's contact details: B.Morris@leedstrinity.ac.uk

Introduction

My name is Thomas St Quinton and I am a PhD student at Leeds Trinity University. My PhD is focused on increasing the number of students participating in university recreational sport. I would like to invite you to participate in the 'SPILTS' study which is a psychological intervention aimed at promoting the behaviour.

Purpose

You have been invited to take part in this study because you are a first-year student here at Leeds Trinity University. The study is an intervention targeting an increase in the number of students participating in recreational sport through the use of text messages. These text messages have been developed based on health psychological behaviour change theories and will therefore target specific psychological processes. As such, I want to understand how effective the intervention is in increasing the number of students playing sport here at Leeds Trinity University.

What next?

Greater information on why the research is being done and what would be required of you if you decide to participate is provided on the next page. Before you make this decision, please make sure that you read the following information carefully. If you would like to take part in the study or have any further questions then please do not hesitate to contact me via my email address provided above.

Thank you for your interest in the study

Thomas St Quinton.

What will happen to me if I take part?

The 'SPILTS' study involves participating in a six-week study aimed at increasing sports participation. For this, you will be asked to complete an initial screening form which determines whether you are eligible to participate in the study (online). If you are eligible, you will then be asked to complete a consent form and a psychological questionnaire. You will then receive text messages over a period of two weeks that will target psychological processes related to sports participation. Following this period, you will be asked to respond to another psychological questionnaire at two separate points: immediately after the intervention has finished and four weeks after the intervention has finished. Text messages will be sent that will include links to the online questionnaires. To summarise, the intervention will last two weeks and measures will be taken at three separate stages: before the intervention has started, immediately following intervention completion and four weeks following intervention completion.

What are the disadvantages of taking part?

You may think that assessment at three different time points takes up a significant amount of your time. However, although relevant psychological properties are assessed, the questionnaires used to do so are rather brief. Furthermore, these will be completed online and through email, therefore minimising contact time. You may also have reservations regarding the number of text messages you will receive. Please be assured that you will only receive nine text messages. Furthermore, you can withdraw from the study at any point without having to provide a reason (please see the question 'What will happen if I don't want to carry on with the study?').

What are the possible benefits of taking part?

You may find that the intervention encourages you to participate in a behaviour that perhaps you are not so familiar with. This behaviour also provides a number of health benefits. You may also gain information that you may not have been aware of relating to sports participation and the psychology underpinning the behaviour. Your participation will also help me greatly in developing my doctoral research further and will contribute somewhat to the literature within health psychology.

Will my taking part in the study be kept confidential?

Any information you provide within the questionnaires will be kept completely confidential. This means that only I will know your name, that you have taken part, and your responses to questions. Although the information may be shared between myself and the supervisory team, be assured that your confidentiality will remain. However, be aware that any information disclosed by yourself which indicates a law has been broken may result in the information being passed to the relevant authorities. If you have any further questions regarding confidentiality, please feel free to contact me at any point.

Will my data be anonymous?

The information that you provide will be completely anonymous. To do this, you will be asked to provide your email address when responding to the online questionnaires. This email address will then be used to match data given throughout the intervention.

Only I will read the questionnaires and data that you provide. Although others will read my project report, they will not know any names or other personally identifying information of people who participated. If any of your data is used within a study report or for presentation purposes, you will be referred to as 'participant X', for example. Please note that the

study is interested in the results of the different groups within the intervention, therefore individual responses are not of great concern.

What will happen if I don't want to carry on with the study?

You may withdraw from the intervention at any point without having to provide a reason. To do this, please contact me and I will guide you through the process. Please be aware that you can also refuse to answer any questions within the online questionnaires by selecting the 'prefer not to say' option.

What will happen to the results of the study?

The results from the study will be used to understand the effectiveness of a text messaging intervention. The researcher will follow the Data Protection Act and adhere to the university and trust policies/procedures on ensuring confidentiality of personal data is maintained at all times. Questionnaires with identifiable information on participants such as contact details forms and consent forms will be locked securely in the researcher's university office desk drawer which is located in a locked office. The university regulations state that research data has to be kept for a period of 10 years. They will then be destroyed by the researcher. The research data will be kept on the Leeds Trinity University server which is password protected. Only the researcher will have access to this password. The entire process of data collection and analysis will only be completed by the researcher. Anonymised questionnaires may be kept for further publication purposes and stored in line with the Data Protection Act (1998).

The study will be published in relevant academic journals and may also be presented at academic conferences. There will be no feedback of the results.

What if I want to withdraw the data I have given?

If you wish to withdraw any of your questionnaire data please do so within 14 days of the study being completed. In doing so, the data obtained from the questionnaire(s) will be destroyed and will not be included in the study. Please contact me if you would like to withdraw data already provided.

What if I have a complaint?

If you have any complaints or are unhappy with any aspect relating to the study then please contact the chair of the school ethics board, Dr Mark Russell: tel- 0113 283 7110 extension 649, email- m.russell@leedstrinity.ac.uk.

What to do next?

If you are interested in participating in the 'SPILTS' study then please contact myself through my email address (t.stquinton@leedstrinity.ac.uk). I will then be able to answer any questions that you may have. If you are happy to proceed, I will provide you with a link to a screening questionnaire which will determine your eligibility for the study. You will then receive relevant information following this.

Appendix D2. Recruitment Poster

The SPILTS Study
(**S**ports **P**articipation **i**n **L**eeds **T**rinity **S**tudents)

Are you a first-year student?
Do you want to participate in a research study?

Background

Hi,

My name is Tom St Quinton and I am a PhD student in Health Psychology here at Leeds Trinity. My PhD is attempting to promote participation in campus sport at LTU. I now want to test the intervention I have developed.

The study

- The study will use health psychological theories to attempt to increase participation in student sport
- The intervention consists of text messages targeting specific psychological processes
- Full ethical approval has been obtained (ref: SSHS-2017-083)

What will be required from you

- The study will be conducted online
- You will be provided links to and asked to complete three separate questionnaires over a period of six weeks
- You will be sent text messages over a two-week period

What to do next?

Please contact me and I will provide you with further details Email:
t.stquinton@leedstrinity.ac.uk

Appendix D3. Recruitment Announcement

Dear student,

I am just contacting you to invite you to take part in my PhD study titled: The SPILTS study (**S**ports **P**articipation **i**n **L**eeds **T**rinity **S**tudents).

The study is a brief text messaging intervention attempting to increase the number of students participating in the sport offered here at LTU. Note that 'sport' here refers to campus sport rather than competitive sport.

If you decide to take part you will receive psychologically informed text messages over two weeks. You will be asked to complete three separate questionnaires too. All contact will be made online and the study will last roughly eight weeks.

Note you have to be a first-year student here at LTU to be eligible.

If you are interested in participating or have any questions then please contact me via my email: t.stquinton@leedstrinity.ac.uk

Thank you!

Tom St Quinton

Appendix D4. Screening and Consent Items

Screening Items

1) What age are you?

18 years, 19 years, 20 years, 21 years, 22 years, 23 years, 24 years, 25 years, > 25 years

2) What year of study are you in?

First, Second, Third, Other

3) Do you own a mobile phone?

Yes/No

4) Have you ever taken or are currently taking any medication for a heart condition?

Yes/No

Consent Items

	Select to agree
1) I have been given the opportunity to ask questions about the research and address any concerns I may have	
2) I understand I can refuse to answer a question within the questionnaires, and I know how to do this	
3) I understand that I can withdraw myself from the study at any point up until 14 days after the intervention has ended	
4) I understand I can withdraw my information at any point up until 14 days after the intervention has ended	
5) I understand that the information I provide will be kept confidential and anonymous	
6) I agree to undertake the intervention using my mobile phone number provided	
7) I agree to be contacted multiple times to respond to follow-up questionnaires using my details provided	
8) I agree to take part in this study	

Appendix D5. Debrief Message

Thank you for partaking in the study titled: A text messaging factorial design targeting motivation and goal priority to increase student participation in university recreational sport.

As part of PhD research, the study sought to assess the effectiveness of a text messaging intervention targeting student participation in university recreational sport.

If you wish to withdraw your questionnaire data please do so within 14 days. In doing so, the data obtained from the questionnaire will be destroyed and will not be included in the study results. Please contact me via my email address stated at the bottom of this sheet if you would like to withdraw.

If you find that the questionnaire or any of the text messages have caused any distress or worry, then please contact the Leeds Trinity University counselling team who can be contacted on either of the following: tel- 01132 837192, email- s.jack@leedstrinity.ac.uk.

If you have any complaints or are unhappy with any aspect pertaining to the study then please contact the chair of the school ethics board, Dr Mark Russell, on either of the following: tel- 01132 837110 extension 649, email- m.russell@leedstrinity.ac.uk

If you require any further information, would like to know the outcome of the study, or have any questions whatsoever, then please do not hesitate to contact me.

Thank you very much for taking part.

Thomas St Quinton

t.stquinton@leedstrinity.ac.uk

Appendix D6.

Table D1. Intervention dates and times

	SMS 1	SMS 2	SMS 3	SMS 4	SMS 5	SMS 6	T1	T2
Date	Sun 18th Feb	Tues 20th Feb	Thurs 22nd Feb	Sun 25th Feb	Wed 28th Feb	Fri 2nd March	Fri 2nd March	Fri 30th March
Time	6pm	8am	6pm	6pm	2pm	8am	6pm	8am

Table D2. Text messages distributed to intervention conditions

	Message condition			
	Attitude only	Goal priority only	Attitude + goal priority	Control
First text message	Did you know that playing recreational sport here at LTU is a great way to socialise! Why not plan to play sport here at uni!	Prioritising a goal can help you achieve it! Try writing down how you will prioritise playing sport at LTU	Did you know that playing recreational sport here at LTU is a great way to socialise! Why not plan to play sport here at uni! Prioritising a goal can help you achieve it! Try writing down how you will prioritise playing sport at LTU	We offer a number of sports here at LTU!
Second text message	Our sports here at LTU are non-competitive, meaning you can play without fear! Why not plan to come and play sport here at uni!	If you prioritise a goal then you are more likely to achieve it! Can you write down how you will prioritise playing sport at LTU	Our sports here at LTU are non-competitive, meaning you can play without fear! Why not plan to come and play sport here at uni! If you prioritise a goal then you are more likely to achieve it! Can you write down how you will prioritise playing sport at LTU	Did you know you can play recreational sport here at LTU?
Third text message	Playing sport at LTU will improve your mental well-being! Why not plan to play sport here at uni!	Research shows that making a goal a priority can increase the likelihood of it been enacted! Why don't you write down how you will prioritise playing the recreational sport here at LTU	Playing sport at LTU will improve your mental well-being! Why not plan to play sport here at uni! Research shows that making a goal a priority can increase the likelihood of it been enacted! Why don't you write down how you will prioritise playing the recreational sport here at LTU	At LTU, you can play recreational sport
Fourth text message	You can become fitter by playing sport here at LTU… Why not come and play!	Increase the chances of achieving your goal by prioritising it… write down how you will prioritise playing the sport offered here at LTU"	You can become fitter by playing sport here at LTU… Why not come and play! Increase the chances of achieving your goal by prioritising it… write down how you will prioritise playing the sport offered here at LTU	Why not get involved in the sport here at LTU
Fifth text message	The sport on offer here at LTU gives you a great opportunity to socialise with friends! Why not plan to play sport here at uni!"	Goal priority can be a good way to achieving your goal. Have a go at writing down how you will prioritise playing sport at LTU	The sport on offer here at LTU gives you a great opportunity to socialise with friends! Why not plan to play sport here at uni! Goal priority can be a good way to achieving your goal. Have a go at writing down how you will prioritise playing sport at LTU	Come and play our sport here at LTU
Sixth text message	We offer sports here at LTU that you can play without competition! Why not plan to play sport here at uni!	Writing down how you will prioritise a goal can help you achieve it! Make an attempt at writing down how you will prioritise playing sport here at LTU	We offer sports here at LTU that you can play without competition! Why not plan to play sport here at uni! Writing down how you will prioritise a goal can help you achieve it! Make an attempt at writing down how you will prioritise playing sport here at LTU	Sport is on offer here at LTU… come and play!

Appendix D7. Measures

T0 (baseline)

Attitude:

For me, participating in university sport at least once per week would be….

1	2	3	4	5	6	7
Bad						Good
1	2	3	4	5	6	7
Pleasant						Unpleasant
1	2	3	4	5	6	7
Unhealthy						Healthy
1	2	3	4	5	6	7
Desirable						Undesirable
1	2	3	4	5	6	7
Unenjoyable						Enjoyable

Goal priority:

I would be prepared to give up many other goals and priorities to participate in university sport at least once per week

1	2	3	4	5	6	7
Strongly disagree						Strongly agree

To enable me to participate in university sport at least once per week, I would be willing to sacrifice other goals and priorities

1	2	3	4	5	6	7
Strongly disagree						Strongly agree

Other goals and priorities will be set aside in order for me to participate in university sport at least once per week

1	2	3	4	5	6	7
True						False

PBC:

For me, participating in university sport at least once per week would be

1	2	3	4	5	6	7
Very difficult						Very easy

How confident are you that you can participate in university sport at least once per week

1	2	3	4	5	6	7
Not very confident						Very confident

I believe I have the ability to participate in university sport at least once per week

1	2	3	4	5	6	7
Definitely do not						Definitely do

Factors outside my control will influence whether or not I play university sport at least once per week

1	2	3	4	5	6	7
Strongly agree						Strongly disagree

Intention:

I intend to participate in university sport at least once per week

1	2	3	4	5	6	7
Strongly disagree						Strongly agree

How likely is it that you would participate in university sport at least once per week

1	2	3	4	5	6	7
Very unlikely						Very likely

I plan to take part in university sport at least once per week

1	2	3	4	5	6	7

Agree Disagree

SN:

People who are important to me would disapprove/approve of me participating in university sport at least once per week:

1 2 3 4 5 6 7

Would disapprove Would approve

People who are like me will participate in university sport at least once per week:

1 2 3 4 5 6 7

Completely false Completely true

People close to me think I definitely should not/should participate in university sport at least once per week:

1 2 3 4 5 6 7

Definitely should not Definitely should

Past behaviour:

On how many weeks have you performed university sport at least once within the past four weeks:

0 1 2 3 4

I have participated in university sport at least once per week within the past four weeks

1 2 3 4 5 6 7

False True

T1 (2 weeks post T0)

Attitude:

For me, participating in university sport at least once per week would be….

1 2 3 4 5 6 7

Bad Good

1 2 3 4 5 6 7

Pleasant Unpleasant

1 2 3 4 5 6 7

Unhealthy Healthy

1 2 3 4 5 6 7

Desirable Undesirable

1 2 3 4 5 6 7

Unenjoyable Enjoyable

Goal priority:

I would be prepared to give up many other goals and priorities to participate in university sport at least once per week

1 2 3 4 5 6 7

Strongly disagree Strongly agree

To enable me to participate in university sport at least once per week, I would be willing to sacrifice other goals and priorities

1 2 3 4 5 6 7

Strongly disagree Strongly agree

Other goals and priorities will be set aside in order for me to participate in university sport at least once per week

1 2 3 4 5 6 7

True False

Intention:

I intend to participate in university sport at least once per week

1 2 3 4 5 6 7

Strongly disagree Strongly agree

How likely is it that you would participate in university sport at least once per week

1 2 3 4 5 6 7

Very unlikely Very likely

I plan to take part in university sport at least once per week

1 2 3 4 5 6 7

Agree Disagree

Past behaviour:

On how many weeks have you performed university sport at least once within the past two weeks:

0 1 2

I have participated in university sport at least once per week within the past two weeks

1 2 3 4 5 6 7

False True

T2 (6 weeks post T0)

Attitude:

For me, participating in university sport at least once per week would be….

1 2 3 4 5 6 7

Bad Good

1 2 3 4 5 6 7

Pleasant Unpleasant

1 2 3 4 5 6 7

Unhealthy Healthy

1 2 3 4 5 6 7

Desirable Undesirable

1 2 3 4 5 6 7

Unenjoyable Enjoyable

Goal priority:

I would be prepared to give up many other goals and priorities to participate in university sport at least once per week

1 2 3 4 5 6 7

Strongly disagree Strongly agree

To enable me to participate in university sport at least once per week, I would be willing to sacrifice other goals and priorities

1 2 3 4 5 6 7

Strongly disagree Strongly agree

Other goals and priorities will be set aside in order for me to participate in university sport at least once per week

1 2 3 4 5 6 7

True False

Intention:

I intend to participate in university sport at least once per week

1 2 3 4 5 6 7

Strongly disagree Strongly agree

How likely is it that you would participate in university sport at least once per week

1 2 3 4 5 6 7

Very unlikely Very likely

I plan to take part in university sport at least once per week

1 2 3 4 5 6 7

Agree Disagree

Past behaviour:

On how many weeks have you performed university sport at least once within the past four weeks:

0 1 2 3 4

I have participated in university sport at least once per week within the past four weeks

1	2	3	4	5	6	7
False						True

Delivery:

How many text messages did you receive throughout the intervention?

0, 1, 2, 3, 4, 5, 6, 7, 8, 9, >10

APPENDIX E: Study 5 materials

Appendix E1. Recruitment Email

Dear _____,

I am a PhD student at Leeds Trinity University investigating ways to promote physical activity within first-year undergraduate students. I am contacting you today to seek your help in distributing some study information to your student population. The study to which I refer uses text messages to persuade students to be more physically active and is conducted online- please see the recruitment poster below.

I would be grateful if you could forward the message and poster below within an email to your first-year undergraduate students. Alternatively, I have attached the poster in PDF format.
The study has received ethical approval from the School of Social and Health Sciences ethics board, Leeds Trinity University (ref: SSHS-2018-024).

If you have any questions or require further information, then please do not hesitate to contact me.

Thank you for your time,

Tom St Quinton
School of Social and Health Sciences
Leeds Trinity University
Email: t.stquinton@leedstrinity.ac.uk

Appendix E2. Recruitment Poster

Leeds Trinity University

Physical activity SMS research study

Are you a first-year university undergraduate student? Do you want to participate in a research study?

We are currently recruiting students to participate in a short online study on physical activity

What will be required from you?

- You will be sent text messages over a two-week period
- You will be asked to complete some brief online questionnaires

Who can participate?

You are eligible if;

- You are a first-year undergraduate student
- You are aged 18-25 years
- You own a mobile phone
- You are not currently, or have ever, taken medication for a heart condition
- You have no medical conditions that may affect your participation

What to do next?

Access study details, undertake the screening process and enrol by either:

1. following the URL; bit.ly/LTUpa

or you can

2. **CLICK HERE TO PARTICIPATE IN THE STUDY**

Please enrol before Monday 5th November!

Please contact Tom if you have any questions or require further details:
Email: t.stquinton@leedstrinity.ac.uk
The study has received full ethical approval (ref: SSHS/2018/024)

Leeds Trinity University

Appendix E3. Participant Information

Thank you for your interest in the study! Before deciding to participate, please can you read the following study details.

- What is the study about?

The study is a brief text messaging intervention targeting participation in physical activity. The text messages have been developed on health psychological theory and I want to understand the impact they have on changing rates of physical activity.

- What will happen if you take part?

You will receive six text messages over a two-week intervention period (3 per week) and complete three separate questionnaires; the first following the screening process, the second immediately after the intervention, and the final questionnaire four weeks after the intervention. You will complete the first questionnaire now and text messages will be sent with links to the second and third questionnaires- clicking the link within the text message will upload the online questionnaire easily for you to complete. The intervention will commence the following Tuesday from when you enrol.

- Will your data be confidential?

Any information provided will be kept confidential between the research team. Only myself and the research team will know your responses to questions. Your contact details will not be shared or passed on to any third parties. Note that any information disclosed by yourself which indicates a law has been broken may result in the information being passed to the relevant authorities.

- Will your data be anonymous?

You are not asked nor required to provide your name at any point. Rather, you will be asked to respond to three personal questions that will generate a pseudo code. This will be used, along with your mobile phone number, to match your data throughout.

- What if you don't want to continue or wish to withdraw data?

You may withdraw during the intervention at any point without having to provide a reason. You may also withdraw any data provided after the intervention is complete. Note that for the latter you will need to withdraw within 14 days of study completion (that is, 14 days after completing the final questionnaire). You will be reminded of this once the intervention is complete. To do either of these, please contact me (see contact details below) and I will guide you through the process.

- What if you have a complaint?

If you have any complaints or are unhappy with any aspect of the study then please contact Dr Mark Russell, the chair of the School of Social and Health Sciences ethics board at Leeds Trinity University, by phone: 0113 283 7100 extension 649, or email: m.russell@leedstrinity.ac.uk.

- What happens next?

We first need to determine your eligibility through some screening questions. If you are eligible you will be asked to provide consent and undertake the first questionnaire. If you are ineligible you will be redirected to a page thanking you for your interest.

If you have any questions or require more information, then please feel free to contact me by email: t.stquinton@leedstrinity.ac.uk, phone: 01132 837100 extension 606, or post: Tom St Quinton, School of Social and Health Sciences, Leeds Trinity University, Leeds LS18 5HD

Many thanks for your interest in the study.

Tom St Quinton, School of Health and Social Sciences, Leeds Trinity University.

If you are happy to participate, please proceed to the screening questions.

Appendix E4. Screening and Consent Items

Screening Items

1) How old are you?
18 years, 19 years, 20 years, 21 years, 22 years, 23 years, 24 years, 25 years, > 25 years
2) Which year of undergraduate study are you in?
First, second, third, I am not an undergraduate student, other
3) Do you own a mobile phone?
Yes/No
4) Are you currently taking, or have you ever taken medication for a heart condition?
Yes/No
5) Do you have any medical conditions that may affect your participation in physical activity?
Yes/No

Consent Items

	Select to agree
1) I have been given the opportunity to ask questions about the research and address any concerns I may have	
2) I understand I can withdraw from the study at any point up until 14 days after the intervention has ended (this is after completion of the final questionnaire)	
3) I understand that the information I provide, including my contact details, will be kept confidential and anonymous	
4) I agree to undertake the intervention and respond to questionnaires using my mobile phone number	
5) I agree to take part in this study	

Appendix E5. Participant Debrief Message

Thank you for participating in the study. Your participation is now complete!

If you believe that any items within the questionnaires or text messages have caused any distress or worry, then please contact a counselling representative at your institution. Alternatively, you can contact the Nightline Association, which is a student support service; https://www.nightline.ac.uk/want-to-talk/

If you have any complaints or are unhappy with any aspect of the study then please contact the chair of the school ethics board, Dr Mark Russell, by phone: 01132 837100 extension 649, or email: m.russell@leedstrinity.ac.uk

If you wish to withdraw your questionnaire data please contact me within 14 days. I will then use your pseudo code and mobile phone number to identify the relevant data to withdraw.

If you would like to withdraw, require any further information, would like to know the outcome of the study, or have any questions whatsoever, then please do not hesitate to contact me by email: t.stquinton@leedstrinity.ac.uk, phone: 01132 837100 extension 606, or post: Tom St Quinton, School of Social and Health Sciences, Leeds Trinity University, Leeds LS18 5HD

Thank you very much for taking part in the study!
Tom St Quinton,
School of Social and Health Sciences,
Leeds Trinity University

Appendix E6.

Table E1. Intervention dates and times

Group	Intervention start date	SMS 1	SMS 2	SMS 3	SMS 4	SMS 5	SMS 6	T1	T2
1	Tues 25th Sept	Tues 25th Sept	Thurs 27th Sept	Sat 29th Sept	Mon 1st Oct	Thurs 4th Sept	Mon 8th Oct	Mon 8th Oct	Mon 5th Nov
2	Tues 2nd Oct	Tues 2nd Oct	Thurs 4th Oct	Sat 6th Oct	Mon 8th Oct	Thurs 11th Oct	Mon 15th Oct	Mon 15th Oct	Mon 12th Nov
3	Tues 9th Oct	Tues 9th Oct	Thurs 11th Oct	Sat 13th Oct	Mon 15th Oct	Thurs 18th Oct	Mon 22nd Oct	Mon 22nd Oct	Mon 19th Nov
4	Tues 16th Oct	Tues 16th Oct	Thurs 18th Oct	Sat 20th Oct	Mon 22nd Oct	Thurs 25th Oct	Mon 29th Oct	Mon 29th Oct	Mon 26th Nov
5	Tues 23rd Oct	Tues 23rd Oct	Thurs 25th Oct	Sat 27th Oct	Mon 29th Oct	Thurs 1st Nov	Mon 5th Nov	Mon 5th Nov	Mon 3rd Dec
6	Tues 30th Oct	Tues 30th Oct	Thurs 1st Nov	Sat 3rd Nov	Mon 5th Nov	Thurs 8th Nov	Mon 12th Nov	Mon 12th Nov	Mon 10th Dec
	SMS time	midday	9am	2pm	midday	2pm	9am	2pm	9am

Table E2. Text messages distributed to intervention conditions

	Message condition			
	Attitude only	Goal priority only	Attitude + goal priority	Control
First text message	Physical activity has positive effects on health, fitness, mood & stress. Why don't you get involved in physical activity?	Prioritising a goal can help you achieve it. Please write down in your own time how you will prioritise physical activity	Physical activity has positive effects on health, fitness, mood & stress. Why don't you get involved in physical activity? Prioritising a goal can help you achieve it. Please write down in your own time how you will prioritise physical activity	It is recommended that you engage in physical activity for 150 mins per week
Second text message	Did you know that physical activity can improve your studies through enhancing concentration? Why not plan to perform physical activity?	Research shows that prioritising a goal can increase the likelihood of it being enacted. Why don't you write down how you will prioritise physical activity?	Did you know that physical activity can improve your studies through enhancing concentration? Why not plan to perform physical activity? Research shows that prioritising a goal can increase the likelihood of it being enacted. Why don't you write down how you will prioritise physical activity?	Globally, 1 in 4 adults do not meet current physical activity recommendations
Third text message	Physical activity can help maintain a healthy weight. Why not become physically active?	You are more likely to achieve a goal if it is prioritised. Why not write down how you will prioritise physical activity?	Physical activity can help maintain a healthy weight. Why not become physically active? You are more likely to achieve a goal if it is prioritised. Why not write down how you will prioritise physical activity?	Physical activity is defined as any bodily movement produced by skeletal muscles that require energy expenditure
Fourth text message	Participating in physical activity throughout your period of study provides opportunities to make friends & socialise. Why not get involved in physical activity?	Increase the chance of achieving your goal by prioritising it; write down in your own time how you will prioritise performing physical activity	Participating in physical activity throughout your study provides opportunities to make friends & socialise. Why not get involved in physical activity? Increase the chance of achieving your goal by prioritising it; write down in your own time how you will prioritise performing physical activity	Physical activity includes activities such as walking, dancing, cycling & sport
Fifth text message	Physical activity can reduce the risk of a number of chronic diseases such as type 2 diabetes. Why not perform physical activity?	It has been found that writing down how you will prioritise a goal can help you achieve it. Make an attempt at writing down how you will prioritise physical activity	Physical activity can reduce the risk of a number of chronic diseases such as type 2 diabetes. Why not perform physical activity? It has been found that writing down how you will prioritise a goal can help you achieve it. Make an attempt at writing down how you will prioritise physical activity	Current guidelines suggest adults should perform physical activity at least 5 days per week for 30 minutes
Sixth text message	Did you know that students who participate in physical activity whilst at uni are more likely to do so in later life? Why not plan to be physically active?	Realise your goal by prioritising it. Have a go at writing down how you will prioritise physical activity	Did you know that students who participate in physical activity whilst at uni are more likely to do so in later life? Why not plan to be physically active? Realise your goal by prioritising it. Have a go at writing down how you will prioritise physical activity	You should aim to participate in physical activity for 150 mins per week

Appendix E7. Measures

T0 (baseline)

Could you now finally complete a psychological questionnaire. This questionnaire comprises of 24 questions. For each question, please select the one response that best represents your views.

Please note that we are defining physical activity as those **moderate to vigorous** exercise activities such as jogging, running, and cycling. We also include sports within this definition (e.g., football, rugby, tennis) and anaerobic exercises (e.g., swimming lengths), but not light exercises (e.g., walking or golf). We are referring to such activities being performed in bouts of at least **30 minutes** on at least **5 days** of the week over the next **2 weeks**. Please use this definition throughout when answering questions concerning physical activity. For example, if asked whether physical activity is embarrassing you should respond to whether participating in physical activity in bouts of at least 30 minutes on at least 5 days of the week over the next 2 weeks is embarrassing.

Attitude:

For me, participating in physical activity would be….

1	2	3	4	5	6	7
Bad						Good
1	2	3	4	5	6	7
Pleasant						Unpleasant
1	2	3	4	5	6	7
Unhealthy						Healthy
1	2	3	4	5	6	7
Desirable						Undesirable
1	2	3	4	5	6	7
Unenjoyable						Enjoyable

Goal priority:

I would be prepared to give up many other goals and priorities to participate in physical activity

1	2	3	4	5	6	7
Strongly disagree						Strongly agree

To enable me to participate in physical activity, I would be willing to sacrifice other goals and priorities

1	2	3	4	5	6	7
Strongly disagree						Strongly agree

Other goals and priorities will be set aside in order for me to participate in physical activity

1	2	3	4	5	6	7
True						False

Intention:

I intend to participate in physical activity

1	2	3	4	5	6	7
Strongly disagree						Strongly agree

How likely is it that you would participate in physical activity

1	2	3	4	5	6	7
Very unlikely						Very likely

I plan to take part in physical activity

1	2	3	4	5	6	7
Agree						Disagree

PBC:

For me, participating in physical activity would be

1 2 3 4 5 6 7
Very difficult Very easy

How confident are you that you can participate in physical activity

1 2 3 4 5 6 7
Not very confident Very confident

I believe I have the ability to participate in physical activity

1 2 3 4 5 6 7
Definitely do not Definitely do

Factors outside my control will influence whether or not I participate in physical activity

1 2 3 4 5 6 7
Strongly agree Strongly disagree

SN:

People who are important to me would disapprove/approve of me participating in physical activity

1 2 3 4 5 6 7
Would disapprove Would approve

People who are like me will participate in physical activity

1 2 3 4 5 6 7
Completely false Completely true

People close to me think I definitely should not/should participate in physical activity

1 2 3 4 5 6 7
Definitely should not Definitely should

Past behaviour:

These questions relate to your past physical activity behaviour. We want to understand the extent to which you **have** participated in **moderate to vigorous** physical activity in bouts of at least **30 minutes** on at least **5 days** of the week within the past **4 weeks**.
You should apply the same logic as above. For example, if asked whether you have undertaken physical activity you should respond to whether you have undertaken moderate to vigorous physical activity in bouts of at least 30 minutes on at least 5 days of the week within the past 4 weeks.

A typical week within the past 4 has consisted of physical activity being performed on at least 5 days

1 2 3 4 5 6 7
True False

Over the past 4 weeks, on average how many days have you participated in physical activity during:

Week 1

_____

Week 2

_____

Week 3

_____

Week 4

_____

During the past 4 weeks I have participated in physical activity ___ days per week on average

T1 (2 weeks post T0)

This questionnaire comprises of 15 questions. For each question, please select the one response that best represents your views.

Please remember that the questions refer to physical activity as **moderate to vigorous** exercise activities such as jogging, running, and cycling. We also include sports within this definition (e.g., football, rugby, tennis) and anaerobic exercises (e.g., swimming lengths), but not light

exercises (e.g., walking or golf). We are referring to such activities being performed in bouts of at least **30 minutes** on at least **5 days** of the week over the next **4 weeks**. For example, if asked whether physical activity is exciting you should respond to whether participating in moderate to vigorous physical activity in bouts of at least 30 minutes on at least 5 days of the week over the next 4 weeks is exciting.

Attitude:

For me, participating in physical activity would be….

1	2	3	4	5	6	7
Bad						Good
1	2	3	4	5	6	7
Pleasant						Unpleasant
1	2	3	4	5	6	7
Unhealthy						Healthy
1	2	3	4	5	6	7
Desirable						Undesirable
1	2	3	4	5	6	7
Unenjoyable						Enjoyable

Goal priority:

I would be prepared to give up many other goals and priorities to participate in physical activity

1	2	3	4	5	6	7
Strongly disagree						Strongly agree

To enable me to participate in physical activity, I would be willing to sacrifice other goals and priorities

1	2	3	4	5	6	7
Strongly disagree						Strongly agree

Other goals and priorities will be set aside in order for me to participate in physical activity

1	2	3	4	5	6	7
True						False

Intention:

I intend to participate in physical activity

1	2	3	4	5	6	7
Strongly disagree						Strongly agree

How likely is it that you would participate in physical activity

1	2	3	4	5	6	7
Very unlikely						Very likely

I plan to take part in physical activity

1	2	3	4	5	6	7
Agree						Disagree

Past behaviour:

These questions relate to your past physical activity behaviour. We want to understand the extent to which you **have** participated in **moderate to vigorous** physical activity in bouts of at least **30 minutes** on at least **5 days** of the week within the past **2 weeks**. You should apply the same logic as above. For example, if asked whether you have refrained from physical activity you should address the extent to which you have refrained from moderate to vigorous physical activity in bouts of at least 30 minutes on at least 5 days of the week within the past 2 weeks. A typical week within the past 2 has consisted of physical activity being performed on at least 5 days

1	2	3	4	5	6	7
True						False

Over the past 2 weeks, on average how many days have you participated in physical activity during:

Week 1 ___

Week 2 ___

During the past 2 weeks I have participated in physical activity ___ days per week on average

T2 (6 weeks post T0)

This questionnaire comprises 18 questions. For each question, please select the one response that best represents your views.

Please remember that the questions refer to physical activity as **moderate to vigorous** exercise activities such as jogging, running, and cycling. We also include sports within this definition (e.g., football, rugby, tennis) and anaerobic exercises (e.g., swimming lengths), but not light exercises (e.g., walking or golf). We are referring to such activities being performed in bouts of at least **30 minutes** on at least **5 days** of the week over the next **4 weeks**. For example, if asked whether physical activity is achievable you should respond to whether participating in moderate to vigorous physical activity in bouts of at least 30 minutes on at least 5 days of the week over the next 4 weeks is achievable.

Attitude:

For me, participating in physical activity would be….

1	2	3	4	5	6	7
Bad						Good
1	2	3	4	5	6	7
Pleasant						Unpleasant
1	2	3	4	5	6	7
Unhealthy						Healthy
1	2	3	4	5	6	7
Desirable						Undesirable
1	2	3	4	5	6	7
Unenjoyable						Enjoyable

Goal priority:

I would be prepared to give up many other goals and priorities to participate in physical activity

1	2	3	4	5	6	7
Strongly disagree						Strongly agree

To enable me to participate in physical activity, I would be willing to sacrifice other goals and priorities

1	2	3	4	5	6	7
Strongly disagree						Strongly agree

Other goals and priorities will be set aside in order for me to participate in physical activity

1	2	3	4	5	6	7
True						False

Intention:

I intend to participate in physical activity

1	2	3	4	5	6	7
Strongly disagree						Strongly agree

How likely is it that you would participate in physical activity

1	2	3	4	5	6	7
Very unlikely						Very likely

I plan to take part in physical activity

1	2	3	4	5	6	7
Agree						Disagree

Past behaviour:

These questions relate to your past physical activity behaviour. We want to understand the extent to which you **have** participated in **moderate to vigorous** physical activity in bouts of at least **30 minutes** on at least **5 days** of the week within the past **4 weeks**. You should apply the

same logic as above. For example, if asked whether you have undertaken physical activity you should address the extent to which you have undertaken moderate to vigorous physical activity in bouts of at least 30 minutes on at least 5 days of the week within the past 4 weeks.

A typical week within the past 4 has consisted of physical activity being performed on at least 5 days

1	2	3	4	5	6	7
True						False

Over the past 4 weeks, on average how many days have you participated in physical activity during:

Week 1 ___
Week 2 ___
Week 3 ___
Week 4 ___

During the past 4 weeks I have participated in physical activity ___ days per week on average

Delivery:

How many text messages did you receive throughout the intervention? Please do not include questionnaire links and prompts

Don't know	0,	1,	2,	3,	4,	5,	6,	7,	8,	9,	10,	other (please specify)