APPLYING THE THEORY OF PLANNED BEHAVIOUR TO WALKING: DEVELOPMENT AND EVALUTAION OF MEASURES AND AN INTERVENTION

by

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A thesis submitted to
The University of Birmingham
for the degree of
DOCTOR OF PHILOSOPHY

School of Sport and Exercise Sciences
The University of Birmingham
September, 2007

ABSTRACT

This research applied the theory of planned behaviour (TPB) to the development and evaluation of a TPB measure of walking cognitions and an intervention to encourage walking behaviour. Study one (N=10) used interpretative phenomenological analysis to provide a rich and detailed account of walking in which participants reported walking as not being "proper" exercise. Perceptions of walking were incongruent with current health promotion campaigns, which focus on the health benefits of walking. Study two (N=180) demonstrated the wide range of beliefs that people hold in relation to walking and was used to develop a TPB questionnaire based on current recommendations. Study three (N=45) showed that TPB measurement development yields problematic questions, making it difficult for participants to interpret and respond to questions. Perceived behavioral control (PBC) was identified as the key determinant of walking behaviour. The final study (N=130) demonstrated that increasing PBC led to an increase in objectively measured walking, in general public participants, from 20 minutes to 32 minutes a day. At one month follow up, participants maintained their increases in walking. Overall, the findings of this thesis partially support the proposed causal nature of the TPB as a framework for developing and evaluating health behaviour change interventions.

LIST OF PAPERS

This thesis comprises the following four original papers:

1. Darker, C.D., Larkin, M., & French, D.P. (in press). An exploration of walking behaviour - An interpretative phenomenological approach. *Social Science and Medicine.*

2. Darker, C.D., French, D.P., Longdon, S., Morris, K., & Eves, F.F. (2007). Are beliefs elicited biased by question order? A Theory of planned behaviour belief elicitation study about walking in the UK general population. *British Journal of Health Psychology, 12,* 93-110.

3. Darker, C.D. & French, D.P. (submitted). What sense do people make of a theory of planned behaviour questionnaire? A think-aloud study. *Psychology & Health.*

4. Darker, C.D., French, D.P., Eves, F.F., & Sniehotta, F.F. (submitted). A theory of planned behavior intervention to promote walking amongst the general population: A waiting list randomized controlled trial. *Health Psychology.*

In addition, the following abstracts arose from presentations of material from this thesis:

- Darker, C., Longdon, S., Morris, K., Eves, F.F., & French, D.P. (2005). Instrumental and affective beliefs about walking in the general population: A theory of planned behaviour belief elicitation study. *Psychology & Health, 20*, S56. Abstract.

- Darker, C., Larkin, M., & French, D.P. (2006). An exploration of walking behaviour - An interpretative phenomenological approach. *Psychology & Health, 21,* S36. Abstract.

- Darker, C., Larkin, M., & French, D.P. (2006). Social cognitions in survey research - An interpretative phenomenological approach. *Psychology & Health, 21,* S36-37.

During the period of postgraduate study at the University of Birmingham, the following papers were also published/submitted:

- Darker, C. (2006). Intervention checklist – Developing a comprehensive checklist to guide the design of interventions. *The European Health Psychologist, 3,* 10-11.

- Darker, C., Larkin, M., & French, D.P. (submitted). Social cognitions in survey research – An Interpretative phenomenological approach. *New Ideas in Psychology.*

ACKNOWLEDGEMENTS

There are many people that I want to thank who have helped me to get through this PhD and emerge relatively unscathed and still with the ability to laugh, love and smile.

To my Mum (Mrs. Mam), who through regular phone chats, kept me up-to-date with all the gossip from Ireland and who has helped me keep my sanity by making me realise that the end was always in sight. I love you.

To my lovely boyfriend Ryan, whom I love and adore. Thank you for your never ending support and faith in my abilities. Thank you for the wonderful distractions of coupledom.

To Bailey and Borgia, I love you both so much girls. I will be home soon, forever, I promise.

To Darren and Adam, thank you for being a part of my family. Good luck with the novel!

To Bob, thank you for your support and pride in my achievements. “Master Plan A” has been realised.

To the people in Sportex, especially Anna, Steven (Eireann go Bră!), Leila and Manjit. You have put up with my many moments of both personal and professional drama. Thank you for your friendship and laughter. I promise to properly try and keep in touch.

To Doug, thanks for making me feel very much welcome from the very beginning. In years to come when I think of my time in Birmingham you will feature with very fond memories. Keep up the stories!

Dr. David French, my fearless leader and supervisor. Thank you for choosing me as your first PhD student. Thank you for the endless reading and painstaking editing of my work and patience as you explained statistics (just one more time) to me. You have made me a better researcher.

CONTENTS

CHAPTER ONE

INTRODUCTION

Walking

The health benefits of walking

Physical activity has been defined as "any bodily movement produced by skeletal muscles that results in energy expenditure" (Caspersen, Powell & Christenson, 1985). Physical activity is closely related to but distinct from exercise and physical fitness. Exercise is a subset of physical activity defined as "planned, structured and repetitive bodily movement done to improve or maintain one or more components of physical fitness" (Caspersen et al. 1985). Physical fitness is a "set of attributes that people have or achieve that relates to the ability to perform physical activity".

There is good evidence that physical activity can have a positive influence on health outcomes, such as a risk reduction of around 30% for all cause mortality (Lee & Skerrett, 2001), obesity prevention (Avenell, et al. 2004), diabetes prevention (Tuomilehto, et al. 2001) and reduction of risk indicators for cardiovascular disease (Wannamethee & Shaper, 2001).

Recently there has been a move towards promoting, encouraging and researching moderate lifestyle physical activities, such as walking. Moderate physical activity is activity performed at an intensity of 3 to 6 METS (work metabolic rate/resting metabolic rate). This is the equivalent of brisk walking at 3 to 4 mph for most healthy adults, which should be sufficient to result in being slightly out of breath. Large scale longitudinal studies and randomised controlled trials (RCT) have detailed the efficacy of walking as a particular form of lifestyle physical activity which can garner health protective benefits. The findings of a recent meta-analysis (Murphy, Nevill, Murtagh & Holder, 2007) of 24 randomised controlled trials of walking suggested that walking is sufficient to increase cardiovascular fitness, reduce

body weight, BMI and body fat and decrease resting diastolic blood pressure in previously sedentary but otherwise healthy individuals.

Some epidemiological studies have suggested that walking may not be a sufficient stimulus to increase cardiovascular fitness (Lee & Paffenbarger, 1997). The sometimes conflicting results in walking intervention studies may be attributable to small sample sizes and underpowered studies (Murphy, et al. 2007). However, it is also likely that walking speed and the baseline level of cardiovascular fitness, will determine whether a walking programme will result in a significant increase in aerobic capacity. It would appear that there is some evidence that for sedentary but otherwise healthy middle-aged individuals, walking at a brisk pace can result in modest but meaningful increase in aerobic fitness (Keller & Trevino, 2001).

There is also some evidence to suggest that walking may be an effective behaviour in the prevention of type II diabetes. The Diabetes Prevention Program (Knowler, et al. 2002) found that a lifestyle modification incorporating a minimum of 150 minutes a week of moderate-intensity physical activity, such as brisk walking, was more effective in preventing type II diabetes mellitus in individuals with pre-diabetes than was either a pharmaceutical intervention or a placebo.

Walking appears to influence a modest reduction in body mass index (BMI) (Fogelholm, Kukkonen-Harjula, Nenonen & Pasanen, 2000). These reductions in BMI illustrate the role that a walking programme plays in the maintenance of lean body mass. Decreases in BMI resulting from an exercise programme are likely to be due to a reduction in

fat mass and therefore potentially more significant in terms of cardiovascular risk than equivalent reductions due to calorie restriction which can reduce lean body weight.

There is clear evidence that walking has a strong predictive capacity for longevity. The Honolulu Heart Program (Hakim, et al. 1998), found that after adjustment for age, the mortality rate among men who walked less than one mile per day was nearly twice that among those who walked more than two miles per day. The distance walked remained inversely related to morality after adjusting for overall measures of activity and other risk factors, such as body mass index, hypertension and diabetes. There were similar findings within The Harvard Alumni Health Study (Lee & Paffenbarger, 2000) whereby walking independently predicted longevity. The Whitehall Study (Smith, Shipley, Batty, Morris & Marmot, 2000) demonstrated that walking pace had an inverse relationship with mortality from all-causes, coronary heart disease, other cardiovascular disease, all cancers and repository disease following adjustment for risk factors which included age, employment grade, smoking and BMI.

History of guidelines

The American College of Sports medicine (ACSM) was an early leader in providing specific exercise recommendations. Exercise guidelines have their historical roots in a publication in 1975 of *Guidelines for Graded Exercise Testing and Exercise Prescription* and its subsequent revised editions, which have had a major influence on the fields of exercise sciences and clinical and rehabilitation medicine (ACSM, 1975; 1980; 1986; 1991; 1995; 2000). The exercise recommendations of the ACSM were quite specific and led to somewhat regimented thinking about how much exercise should be recommended. For example, early

recommendations were for a person to exercise three to five days per week, for a duration of 20-45 minutes at 70-90% of maximum heart rate (ACSM, 1975). This can be compared to the later recommendations that suggest a frequency of seven days per week, a duration of more than 20 minutes a day at an intensity of 40-85% of maximum heart rate (ACSM, 2000). These older highly structured exercise recommendations may have resulted in many people thinking that exercise not meeting these specific criteria would be of limited or no value (Pate, et al. 1995).

In the past, exercise recommendations (including those from the ACSM) were based on scientific studies that investigated dose-response improvements in performance capacity after exercise training, especially the effects of endurance exercise training on maximal aerobic power (maximum oxygen consumption). However, it now appears that the majority of these health benefits can be gained by performing moderate-intensity physical activities outside of formal exercise programmes (Pate, et al. 1995).

The American Heart Association (Fletcher, et al. 1992) identified physical inactivity as the fourth major modifiable coronary heart disease risk factor, joining smoking, hypertension and dyslipidemia. An important feature of this report was recognition of the health value of moderate amounts and intensities of exercise. Evidence cited in the report supported the conclusion that there was an adverse and graded dose-response association between exercise and coronary heart disease and that high levels of exercise training were not required for a person to gain much of the health-related benefit of exercise.

The next major development in public health recommendations for physical activity was the Centers for Disease Control and Prevention (CDC) and the ASCM report published in 1995 (Pate, et al. 1995). The CDC and ACSM recommended that "every US adult should accumulate 30 minutes or more of moderate-intensity physical activity on most, preferably all, days of the week" (Pate, et al. 1995). Reports from a National Institutes of Health consensus conference, the US Surgeon General and the American Heart Association presented very similar recommendations in 1996 (Fletcher, et al., 1996; National Institute of Health, 1996; US Department of Health and Human Services, 1996).

In 1996, the US Surgeon General issued *Physical Activity and Health*, a report stating that persons of all ages should accumulate a minimum of 30 minutes of physical activity of moderate intensity on most, if not all, days of the week. This amount of physical activity is roughly equivalent to expending 150 kcal per day or 1,000 kcal per week. The primary outcome affected by this quantity of physical activity is decreased risk of developing chronic diseases such as diabetes and cardiovascular disease. The report also acknowledges that for most, greater physical health benefits and weight control can be obtained by engaging in physical activity of more vigorous intensity or of longer duration.

The new recommendations extend the traditional exercise-fitness model to a broader physical activity-health paradigm. This recommendation is distinct in two important ways. First, the health benefits of moderate-intensity physical activity are emphasised. Second, accumulation of physical activity in intermittent, short bouts is considered an appropriate approach to achieving the activity goal. These unique elements of the recommendations are based on mounting evidence indicating that the health benefits of physical activity are linked

principally to the total amount of physical activity performed. This evidence suggest that amount of activity is more important than the specific manner in which activity is performed (i.e., mode, intensity or duration of the activity bouts). Emphasising the amount rather than the intensity of physical activity offers more options for people to select from in incorporating physical activity into their daily lives.

In 1996 the Department of Health issued a "Strategy statement of physical activity" that outlined a new policy promoting 30 minutes of moderate intensity activity on at least five days of the week (Department of Health, 1996). This recommendation was originally formulated by a review of evidence and expert consensus, emerging from the US, in 1994. It agrees with recommendations produced by the American College of Sports Medicine and the Centers for Disease Control and endorsed by the US Surgeon General (1996).

The Department of Health (2005) currently recommend that for general health benefits:

- Adults should achieve a total of at least 30 minutes a day of at least moderate intensity physical activity on five or more days pf the week. The recommended levels of activity can be achieved either by doing all the daily activity in one session or through several shorter bouts of activity of 10 minutes or more. The activity can be lifestyle activity or structured exercise or sport or a combination of these.

- More specific activity recommendations for adults are made for beneficial effects for individual disease and conditions. All movement contributes to energy expenditure and is important for weight management. It is likely that for many people, 45-60 minutes of moderate intensity physical activity a day is necessary to prevent obesity.

For bone, health, activities that produce high physical stresses on the bones are necessary.

The basis for developing and promoting this new paradigm is multi-fold. It has evolved from the recognition that it is highly unlikely that a substantial proportion of the most sedentary adults will become active if required to follow stringent exercise guidelines. Also newer data has emerged on the relationship of activity or fitness status to all-cause and cause-specific mortality and studies of the effects of exercise training or physical activity interventions on various health related outcomes.

Why walking is a good target behaviour for interventions

Sedentary behaviour has been identified as one of the leading preventable causes of death and disease in the developed world (Mokdad, et al. 2004). The Chief Medical Officer for England recommends that for general health, adults should achieve at least 30 minutes a day of at least moderate-intensity physical activity on five or more days of the week (Department of Health, 2004). When all sources of activity are considered, only 37% of men and 24% of women in England currently meet the Chief Medical Officer's minimum recommendations for activity in adults and are sufficiently active to benefit their health (Department of Health, 2004). The main reasons for adults not participating in active sports during the last year, is that their health is not good enough (50 per cent) followed by difficulty in finding the time (18 per cent) and not being interested (15 per cent) (Department of Health, 2005). Currently, over 23% of men and 25% of women in England are classified as obese (Department of Health, 2004) which is a risk factor for morbidity and mortality. Given the many benefits of physical activity and the low prevalence rates, it is imperative that

interventions be designed that effectively promote the adoption and maintenance of active lifestyles in large numbers of people (US Department of Health & Human Services, 2000).

Walking, in the United Kingdom, remains the most popular physical activity that is carried out for leisure over the four national surveys conducted during the last 20 years and walking has scored more than double indoor swimming, which was the second-ranked pastime in the last three surveys (Office for National Statistics, 1997). One of the appeals of walking lies in the fact that it is accessible to all, requires little skill and has a low risk of injury. Walking can be performed at a variety of speeds and intensities, in a group or alone and without the need for any training, special equipment or clothing. It can also be performed in an individuals' own locality and time.

The importance of walking for an individual attempting to increase their daily physical activity is underscored by the results of a study by Dunn et al. (1998). When individuals were asked to voluntarily incorporate 30 minutes of additional physical activity into their daily lives they did so by increasing their walking activity by 19-20 minutes per day. In other words, walking appears to be a preferred activity among sedentary individuals taking up physical activity. This reinforces the centrality of walking in health promotion and underlies the efficacy of this type of physical activity for enhancing health among the sedentary majority.

Theory based interventions

A recent systematic review of studies investigating walking (Ogilvie, et al. 2007) underscored that it is difficult to make clear interpretations of what constitutes an

effective walking intervention due to the variety of different types of interventions, targeted at different populations, utilising different modes of delivery and different assessments of change in walking. A recent report by the National Institute for Health and Clinical Excellence in the UK has stated that currently there is not enough evidence to support the use of walking interventions within primary care (NICE, 2006). More work is needed to extrapolate effective intervention components concerning walking. It has been argued that a cornerstone of effective behavioural change is basing interventions on a sound evidence based theoretical structure (Michie & Abraham, 2004). Theory based interventions can provide an explanation of how an intervention works, developing an understanding of the causal processes and mechanisms which account for observed behaviour change.

A theory has been defined as "A set of interrelated concepts, definitions and propositions that presents a systematic view of events or situations by specifying relations among variables in order to explain and predict events or situations" (Glanz, Lewis, & Rimer, 1997, pp. 21). Thus according to this definition, a theory should describe (1) what variables are most important and (2) how the variables relate or interact.

Theory provides a clear account of hypothesised mechanisms or causal processes that generate behaviour change (Noar & Zimmerman, 2005). The use of theory allows knowledge to be cumulative. It explains why interventions work by clarifying causal processes (Rothman, 2004). Theory can reduce the number of possible variables and mechanism under consideration and guide the development of effective interventions (Campbell, et al. 2000). Theory also allows an effective intervention to be evaluated by addressing a number of key issues (Michie & Abraham, 2004). Firstly, *does it work?* Demonstrating that an intervention

has produced measurable improvement relative to an appropriate control group is prerequisite to investment in subsequent trials or adoption in health care practice (Abraham, Norman & Conner, 2000). Secondly, *how well does it work?* The effect size generate by a successful trial indicates the impact that the intervention is likely to have at an individual level or population level. Thirdly, *how does it work?* Evaluation replication and intervention adoption depends upon specification of the critical techniques or procedures responsible for behaviour change (Bartholomew, Parcel, Kok, & Gottlieb, 2001). Ultimately, theoretical and practical innovations are needed if there is to be an advancement in efforts to persuade and enable people to make healthy changes in their behaviour (Rothman, 2004).

The theoretical basis for this current body of work is the Theory of planned behaviour (TPB; Ajzen, 1991) which is an extension of the earlier theory of reasoned action (TRA; Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975). There are several reasons as to why the TPB is a useful theory on which to base interventions to increase walking behaviour. First, the theory postulates clear constructs through which behaviour is hypothesized to operate through. Second, meta-analytic reviews of correlational studies using the TPB have provided empirical support in terms of its capacity to predict many behaviours (Armitage & Conner, 2001; Conner & Sparks, 2005), including physical activity (Hagger, Chatzisarantis, & Biddle, 2002). Third, the TPB is one of the most common social cognition models utilised within health psychology (Godin, Conner, & Sheeran, 2005; Johnson, French, Bonetti, & Johnson, 2004; Ogden, 2003).

Description of the TPB model

The TPB (Ajzen, 1991) is an extension of the earlier theory of reasoned action (TRA; Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975). The TPB postulates behavioural intention as the proximal determinant of volitional behaviour. Thus, the more that a person intends to perform a behaviour, the greater the likelihood that the behaviour will actually be performed. The strength of a person's intention is determined by three factors, that is, attitude, subjective norm and perceived behavioural control (PBC). Attitude towards the behaviour reflects the individuals positive or negative evaluations of performing the behaviour. Subjective norm is determined by the perceived pressure or wishes of important others. PBC is taken to be a function of the persons beliefs about the resources and obstacles relevant to performance of the behaviour. PBC is also believed to have a direct effect on behaviour when people are accurate in their estimates of actual control. As a general rule, the more favourable the attitude and subjective norm and the greater the PBC, the stronger should be the persons intention to perform the behaviour in question.

The theory proposes that the antecedents of attitude, subjective norm and PBC are corresponding beliefs, reflecting the underlying cognitive structure. Attitude arises from a combination of beliefs that the behaviour will lead to certain outcomes and the evaluation of these outcomes (behavioural beliefs). Similarly the origins of subjective norms can be traced to corresponding belief based judgements that include normative beliefs and motivation to comply. Normative beliefs refer to behavioural expectations that important individuals or groups will approve or disapprove of the behaviour and motivation to comply is the persons general tendency to go along with the wishes of salient referents. PBC is underpinned by a set of control beliefs and the perceived power of these beliefs. Control beliefs refer to the

perceived presence of factors that may influence or impede performance of a behaviour and perceived power refers to the perceived impact that facilitating or inhibiting factors may have on performance of behaviour.

According to the TPB, behaviour may be predicted from intention, providing that two conditions are met (Ajzen, 1991; 2002). First, both behavioural intention and behaviour must be measured with the same degree of specificity with respect to the target, action, context and time frame of the behaviour concerned (the TACT principle). Second, there should be little opportunity for intention to change between the assessment of behavioural intention and the subsequent behavioural measure, which implies that for the purpose of prediction the time interval between the two measures, should be kept to a minimum.

According to the TPB, anything that changes the key underlying behavioural, normative and/ or control beliefs in the appropriate direction will increase the likelihood of behaviour change by increasing intention to change.

Application of the TPB to physical activity

The TPB has been applied to the prediction of a wide range of social and health behaviours (for reviews see Armitage & Conner, 2001; Conner & Sparks, 2005), including exercise (Hagger, Chatziarantis, & Biddle, 2002).

In their meta-analysis of 72 TPB exercise studies, Hagger et al. (2002) reported significant average correlations between attitude (r=.48), subjective norm (r=.25) and PBC (r=.44) constructs and exercise intentions. Together these variables explained 45% of the

variance in exercise intentions. Both intention (r=.42) and PBC (r=.31) were found to have significant average correlations with exercise behaviour, explaining 27% of the variance in exercise behaviour. Findings suggested that people attitudes and to a lesser extent, PBC, seem to be the key influences in forming intentions to participate in physical activity. Practically, this suggests that interventions based on the enhancement of attitudes toward physical activity may lead to an associated increase in generalised physical activity behaviour.

Application of the TPB to walking

When a specific form of physical activity has been investigated, it has been found that there is variation in the predictors of these specific physical activity behaviours (Ajzen & Driver, 1992; Bryan & Rocheleau, 2002). The TPB has been used to predict intentions or actual walking behaviour in six empirical studies. Eves, Hoppé and McLaren (2003) found that PBC emerged as the only significant predictor of walking intentions within a sample of students. In another study with students, TPB constructs explained 21.7% of the variance in reported intentions to walk, with PBC the only unique predictor (Scott, Eves, French & Hoppé, 2007). In a follow-up study, with military personal, PBC again had the strongest relationship with intention (Scott et al, 2007). Darker and French (submitted) and Rhodes, Brown and McIntyre (2006) with samples of members of the general public, also found a significant relationship between PBC and intention. Galea and Bray (2006) examined the efficacy of the TPB to predict intentions to walk in individuals with intermittent claudication. Intention and PBC explained 8% of the variance in self-reported walking behavior, however, PBC was found to be the sole significant predictor of walking. Across diverse samples therefore, PBC was found to be the biggest predictor of intention in all but one study (namely

that of Rhodes et al, 2006). PBC therefore appears to be the construct that behavior change interventions should aim to alter in order to increase intentions to walk more.

Intention-behaviour gap

Despite these encouraging findings, two issues are worthy of comment. First, it is clear that the TPB is better able to explain exercise intentions than behaviour. One potential reason for this is that the TPB attempts to predict behaviour using a limited number of constructs (Schwarzer, as cited in Sniehotta, 2007). This suggests that the model is open to the inclusion of further variables that may capture additional variance in behaviour. Second, despite the reporting of significant average correlations between intention and behaviour in recent meta-analysis (Armitage & Conner, 2001; Hagger, et al. 2002), it is clear that there is considerable heterogeneity in the strength of this relationship. However, since correlational tests of intention-behaviour consistency cannot rule out the possibility that a third variable is responsible for the observed associations, Webb and Sheeran (2006) conducted a meta-analysis of studies which empirically tested the intention behaviour relationship. Included in the meta-analysis were 47 studies which, a) randomly assigned participants to experimental and control groups, b) generated a significant difference in intention scores between groups and c) followed up behaviour. The key findings was that a medium to large change in intention engendered a small to medium change in behaviour. Thus, intention has a significant impact on behaviour but the size of the effect was considerably smaller than the previous meta-analyses which included correlational studies suggested.

Such findings suggest a need to identify the conditions under which intentions are more or less likely to lead to behaviour. Sheeran (2002) has conducted a detailed analysis of

the nature of intention-behaviour inconsistencies and has demonstrated that the "intention-behaviour gap" is predominately due to intenders who fail to act on their intentions rather than non-intenders who do act. Across six studies (a median of) only 53% of intenders performed the focal behaviour whereas, in contrast, 93% of non-intenders did not perform the focal behaviour. This suggests a need for further work to outline the volitional processes through which people can successfully translate their intentions into action.

Descriptive and process models

A recent editorial (Leventhal, Musumeci & Contrada, 2007) has called for a reorientation of the role of theory in research and detailing two broad types of theoretical models – descriptive models and process models. Descriptive models originate from epidemiological research and identify problems and set focus for future research, for example, by identifying predictors of behaviour. By contrast, process models explain how things happen and require the development of content variables at different levels.

Sutton (2002) has argued that the TPB is a descriptive model that should be thought of as a process model which suggests that behaviour is caused by intention. However, as Leventhal, et al. (2007) have argued, intention may not be part of the causal chain and that intention may be a non-causal predictor or proxy for the behavioural outcome. Further, identifying predictors is only a means of arriving at explanation, it does not constitute explanation (Weinstein, 2007). Understanding the dynamics of cognitive processes for specific behaviours and observing how these processes are shaped by social, cultural and interpersonal context are steps toward the development of effective, efficient and usable interventions (Leventhal, et al. 2007). One of the consistent criticisms of the TPB is that it

does not suggest specific techniques in which to alter beliefs and bring about behavioural change. As Eagly and Chaiken (1993, pp. 240) note, “the model provides no formal guidance for choosing specific arguments to include in messages designed to influence a specific belief”.

Social cognitive theory (SCT; Bandura, 1986, 1992) on the other hand clearly describes the mechanisms which precedes behaviour and suggests techniques in which behavioural change may be facilitated. According to SCT, motivation and action are extensively regulated by forethought. This anticipatory control mechanism involves expectations that might refer to outcomes of undertaking a specific action. The theory outlines a number of crucial factors that influence behaviour. The first factor is perceived self-efficacy, which is concerned with people beliefs in their capabilities to perform a specific action required to attain a desired outcome. Outcome expectancies are the other core construct of SCT which are concerned with peoples beliefs about the possible consequences of their actions. Besides these two cognitions, SCT also includes goals and perceived impediments and opportunity structures. SCT has been employed to develop interventions to change multiple health behaviours such as physical exercise (Dishman, et al. 2004), nutrition and weight (Baranowski, et al. 2003) and addictive behaviours (Winkleby, Feighery, Altman, Kole, & Tencati, (2001). Self-efficacy beliefs are constructed from four principle sources of information: enactive mastery experiences that serve as indicators of capability; vicarious experiences that alter efficacy beliefs through transmission of competencies and comparison with the attainments of others; verbal persuasion and allied types of social influences that one possess certain capabilities; and physiological and affective states from which people partly

judge their capabilities. Any given influence, depending on its form, may operate through one or more of these sources of efficacy information (Bandura, 1992).

The TPB therefore, is limited in its ability to be an effective process model because it is not delineate exactly *how* to change behaviour, where SCT does. Fishbein (1993, p211,) has argued that "the ultimate test of the theory…lies in its capacity to guide behaviour change interventions". Therefore, there is a need to identify effective behavioural change techniques which compliment the rationale within the TPB and to understand how these techniques operationalise within the theory, in order to test the efficacy of the TPB as a theoretical framework that facilitates behaviour change.

Unresolved issues in TPB based interventions

Elicitation studies are recommended when using the TPB to establish the cognitive foundation of a population's salient behavioural, normative and control beliefs (Ajzen & Fishbein, 1980). In spite of the importance of the elicitation phase of TPB studies, it is often neglected by researchers. Whereas the Hagger, et al. (2002) review identified 72 studies, a more recent review identified only 47 instances where salient beliefs about physical activity were elicited to inform predictive studies (Downs & Hausenblas, 2005). The modal set of salient behavioural, normative and control beliefs for a population can be identified by asking a sample defined open-ended questions to which they provide the responses. The TPB stipulates that the salient beliefs of an individual are the ultimate psychological determinants of behaviour operating through TPB constructs. Therefore, if beliefs can be successfully experimentally manipulated, attitude change and consequent behavioural change can occur (Sutton, 2002). Understanding how individuals feel about a behaviour can assist researchers

with tailoring interventions to meet the specific needs and encourage positive beliefs about the behaviour in question.

A systematic review (Hardeman, et al. 2002) identified 24 interventions which applied the TPB to behaviour change across a range of behaviours. The TPB was mainly used to measure process and outcome variables and to predict intention and behaviour. It was less commonly used to develop the intervention. Behaviour change methods were mostly persuasion and information, with increasing skills, goal setting and rehearsal of skills used less often. Only 12 studies reported on how the intervention may have resulted in a change in intention and/or behaviour. Of these 12 studies, half of the interventions were effective in changing intention and two-thirds in changing behaviour, with generally small effect sizes, where calculable. None of the studies utilised an objective measure of behaviour. Evidence about mediation effects by TPB components were sparse. It was deemed difficult to assess the true effectiveness of using the TPB as a theoretical framework for interventions, as interventions were rarely designed on the basis of the theory and often also other theories and models were used to develop the intervention, thus clouding the effectiveness of the TPB on its own. The studies reviewed were also of "poor design" (Hardeman, et al. 2002, pp. 149). Thus suggesting that very few TPB based behaviour change intervention studies rarely have a systematic formative process of intervention development. The authors had a number of recommendations for future studies; 1) utilise the TPB in the development and evaluation of behaviour change interventions, 2) precise estimates of effectiveness could be garnered if studies employed a randomised controlled design, 3) longer follow-up periods, 4) reliable measures of constructs, and 5) objective measure of behaviour.

According to Ajzen (1991), anything that changes the key underlying behavioral, normative and/or control beliefs in the appropriate direction will increase the likelihood of behavior change by increasing intention to change. Hardeman, et al. (2002) found that only two studies that utilised the TPB to develop the intervention conducted mediation analysis to establish whether the effects of the intervention on behavior were mediated by TPB constructs. Since the Hardeman review, only two studies, to our knowledge, examined whether the TPB constructs mediate the effects of interventions on behavior. Vinokur, Merion, Couper, Jones and Dong (2006) examined an educational web-based intervention for high school students to increase knowledge and promote positive attitudes towards organ donation. Chatzisarantis and Hagger (2005) investigated the effects of a brief intervention based on the TPB on leisure-time physical activity participation. However, as with the studies included in the Hardeman, et al., (2002) review, neither of these studies that conducted mediation analyses also objectively measured behavior. So, critically the TPB has rarely been used to develop, design or evaluate interventions and no study has shown an effect on objectively measured behavior that was shown to be mediated by TPB constructs. There is a need to explore mediational effects so that the assumptions underlying the theory can be tested in more depth (Sutton, 2002).

Unresolved issues in measurement of the TPB

Ogden (2003) raises a number of concerns about the use of social cognition models, such as the TPB, to examine behaviour. Her critique focuses on four issues and is based on 47 empirical studies. First, she asks whether the theories are useful. She concludes that the models are indeed useful from both the perspective of the researchers and "…to inform

service development and the development of health-related interventions to promote health behaviours" (Ogden, 2003, pp. 425).

Second she questions whether the theories can be tested. Her conclusion is that they cannot be disconfirmed, Ogden supports this conclusion by arguing that researchers do not conclude that they have disconfirmed the theory under test when they find that one or more of the theory's antecedent variables do not predict the outcome measure or that the findings do not explain all or most of the variance in intentions or behaviour. Ajzen and Fishbein (2004) highlight in their response to Ogden's criticisms that the logic of this argument is unsound; to conclude that a theory has been disconfirmed under such circumstances would not be consistent with the theories being tested. Numerous descriptions of the TPB make clear that the extent to which each of the antecedent variables predicts intentions or behaviour is a function of the population and the behaviour under study. For a specific behaviour and population one or more antecedents may indeed not be predictive, without disproving the theory. However, evidence disproving the theory would be obtained if none of the antecedent variables were predictive of intentions or behaviour. In this way the TPB could be disconfirmed.

Third Ogden claims that the theories contain only analytic truths because the correlations observed between measured cognitions are likely to be attributable to overlap in the way the constructs are measured. She claims that this argument extends to measures of behaviour because these are so often based on self-report. However, in the meta-analysis by Armitage and Conner (2001) the TPB showed that intention and perceived behavioural control still accounted for 21% of variance in behaviour when objectively measured.

Fourth, Ogden suggests that the application of the theories leads to the creation of cognitions rather then the measurement of such cognitions and this in turn influences behaviour. As Ajzen and Fishbein (2004) point out, this is a common concern in questionnaire and interview studies. However, the evidence to support this claim is lacking. For example, Ajzen, Brown & Carvajal, (2004) had participants complete questionnaires either before or after the opportunity to perform the behaviour. No evidence was found that behavioural performance was influenced by completing the questionnaire or that performing the behaviour influenced the completing of the questionnaire.

Studies based on the TPB have tended to rely on self-reports, despite evidence to suggest the vulnerability of such data to self-representational biases (Armitage and Conner, 2001). This bias may threaten the reliability and validity of the model by augmenting the strength of the TPB-behaviour relationships (Norman & Conner, 2005). Individuals' reports of their internal states are collected at the same time as their reports of their past behaviour related to those internal states. Consequently, the possibility arises that method variance has inflated the observed correlations between these two types of variables artifactually (Lindell & Whitney, 2001). Scott, Eves, French and Hoppe (2006) conducted two studies that examined the efficacy of the TPB in predicting both self-reported walking behaviour and step count as assessed by pedometers. In the first study, 41 students wore a pedometer for one week. Participants then completed a questionnaire containing measures of the TPB constructs and two self-report measures of walking, followed by two interview measures of walking. In the second study, members of the military wore pedometers for two weeks. At the end of each week, participants completed the questionnaire and interview measures of walking. Both

studies found no significant association between questionnaire measures of walking and pedometer measures. TPB variables were found to explain 22% of variance in intention to walk in the first study and 45% of the variance in the second study. This suggests that peoples recall of walking is poor and accurate measurements by self-report only is problematic. These findings underscore the need for an objective measure of walking behaviour.

How to measure walking

While the importance if walking is widely recognised, the best way to measure walking in epidemiological research is still not clear (Johnson-Kozlow & Matt, 2004). Self-report measures of physical activity are economical and play a central role in many studies of physical activity in general and walking in particular (Johnson-Kozlow & Matt, 2004). They are easy to use for assessing large populations quickly and can provide rich contextual information (Tudor-Locke, Williams, Reis & Pluto, 2004). A considerable body of research has been generated, investigating biases and response errors in self-report data on physical activity (Matt, Garcia, Primicias, Frericks & de Faria, 1999; Sallis & Saelens, 2000). Many self-report measure of physical activity are available (Kriska, et al. 1997). The supplement describes 32 instruments of physical activity and all but three specifically assessed walking. The assessments of walking differed in several ways. They were made across various time intervals, during the past one or two weeks, the last month, the previous year and across a lifetime. Walking was assessed during leisure time and as part of work-related activity. Intensity if walking was assessed as brisk and fast walking or slow and easy walking. Assessments were variously quantified, as sessions and duration per week, as number of miles per week, number of blocks walked and as walking more or less with reference to others of the same age. The format in which walking is measured impacts estimates of time spent

walking and their validity (Johnson & Sallis, 2000; Schwartz, 1999). Tudor-Locke & Bassett, et al. (2004) conducted a one year continuous self-monitoring using pedometers to determine the sources of natural variability of walking. The findings revealed seasonal and weekly natural fluctuations in steps per day as well as individuals misperceptions about when they engaged in more or less activity. These misperceptions emphasise the problems of relying on self-reported recalls of physical activity that are often used in epidemiological and experimental studies of physical activity (Ainsworth, et al. 2000; Sallis & Saelens, 2000). It is due to inconsistencies in how to measure self-reported walking and reporting biases in general, that a growing number of studies are utilising objective measures of walking behaviour in conjunction with self-report measures.

A common method to objectively measure walking is a pedometer. Pedometers detect steps and distance taken throughout a day and represent affordable hardware to use within a study with a large sample size (Tudor-Locke & Basset, 2004). Pedometers have good validity for measuring moderate-intensity activity under controlled laboratory conditions (Crouter, Schneider, Karabulut & Bassett, 2003) and free living conditions (Schneider, Crouter & Basset, 2004). Accelerometers portray movement as a volume of physical activity and can be used to infer time spent in bouts of specific intensity categories (e.g., light, moderate, vigorous) (Freedson & Miller, 2000). However, their high cost limits their usage in studies with large sample sizes. A new type of pedometer has recently emerged which integrates some of the technology of an accelerometer. For example, a New Lifestyles NL-1000 (New Lifestyles Inc. USA) activity monitor is a pedometer which incorporates a medical grade accelerometer device which can record, steps, distance and number of minutes spent in light, moderate and vigorous physical activity.

The present thesis comprises four studies examining walking and the TPB. The initial study explored members of the general public's experiences and understanding of walking using the qualitative method of interpretative phenomenological analysis and to examine whether our participants' perception of walking is congruent with current health promotion campaigns, which typically highlight the physiological benefits that accrue from walking. This was achieved through the qualitative research of interpretative phenomenological analysis. The second study was concerned with eliciting the salient behavioural, normative and control beliefs, in line with current TPB recommendations (Ajzen, 1991), that members of the general public hold in relation to walking. This study concerned a number of hypotheses; (i) that varying the order of the constructs within the TPB belief elicitation questionnaire would influence the number and types of beliefs that were elicited during the open-ended format of the questionnaire; (ii) that different salient behavioural beliefs about walking would be elicited by questions designed to assess instrumental and affective beliefs ; (iii) that age and gender would have an effect on the number and types of behavioural, normative and control beliefs that were elicited. The third study was concerned with understanding the processes of interpretation and responses that individuals go through when they complete a TPB questionnaire on walking behaviour. Finally, the last empirical study in this thesis provided a rigorous test of a randomized controlled trial intervention to encourage objectively measured walking behaviour, based on the TPB, amongst the general population. In line with Ajzen (1991), we hypothesised that (i) the intervention would lead to a change in control beliefs; (ii) the intervention will result in an increase in PBC, mediated by a change in control beliefs; (iii) the intervention will result in an increase in intention to walk, mediated by a change in PBC and that (iv) the intervention will lead to an increase in the number of

minutes spent briskly walking assessed by pedometers, mediated by a change in intention and/or PBC.

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CHAPTER TWO

An exploration of walking behaviour – An interpretative phenomenological approach.

Abstract

The aim of this study was to provide a rich and detailed account of participants' experiences of walking using the qualitative method of interpretative phenomenological analysis. Participants were a snowball sample of ten members of the UK general public, aged 25-35 years, with equal numbers of males and females. Participants reported walking as not being "proper" exercise and that it is not a goal in itself. Factors that participants cited as making walking easier included the functionality of walking for transport, contextual factors of social support and psychological benefits. Perceived lack of time was cited as an inhibitory barrier to walking. Participants' perceptions of walking were incongruent with current health promotion campaigns. There is a need to address the misconception that walking is not proper exercise. The traditional focus of walking promotion campaigns concerns beliefs about the benefits of walking on health. People engage in healthy behaviour for reasons other than to be healthy. Interventions to promote walking should consider targeting the psychological meaning and value of walking, in addition to beliefs about health.

Keywords: interpretative phenomenological analysis, walking, public health.

In recent years there has been a dramatic increase in obesity levels globally, due to a combination of over eating and inactivity (Kopelman, 2000). Recent reviews confirm the positive contribution that physical activity contributes to health benefits such as lower risk of cardiovascular problems (Wannamethee & Shaper, 2001) better control of hypertension (Kelley, Kelley, & Tran, 2001), reduction in the risk of all cause cancer (Lee, 2003), prevention of diabetes mellitus (Delahanty, Meigs, Hayden, Williamson, & Nathan, 2002) and prevention of osteoporosis (Melzer, Kayser, & Pichard, 2004). Consequently, encouraging individuals to take up a more active lifestyle has become a health promotion priority.

Current recommendations suggest that individuals engage in at least thirty minutes of moderate exercise, such as brisk walking, or cycling for at least five days each week, to gain health protective benefits (British Heart Foundation, 2001). Despite this information, the majority of adults in the Western world, do not meet these minimal requirements for physical activity wherein health benefits are thought to occur. In the United Kingdom, over 60% of adult males and 75% of adult females do not undertake enough physical activity to benefit their health (Department of Health, 2004). In a recent report, the Chief Medical Officer for England recognised the difficulty many people have in translating a physical activity recommendation into a meaningful behaviour pattern that can fit into daily life (Department of Health, 2005).

Ecological models have increasingly been applied to understand the determinants of physical activity and inactivity. It is widely recognised that social and physical environments can influence health behaviours (McLeroy, Bibeau, Steckler, & Glanz, 1988; Stokols, 1992), including physical activity (Frank, Schmid, Sallis, Chapman, & Saelens, 2005). These can

form the basis of new environmental and policy interventions (Sallis & Owen, 1999). The limited number of published studies that attempt to alter the physical environment to increase physical activity suggest that spatial access to recreational facilities may influence physical activity participants (Giles-Corti & Donovan, 2002). The influence of both individual and social environmental determinants play an important role in determining exercising in general (Sallis, Cervero, Ascher, Henderson, Kraft, & Kerr 2006). However, evidence remains elusive that simply having access to facilities will increase regular physical activity. While place of residence and its influence on physical activity may be an important influential determinant of activity, other, perhaps more modifiable, determinants of activity and inactivity should also be considered as targets of interventions. These include the underlying beliefs and attitudes people have towards increasing their physical activity and the perception of potential barriers to them implementing their activity plans (Downs & Hausenblas, 2005).

Individual, rather than environmental, interventions aim to modify the psychological factors that control behaviour and those changes are expected to alter behaviour (Sallis & Owen, 1999). The literature on the determinants of physical activity in adults suggest that a successful intervention would promote low to moderate intensity physical activity; alter perceptions of benefits, self-efficacy, intentions and enjoyment; and stimulate more social support for exercise. These determinants are more readily available for manipulation compared to altering a person's environment (Sallis & Owen, 1999).

In recent years there has been a shift away from advocating structured formal exercise towards more *lifestyle* activities. Lifestyle activities are activities that are performed as part of everyday life, such as climbing stairs, walking and cycling (Department of Health, 2005).

French, Sutton, Hennings, Mitchell, Wareham, and Griffin (2005) investigated individuals attitudes towards increasing their physical activity, such as increasing their current levels of walking and stair usage. The respondents agreed that increasing their overall physical activity would be good for them but it was whether or not they enjoyed physical activity that was the main predictor of their intentions to increase their physical activity later on. Eves, Hoppe, and McLaren (2003) examined a range of physical activities including examples of vigorous intensity leisure time pursuits (team sports and aerobics), moderate intensity leisure-time activity (dancing and swimming) and two moderate intensity lifestyle activities (walking and cycling). The predictors of intentions to walk were found to be distinctly different from the other behaviours examined, suggesting that individuals conceptualise walking as being a unique form of physical activity. Little is known about the contextual element that social support or companionship may have for each specific form of lifestyle physical activity.

Walking is the most common form of lifestyle physical activity (Siegel, Brackbill, & Heath, 1995). It is especially promising as a focus of public health interventions because of its widespread acceptability, and accessibility, particularly among populations with a low prevalence of physical activity (Morris & Hardman, 1997). However, there is still a dearth of research on walking in comparison with other, more vigorous forms of physical activity.

Previous research has shown that adults within the UK population hold many salient beliefs in relation to walking (Darker, French, Longdon, Morris, & Eves, 2007). Positive beliefs such as walking for exercise, stress relief and fresh air may encourage people to walk more whereas beliefs like inclement weather and a perceived lack of time are the most commonly held negative beliefs in relation to walking for an average of 30 minutes a day

(Darker, et al. 2007). One limitation of such research is the conceptualisation of walking from a particular theoretical perspective and the use of questionnaires as the only measurement tool, thus potentially limiting how such research may further our understanding of walking. By contrast, qualitative research is a form of empirical inquiry which enables a detailed and richly contextualised understanding of the phenomenon under investigation (Bramley & Eatough, 2005).

The context of the present study is a culture defined by some strong, conflicting discourses about the body and about exercise. On the one hand, following Foucault, we have a modern conception that our bodies should be shaped and managed, through regimes of exercise and diet (e.g. Harré, 1991; Featherstone, Hepworth, & Turner, 1991). This body is a 'socialised' body (Giddens, 1991); even a super-natural body – it surpasses the 'natural' given body. On the other hand, as Burkitt (1999) points out, bodies are always a site of agency. We might, therefore, expect to see that many participants resist the cultural pressures of exercise (gyms, treadmills, exercise classes, personal trainers and so on), by taking up either resistant (e.g. defiantly 'lazy' or 'epicurean') or marginal positions (e.g. exercising in less visible or purposeful ways, or transforming the body in other ways). This context has a direct impact on people's experiences of themselves, as embodied beings in the world (Merleau-Ponty, 1962).

The aim of the current study is to explore how walking is understood, and to examine whether our participants' perception of walking is congruent with current health promotion campaigns, which typically highlight the physiological benefits that accrue from walking. This will be accomplished through the use of semi-structured interviews and Interpretative Phenomenological Analysis (IPA; Smith, 1996). IPA is an approach to qualitative research

which is now well-established in British psychology (e.g. see Brocki & Weardon, 2006 and Reid, Flowers, & Larkin, 2005 for reviews). It is an eclectic, idiographic and hermeneutic approach to phenomenological inquiry, which has drawn variously on Mead, Giorgi (Smith, 1996), Heidegger (Larkin, Watts, & Clifton, 2006; Smith, in press), Solomon, Merleau-Ponty, Van Manen (Eatough & Smith, 2006) Gadamer, and Schleiermacher (Smith, in press) for its theoretical underpinnings. The aim of IPA is to understand and make sense of another person's sense-making activities. Thus, IPA research papers present a narrative thematic account derived from a detailed series of coding procedures which are conducted for each participant's understanding of the topic being researched (e.g. see Larkin et al. 2006), in this case walking. Through our interviews about the experience and meaning of everyday walking behaviours, we hope to approximate an understanding of the participants' individual experiences, and to identify any shared patterns of meaning within their accounts. The aim of the following analysis is to explore the meaning of walking for our participants.

Method

Participants

The ten participants were a snowball sample comprising equal numbers of males and females between 25 and 35 years of age (mean = 28.9 years). A snowball sample involves using initial contacts to identify other potential participants (Henry, 1990). Snowball sampling is a technique that is often used in qualitative research (Coolican, 1999). Participants reported being interested in the *idea* of walking but did not necessarily classify themselves as being *avid walkers*.

A sample of this size is recommended for IPA, due to the in-depth nature of phenomenological inquiry (Reid et al., 2005). As an idiographic method small sample sizes are the norm in IPA as the analysis of large data sets may result in the loss of "potentially subtle inflections of meaning" (Collins & Nicolson, 2002, pp. 626) and a consensus towards the use of smaller sample sizes is emerging (Reid, et al., 2005; Smith, 2004). A major strength of IPA is the rich thematic texture that can arise from this type of analytic undertaking. The major goal within this paper is the elaboration of a conceptually rich and contextually grounded understanding of a phenomenon, a goal which is not possible to capture in a methodological format, such as a questionnaire, that is more conducive to larger sample sizes.

As people age, they tend to be less physically active (Williamson, Madans & Anda, Kleinman, Kahn, & Byers, 1993). Further, a particularly steep reduction in activity occurs between the ages of 25 and 35 (Department of Health, 2004), which is only matched by the period when people retire. This drop in activity may be due to people gaining permanent employment, purchasing cars and having children. IPA sampling tends to be purposive and broadly homogenous so as to provide a sufficient perspective given adequate contextualisation (Smith & Osborn, 2004). Consequently, this study recruited participants in this age range to explore ideas about walking in a group which is particularly likely to be decreasing their levels of physical activity.

Data collection

An information sheet was provided, along with the opportunity to discuss any queries with the researcher. All the individuals approached agreed to take part on the basis of informed consent, and were interviewed in private by the first author. The interviews were

conducted during the summer of 2006 and tape recorded and transcribed verbatim. Each participant is referred to by a pseudonym.

Interviews

The interview schedule was developed during two pilot interviews, and refined over the course of the interview process. The participants were asked to recall an episode of walking that was salient to them. They were asked what they enjoy, or dislike about walking. They were also asked about their reasons, and motives for walking, where they walk and who they share their walking with. The interview schedule outlined the areas of interest, but it was not prescriptive, and permitted exploration of topics as they developed. Typically, the interviews lasted 45 minutes (See Appendix for sample schedule).

Analysis

Following the conventions of IPA, an idiographic approach to analysis was adopted, and each transcript was examined in detail. Rigorous line-by-line coding was applied, with a focus on experiential claims and concerns (Larkin et al., 2006). Patterns within these codes were identified through a process of induction, and tested via a process of analytic audit (see Smith, 2004). These patterns in the data were then clustered into a thematic structure, allowing the super-ordinate themes to be identified (for a detailed account of this process, see Smith, 1996). The texts and emerging themes were reviewed by three researchers, all of whom had varying levels of immersion in the project. The following demonstrates the credibility of the analysis, by offering a model of triangulation (Smith, 1996). The first author carried out the interviews and conducted the detailed coding, and theme-development, the second and third authors contributed to the development, audit, and structure of these themes,

drawing on their informed positions on, respectively, the research topic and the application of IPA.

Results

The following analysis is structured according to three superordinate themes identified: (a) implicit understandings of exercise, (b) how walking is understood by participants, and (c) conflicts towards walking. Only one phenomenological theme is represented within the first superordinate theme, comprised of participants tending to understanding walking by comparing it to other forms of exercise. There are three phenomenological themes within the second superordinate theme: (i) the functionality of walking for transport, (ii) contextual factor of social support, or companionship, and (iii) psychological benefits. The third superordinate theme addresses the perceived lack of time as a barrier to walking.

Implicit understandings of exercise

Comparison of walking to other forms of exercise

Walking has often been typified as the form of physical activity that is most accessible and acceptable to a wide range of people (Morris & Hardman, 1997). However, some participants within this particular study did not value walking as a form of exercise. John for example, described himself as being sedentary, even though he appears to walk much more than the current recommended 30 minutes per day.

I: So first off, how would you describe yourself as a person?

John: Male (Laughs), pretty laid back. Sedentary.

I: Okay and what do you mean by "sedentary"?

John: I don't do much physical stuff. (...) Walk, garden. That's about it really.(...). Its already hour to an hour and half each day. It has been like that for a while so I don't see it changing much.

I: How long have you been doing that?

John: What walking for an hour to an hour and a half each day?

I: Yeah.

John: About 15 years. (...) I sit in front of a computer all day which I would suggest is sedentary.

I: But would you think that maybe your job is sedentary but your activity level is not that sedentary?

John: Ish, not sure. (...) I don't really consider it as exercise, its just a means to an end really. Its just to get somewhere, like 'I have legs, lets use them' (Laughs). I don't think about the health benefits.

Similarly, in Steve's view, 'proper' exercise is a purposeful activity that can have positive effects both on the cardiovascular system, and in calorific balancing. Walking is seen as an activity that is too 'low in intensity' to be of much benefit. However, he does feel that walking after a meal has value as an aid to digestion.

Steve: Not really because I do a lot of sport. So in terms of keeping the weight down or whatever, making sure that I get a high heart rate every now and again. But that is really not an issue. I suppose it can keep the weight off a little but. For example, I have gone walking with a mate, you know walking up the canal path into Birmingham to get something to eat and then bloating out on a lot of food and then walking back. I think that you can offset that a bit with walking.

I: Ok, so a main consideration for you would be to use walking as a weight control?

Steve: I couldn't say that it is, as quite as direct as that coz I don't have an issue with weight. Fortunately. But I do know that inevitably that I am burning calories and maybe it is a noteworthy number so it does off set the calories that I have taken. It is something that I bear in mind but it's a little bit theoretical.

Alex views walking as a '*load bearing'* activity that can be beneficial, in that it burns energy, and is good for stress relief. He describes how fast walking is physiologically different from slower walking, because it can push the heart and lungs. Alex therefore does value walking as a form of exercise, but only when the pace is fast. For example, he feels that *"a fast walk on an inclined treadmill has the same benefits of running, but without the jarring of the knees" (Alex).*

The participants in this study are comparing walking as an activity against their implicit understandings of what should constitute exercise. Exercise is being shown to be seen as an intense, purposeful activity that is undertaken for the purpose of cardiovascular health benefits. Whereas, walking on the whole does not seem to possess these same properties of "proper" exercise.

How walking was understood by participants

(i) The functionality of walking for transport

If walking is not viewed as "proper" exercise, than what is seen as the goal of walking? Walking is obviously a primary form of transport for human beings. We can use our legs as a means of moving from one place to another. For Caroline, walking serves this functional purpose. If there is a need to get somewhere, then walking is her form of transport.

Caroline: Most of the times I am walking I am doing it for a purpose. I am doing it because I need to get somewhere else. My feet are my form of transport.

For some individuals, environmental constraints will prohibit them from being able to walk. For Samantha, walking is an ineffectual mode of transport which *"just doesn't play as big a role because the places that I need to go to aren't close enough to walk to a lot of the time" (Samantha).*

The type of walking that Steve does is mostly functional, generally 'transport walking,' which is based on pragmatic decisions. The goal for Steve when considering walking is not based on the idea of a walk for its own sake, but driven by a need to be efficient.

I: Would you do a lot of walking?

Steve: Kind of. No, I tend to cycle actually. It cuts down the time. I don't actually walk that much, I certainly don't actually walk that much. Occasionally but I am not a great walker for pleasure. Occasionally I will walk functionally, just to get from A to B. But I have a bicycle so it tends to be that rather than walking.

I: And when you say that you are not "a regular walker for pleasure" what do you mean by that?

Steve: So on the weekend I don't tend to go for a walk in the country, I will occasionally. I did with my parents recently and I have got a friend coming across from a foreign country, so we will probably do a bit of walking so as that we can see some sights and some places. Generally its more pragmaticism, I need to get somewhere. I don't own a car and I can't wait for buses, I can't stand waiting for a bus. So therefore, if it's under my own steam at least I know that I am getting there. If you have a bike, most of the time it is quicker to cycle than to walk.

An important focus of health promotion campaigns has been to emphasise that slight, but crucial changes to a persons' lifestyle can have a positive health outcome. A typical example of this type of campaigns encourages people to "get off the bus one stop earlier than usual and walk the rest of the journey" (British Heart Foundation, 2001). Our participants viewed walking in rather different terms. Caroline also sees beneficial differences between types of walking. For Caroline, "proper" walking takes place outside, it has perceived benefits that indoor walking lacks.

Caroline: I don't ever really consider the bits that I do during the day.

I: Why do you think that is?

Caroline: Because it is not like having a proper walk. It's just moving from one place to the other, which I suppose its what I was saying that outdoor walking is as well. I feel that outdoor walking has other benefits as well as just getting from one place to another. Walking indoors, well it is walking but I don't feel that it is proper walking. (...) I just feel like if I am going too walk I might as well be outside. If I am going to use a treadmill, then I might walk to warm up and cool down at

the end of jogging but I wouldn't just get on a treadmill and walk. I don't particularly like cycling in a gym either. Maybe if I pass the test and get the car I might start walking indoors but at the moment I think of it as something that I do outdoors and there doesn't seem to be any point to take it indoors. This morning I felt like I wanted to go to the gym but I cycled here and now I feel like it's less of a necessity because I have already had that exercise and really I would rather exercise outdoors.

The participants in this study are making comparisons between their experiences of walking and their implicit understandings of 'exercise'. Exercise is seen as an intense, purposeful activity, undertaken for the purpose of cardiovascular health benefits. Walking, on the other hand, is generally understood to be a simple, functional and rather mild activity. Curiously then, in the wider context of a culture which equates exercise with intense purposeful activity, walking can actually be constituted as a form of resistance – it is a means of acquiring 'exercise' almost surreptitiously, and without the hierarchical qualities of competitive sports, and free from the aspirational and transformational identities which may be attached to the gym.

(ii) Contextual element of social support/ companionship

Walking may influence psychological well-being through associated social benefits. Social dynamics may in turn influence this experience. Walking can provide particular social settings, such as groups of people with shared interests, even when the activity of walking is seen as a means to an end, rather than an end in itself.

Zoë recalls an atypical episode of walking, characterised by the importance of striving to overcome a shared challenge. It is the sense of collective experience which makes this episode

significant and memorable. There is a clear sense of a common struggle, and of the special qualities of the particular environment i.e., Dartmoor in winter:

Zoë: (Laughs) Well years ago I used to be in the Air Training Corp, which is kind of like the Scouts. We were going on a 100 miles walk. We would walk 25 miles a day. It was in the snow as well. In the middle if Dartmoor, it was quite hilly, quite cold. It took a long time, it took all day almost.(…) I mean there was a big group of us, it was quite fun. We were stirring each other on. It wasn't too bad, the scenery was quite nice. It took its toll on my legs, I was a bit worse for wear afterwards.

I: Would you do it again?

Zoë: I would.

I: What would make you do it again?

Zoë: If it was with the right group of people and if it was in the right place.

This extract illustrates the contingency of people's willingness to engage in 'non-functional walking' (for exercise, fun, challenges, exploration or shared experience, for example). In Zoë's case, the people and place are deciding factors. For most of our participants, under the right circumstances, a walk can serve as a medium for sharing experiences, seeing scenery and enjoying companionship. Matthew illustrates this pattern even as he describes an exception. Matthew typically walks alone and for functional purposes. Within this extract, there is a strong sense of the value which Matthew places on shared experience and companionship.

Matthew: Its usually only me that is going to that destination, which is my work. The majority of the time, well it depends on the country walk I would prefer to have someone with me but in day-to-day life, it's normally on my own. Hence the music, its also company.

I: You said that on the countryside walks you would "prefer to have someone with you". Why is it important to have someone with you on the countryside walks?

Matthew: To share the experiences, two points of view. Two pairs of eyes, that way you can see more. (...) It's always better to share an experience than to live an experience on your own.

As we have already seen with Zoë, the environmental context of the walk plays a key role. Tina believes that living in a city facilitates a different type of walking. She would *"get in the car drive somewhere and then go from there" (Tina).*

Matthew too finds urban surroundings unpleasant. He attempts to drown out the noise of construction, for example, by listening to music while walking, thus allowing him to think more. There is a sense that the expectations for reflection are higher in natural than in urban settings. He has a clear preference for the countryside and while in the city he likes to isolate himself by listening to music:

Matthew: (...) otherwise you have all the noise of the cars going past you and general construction work or whatever, you know general interference from things around you that you don't generally want to hear. If you are listening to music than it's your preference, its what you want to hear.

I: That's interesting; tell me a bit more about that.

Matthew: When I walk generally I am thinking. I have got cars and everything going past me like, it's annoying. It's not a noise that I find comfortable or pleasurable in any way. Its city life, I like

the countryside. I suppose I like nature. So if I can't have that in the middle of the city then I will listen to music and try and isolate myself that way.

(iii) Psychological benefits

Research suggests that exercise is good for mental health, helping to reduce anxiety, improve physical self perception and global self esteem and enhance mood states (Fox, 1999). Is walking seen as also having these benefits?

An aspect of walking that Steve enjoys is the *"slower pace".* This allows him to appreciate the details in the scenery around him, while taking a mental break. Similarly, for Peter, walking is a chance to relax. He utilises walking as a method of reflection, thus allowing him to work through issues from the day.

Peter (457-461): And that's probably why I love walking, whether that's thinking to solve a problem, or just thinking or just reflecting on what's happened in work, what's happening in my private life, what's happening socially. Sometimes I am just day-dreaming, which is really fun (Laughs).

Where, after Merleau-Ponty (1962) and Burr (1999), we might have expected our participants to communicate a something of the 'embodied knowing' acquired through walking (a walker's sense of being-in-the-world), instead we have walking constituted as an experience which takes one *out* of the world, and into an inner realm. Tina, for example, also utilises walking as a method of relaxation. It allows her mind to wander. She sees walking as "a good thing" to do during times of high stress.

Tina: No. I use walking and to some extent going for a gentle run as forms of therapy when needed. Like for example, when I was at Cardiff and I was doing exams and I had to revise all day because I was doing an exam. It was important for me to do well but I couldn't concentrate for 12 hours. So I would allow myself an hour for my relaxation. I would go out and have a walk around the lake or go for a run around the lake rather than watch TV for an hour. So I have always used it for relaxation. (…) It allows my mind to wander. If I am still thinking about work then I am still thinking about work. If I am thinking about other things, then I am thinking about other things. If I'm sitting in front of the TV, I feel guilty because I am sitting in front of the TV and I am doing nothing. Whereas if I am going for a walk, than that's going for a walk. Even if my mind is not doing anything that is productive, then that's fine.

I: You can allow yourself that?

Tina: Yeah, I can allow myself that. So when I have employed walking or running as relaxation in times of high pressure or high stress, that's when I find it, I don't know, it's a "good thing to do". Rather than a "bad thing to do" like watching TV.

For these participants, walking is understood to have therapeutic effects: it offers a respite. These therapeutic effects are seen in the context of peoples' lives, and as embodied interactions between themselves, and the world. It can enable people to feel soothed, calmed and refreshed.

Perceived lack of time as a barrier

"Time", or more appropriately "a lack of time", was a common recurring theme for participants when describing their beliefs about walking. Given that a lack of time is often cited by many participants as a reason to not participate in many positive lifestyle behaviours (Darker, et al, 2007), it is an important underlying feature of physical activity to understand. It

penetrated many aspects of walking for the participants, such as their overall attitude towards walking and consideration of walking as a means of transportation in certain instances.

Alex believes that walking is not an efficient form of transport compared to others. Like many of our participants, Alex perceives himself as leading a very busy life. However he is willing to dedicate about 10-15 minutes of walking to get from A to B.

Alex: I think the time it takes, compared to a more efficient form of transport. I and we live such busy lives that we can't just give our time over to half an hours walk, just to get from A to B. So it is more of a choice of efficiency and time wise it is not the most efficient way of getting places. Unfortunately.

I: Would be the amount of time that you would dedicate from getting A to B by walking?

Alex: Ten or fifteen minutes.

In the following extracts from Samantha's interview we can see the intricacies of thought that surround the "time" factor. Samantha begins by saying that "*anything up to half an hour would be okay"* as an amount of time dedicated to get to a destination. She recollected a walk that took 45 minutes and that *"was a lot. It was sort of annoying that it like took so long. You know that you have lost that time out of your day" (Samantha).*

However, when recalling a particular episode of walking Samantha remembers that it took three hours to walk up Snowden in Wales. Time in this case is not seen as a barrier when enjoying the walk. Instead this episode was viewed as a challenge, there is a sense of pride in her words.

Samantha: Yeah and I think it probably took us about. Ehm? Two and a half, three hours to walk up? (…) Walking down because it was down hill all the time and my shoes were starting to rub, in fact I think that I still have the bruises on my little toe from it. But all in all it was really pleasurable, the views from the top were amazing. And we were just glad that we did it, I felt like we had overcome a challenge. And also afterwards I was really pleased because I didn't ache as much as I thought I would. (Laughs)

Samantha was drawn on this seemingly conflicting opinion towards time, and walking considerations. She teases out her opinion of the two episodes of walking: the urban episode and one that took place on Snowdon in Wales. She views these two episodes of walking as being fundamentally different. The urban episode of 45 minutes duration was negative because at its root core was the function of walking for transport, whereas Snowden was an episode encompassing leisure walking. Thus the negative feelings were a result of this fundamental distinction and not necessarily the time element.

Samantha): Coz you are walking for very different reasons. Walking back from Edgbaston was for transport, where walking up Snowden was for leisure.

For Peter a perceived lack of time will determine whether he uses walking as his means of transport. He feels that the mode of transport is not *"intrinsic to the decision" (Peter),* but time will be the deciding factor. Peter recognises that this perceived lack of time is down to poor time management on his part.

Peter: Probably the one down side which I'm guilty of is perhaps sometimes, the time barrier. Sometimes maybe I don't enjoy it although I make it a habit and I know that its good for my day,

say I had been lazy and had a lie-in and I should have been at work earlier then I wish I could be there in the next 5 minutes when its going to take me half and hour to get there (...) it's more probably the fact that it's my fault because I haven't planned the walking in.

Peter in a summation of his overall attitude towards elements of walking surmises the issue of time constraints.

Peter: If I was to sum it up, if I plan walking then that's fantastic, if its spontaneous, then its something I most enjoy. And walking that has time constraints, that isn't so enjoyable.

Discussion

Our participants understood walking through comparison with, and opposition to, an implicit framework of 'exercise'. Walking was, on the whole, contrasted with the intensity, purposefulness, and cardiovascular benefits of more vigorous physical activity. Instead, walking was generally seen as a functional mode of transport. While it appeared to suffer from this comparison, we note that walking could potentially be promoted as a (healthy) form of resistance to the hegemony of 'exercise'. The contextual factors of social support and companionship were considered to be positive aspects of certain kinds of more purposeful walking by many of the participants. Everyday, functional, individual walking was also regarded as a sort of psychological respite, a pleasurable activity with positive benefits for wellbeing. These two aspects of walking experience are interesting because they appear to refer to different sorts of walking. They thus offer health professionals two parallel approaches to the promotion of walking. On the one hand, social, purposeful walking for the pleasure of shared experience; on the other, individual, functional walking for the positive psychological benefit of respite from the world.

These findings can be taken in light of current health promotion initiatives. Large scale community campaigns to promote physical activity have been conducted over the past three decades (Iverson, Fielding, Crow, & Christenson, 1985; King, 1994). The extent to which these campaigns have influenced physical activity remains debatable (Marcus, Owen, Forsyth, Cavill, & Fridinger, 1998). In a recent review of 15 mass media campaigns to influence community norms in relation to physical activity, it was found that the campaigns increased awareness of the issue of physical activity but failed to have a population level effect on actual behaviour (Cavill & Bauman, 2004). Campaigns tend to focus on the cardiovascular health benefits that are to be gained by an increase in physical activity. By contrast, the participants within this study did not view walking as a form of activity that could bring about any healthy benefits to the heart. There is a need to address this misconception within the public's mind. Also other types of reasons are cited by the participants about why they would walk, such as stress relief, fresh air, and scenery. These factors receive little or no consideration in health promotion campaigns, which tend to focus on the physical health benefits of taking participating in more active lifestyle.

To maximise the impact of promoting walking messages, there is a need to deal with this mismatch between campaign direction, and participants' beliefs. People engage in healthy behaviour for reasons other than to be healthy. Within exercise literature, it has been demonstrated that people are motivated to intend to exercise because they enjoy elements of it not because they think that it is "good for them" (Eves, Hoppe, & McLaren, 2003; French et al., 2005; Lowe, Eves, & Carroll, 2002). Similar findings apply in relation to walking behaviour (Darker, et al., 2007). Therefore, potential new avenue for campaigns could be to

focus on the elements that people enjoy about walking. Here, those elements would appear to be shared experience, and psychological respite.

The participants generally claimed that walking was not a goal in itself. One of the primary ways the participants understood walking was as a mode of transport. Urban planning and transport agencies have developed policies and strategies that have the potential to influence whether people walk in their neighbourhood. Current society is increasingly structured to support motoring and discourage walking (Freund & Martin, 2004). Considerations of the efficiency of walking as a form of transport, reflecting the distance to the destination, were raised by participants in the current study. This is similar to the findings of Pikora, Giles-Corti, Bull, Jamrozik and, Donovan (2003) whereby a framework was developed for assessment of the environmental determinants of walking such as functional, safety, aesthetic and destination considerations of walking. The functional feature of their framework concentrated on features such as the physical attributes of the street and path within the local environment. The current study also highlights key elements such as efficiency and distance for some participants when considering walking as a mode of transport.

These findings emphasise how the benefits of physical activity depend not only on the individual's understanding, and beliefs about the activity itself, but also on the social context in which the activity takes place. Ryave and Schenkein (1974) have suggested that walking with another person is an art form in itself. The on-going production of walking with another person involves at least maintaining spatial proximity to one another in some recognisable pattern. The very fact of either walking alone or walking with another person can provide

people with both a constraint and a resource. Broadening the concept of walking within a social context, social support and social relationships are key aspects of a persons life circumstances, major influences on health and well-being and important factors in the development and maintenance of active living (Weyerer & Kupfer, 1994). A review of relationships between active living and determinants of health (Frankish, Milligan, & Reid, 1998) found that despite the connection between social support and participation in vigorous exercise, few people are encouraged by others to be active. Darker, et al, (2007) also found that most people cited few people in their lives who would approve of them walking for just 30 minutes a day. By contrast, participants in the present study found social companionship to be not only a consideration in their walking but also a facilitative factor.

Alongside possible physical benefits, walking may also contribute to psychological well being. Psychological benefits may derive from the physical activity itself, from the outdoor environment in which the walking takes place and from the social experience of walking with another person or peoples. It is likely that multiple mechanisms could be effective in any one situation. The importance of any one mechanism will be determined by the walking characteristics such as intensity and duration, characteristics of the individual and environmental factors surrounding the walk.

Any lasting change in behaviour can only be achieved if the barriers to conducting that behaviour are also tackled. The participants in this study cited a lack of time as being the main barrier to their walking. Time has been conceptualised previously as purely an environmental characteristic associated with physical activity (Sherwood & Jeffery, 2000). Time constraints are the most frequent barriers to exercise, reported by both sedentary and active individuals

(Dishman, Sallis, & Orenstein, 1985; King, Taylor, & Haskell, 1990). However, for participants within the current study the perception of time permeated their overall attitude towards walking above and beyond ecological considerations. There is a requirement to ascertain whether there is a realistic deficit in the number of hours in a persons day to dedicate just 30 minutes to attaining the required amount of physical activity to garner a health benefit, or if this is a "perceived" lack of time. Self-monitoring tools such as a diary, or log book have been utilised within a dietary context to increase conscious awareness while conducting behaviours (Porzelius, Houston, Smith, & Arfken, 1995; Smith, Sondhaus, & Porzelius, 1995). This method of "mindful behaviour" could be utilised within a time management context to aid participants how best to allocate their time to include the recommended duration of daily physical activity.

It is of interest to note that the participants spoke about episodes of walking that were more extreme in nature or had a challenging aspect. Walking was rarely spoken about as a routine activity unless the participants were prompted to do so. This has a potential application to health promotion in that the episodes participants find the most salient, and can recall with ease are the more unusual and not the mundane. This characteristic of individuals' recall may need to be considered when contemplating the overall schematic conceptualisation of a walking campaign. This however maybe an artefact of the interview schedule, and would need to be further investigated in future research.

The findings reported here were based on an interpretative analysis of interviews with a small number of participants. It is not the aim of IPA to achieve a representative sample in terms of either population or probability. Statistical representativeness is not a prime

requirement when the objective is to understand social processes (Mays & Pope, 1995). However, future research should aim to establish whether the concerns and issues identified here apply more generally to a wider selection of members of the general public and could use this current study to provide guidance to further research in the area of physical activity.

To summarise, campaigns that aim to promote walking for people, should focus more on and include the experiences of psychological benefits from walking itself, engaging people through walking for transport reasons and the social setting of the activity. Perceived barriers to walking must also be dealt with in order to facilitate long-term behaviour change. There is a continuing need to understand these alternative determinants found in the current study of physical activity in order to develop appropriate intervention strategies to encourage people to be more physically active.

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Appendix

Can you tell me about the types of physical activities that you do?

You mentioned walking, can tell me a little more about the walking that you do?

i.e. That's great that you do so many activities, how do you find for example walking?

How often would you walk?

Would you always need to have a destination or do you just "go for a walk"?

Can you tell me about an episode where you were walking that really sticks out in your mind?

What made you choose that one? What is it about it that allows you to recall it with ease?

What is it about walking that you enjoy so much? Is there anything that you do not like about it?

What is it about walking that you dislike so much? Are there any positives?

Have you ever promoted walking to others?

Do you think that walking can help with mood/weight control/health?

When you walk, do you go alone?

What do you think about when you go for a walk?

How much do you think of your own physical health?

Has there ever been a time when you felt like you could not go walking?

Have there been instances whereby you felt like you did not want to walk?

What types of things would help to promote people to walk more?

CHAPTER 3

Are beliefs elicited biased by question order? A Theory of planned behaviour belief elicitation study about walking in the UK general population.

Abstract

Objectives: To elicit salient beliefs about walking for an average of 30 minutes per day, with the aims of investigating whether the order of theory of planned behaviour (TPB) belief elicitation questions affects the number and types of beliefs elicited and whether affective and instrumental questions elicit different beliefs. Design: A 3x2x2x2 mixed factorial design was employed, with order of behavioural, normative and control questions, and affective and instrumental questions as between-subjects variables and affective/ instrumental and positive/ negative questions as within-subjects variables. Method: Quota sampling with regards to age and gender (N=180) was employed to obtain a sample that was broadly representative of the adult general population. Results: The order in which behavioural, normative and control beliefs were asked had little impact on the number or type of beliefs elicited. The affective/instrumental attitude distinction was supported. Few differences were apparent between older and younger respondents and between men and women. Conclusion: TPB belief elicitation studies are not biased by order effects. Interventions to promote walking should consider targeting affective beliefs, e.g. stress relief, in addition to beliefs about health, which is the traditional focus of health campaigns. Given the similarities in beliefs across demographic groups, "one size fits all" interventions to promote walking are appropriate.

Keywords: belief elicitation, theory of planned behaviour, affective and instrumental items, general population.

There is substantial evidence that physical inactivity is associated with several chronic diseases and premature mortality (Blair & Brodney, 1999; Booth, Gordon, Carlson & Hamilton, 2000; Katzmarzyk, Gledhill & Shepard, 2000). There is also an extensive literature indicating that physical activity is effective in preventing against cardiovascular disease, obesity, stroke, hypertension, type 2 diabetes, colon cancer, breast cancer, osteoporosis and several psychological disorders (Blair & Brodney, 1999; Bouchard & Shepard, 1994). The prevalence of obesity in Britain has doubled in the past decade and sedentary lifestyles are at least as important as diet in its aetiology and possibly represent the dominant factor (Prentice & Jebb, 1995). The British Heart Foundation (2001) recommends that individuals engage in at least thirty minutes of moderate exercise, such as brisk walking or cycling for at least five days each week, to gain health protective benefits. The majority of adults do not meet these minimum recommended levels of physical activity. In England and Wales, 60% of males and 70% of females do not undertake enough physical activity to benefit their health (Department of Health, 1999). Thus, there is an urgent need to understand the determinants of physical activity in order to develop appropriate intervention strategies.

Walking is the most common form of physical activity among the general population (Siegel, Brackbill & Heath, 1995). It is especially promising as a focus of public health interventions because of its acceptability and accessibility, particularly among populations who are the most physically inactive (Morris & Hardman, 1997). Walking, for an average of at least thirty minutes a day, was therefore chosen as the physical activity which would be the focus of this study.

One leading psychological model explaining motivational influences on behaviour is the Theory of Planned Behaviour (TPB) (Ajzen, 1985; 1988; 1991). The TPB suggests that the proximal determinants of volitional behaviour are a persons' intention to engage in that behaviour and perceived behavioural control (PBC), i.e., the extent to which a person feels that the behaviour is easy to perform and/or under their control. In turn, intentions are determined by Attitude towards the behaviour, Subjective Norm, (SN) i.e., the perceived views of important others, and PBC.

The basis of Attitude, SN and PBC are posited to be behavioural, normative and control beliefs. Attitude is determined by both behavioural beliefs i.e., the perceived consequences of engaging in that behaviour, and the evaluation of these consequences (Ajzen & Fishbein, 1980). Subjective norms are determined by normative beliefs i.e., perceptions of whether important others think a person should or should not engage in a behaviour, and by a persons motivation to comply with the perceived wishes of these important others (Ajzen & Fishbein, 1980). Perceived behavioural control is determined by control beliefs, i.e., factors or conditions that make it difficult or easy to perform the behaviour, and by the perceived power of these factors or conditions to facilitate or inhibit the behaviour (Ajzen, 1991).

Meta-analytic reviews of the TPB have provided empirical support in terms of its capacity to predict many health behaviours (Armitage & Conner, 2001; Godin & Kok, 1996) including physical activity (Hagger, Chatzisarantis & Biddle, 2002; Hausenblas, Carron & Mack, 1997). Support for the TPB in the exercise domain is robust, ranging from young adults (e.g., Courneya, Bobick & Schinke, 1999) to ill populations such as cancer patients (e.g., Courneya & Friedenreich, 1999).

Despite a good deal of research applying the TPB to physical activity most studies have investigated general categories of physical activity such as “exercise” or “vigorous physical activity” (Hagger, et al, 2002). However, there has been little research examining specific behaviours such as walking. Ajzen & Fishbein (1980) stress that that both behavioural categories and specific behaviours can be well predicted if the measures of predictive variables and outcome variables of intention and behaviour are correspondent with one another. This is important as the predictors of specific and omnibus behaviours are likely to be different. An examination of aerobic versus resistance exercise provided empirical evidence to support this view, whereby differences in the predictive validity of the model constructs were found for these different forms of physical activity (Bryan & Rocheleau, 2002).

When utilising the TPB, Ajzen and Fishbein (1980) recommend conducting a belief elicitation study with each new target behaviour and new population of interest. Identifying the relative contribution of the beliefs across TPB and physical activity studies with different populations is important because it demonstrates that variability exists in people’s beliefs towards physical activity. For example, the normative belief-subjective norm association was smaller ($r = 0.37$) in a study of cancer patients (Courneya & Friedenreich, 1997) compared to a study of fitness participants ($r = 0.60$; Deyo, 1984). In the present study, the UK adult population was chosen as the target population of interest. Ajzen & Fishbein (1980) suggest that demographic variables such as age and gender can have an effect on behaviour only indirectly – “that is, external variable will be related to behaviour only if they are related to one or more of the variables specified by our theory”, (p.82, Ajzen & Fishbein, 1980). It is

important to differentiate between age and gender when examining the general population, as age and gender can be important determinants of beliefs about physical activity. For example, a young male student's beliefs about the perceived barriers to walking may be different from those of a middle aged female with a full time career and a young family.

In spite of the importance of the elicitation phase of TPB studies, it is often neglected by researchers. Whereas the Hagger et al (2002) review identified 72 studies, a more recent review identified only 47 instances where salient beliefs about physical activity were elicited in the context of the TPB (Symons Downs & Hausenblas, 2005). The modal set of salient behavioural, normative and control beliefs for a population can be identified by asking a sample defined open-ended questions to which they provide the responses. The TPB stipulates that the salient beliefs of an individual are the ultimate psychological determinants of behaviour operating through TPB constructs. Therefore, if beliefs can be successfully experimentally manipulated, attitude change and consequent behavioural change can occur (Sutton, 2002).

To our knowledge, open-ended questions to elicit salient beliefs in the TPB have always been asked in the same order: behavioural beliefs followed by normative beliefs followed by control beliefs. This may have led to distortions in the observed patterns of beliefs obtained. It is entirely possible that if control beliefs were elicited first, that this may in turn affect the amount and types of beliefs elicited. For instance, it is commonly observed that more behavioural beliefs are elicited than control and normative beliefs (e.g. Sutton, et al, 2003). This may be due to a "real" difference in the number of each type of salient belief. Alternatively, it may be due to respondent fatigue or an artefact of respondents not wishing to

repeat themselves by giving the same answers that they provided to earlier questions (Grice, 1975). These order effects may be particularly strong depending on whether control beliefs are elicited before or after behavioural beliefs. There are both conceptual and empirical grounds for believing that attitude and pbc overlap (Kraft, Rise, Sutton, Roysamb, 2005; Leach, Hennesy & Fishebin, 2001; Trafimow & Duran, 1998).

The earliest set of recommendations on how to elicit salient behavioural beliefs was to ask respondents what they viewed as being the "advantages" and "disadvantages" of that behaviour (Ajzen & Fishbein, 1980). This was later revised to also include questions about what they would "like or enjoy" and "dislike or hate" (Ajzen, 2002). This was in response to research based on the work of Rosenberg (1956), identifying distinct concepts of "hot" (affectively) based and "cold" (instrumentally) based attitudes which has been supported in TPB research (Ajzen, 1991; Ajzen & Driver, 1991; Conner & Armitage, 1998). Further, this two-component attitude structure is supported across multiple attitude measurements and conceptualisations in research beyond the confines of the TPB (e.g., Crites, Fabrigar & Petty, 1994; Olson & Zanna, 1993). This research has argued for the distinction of components based on factor analysis in traditional correlational designs (e.g., Crites, et al., 1994). Moreover, some research has also demonstrated that affective and instrumental attitudes can be differentiability manipulated using experimental designs (e.g., Edwards, 1990; Edwards & Von Hippel, 1995).

Many researchers now view attitudes towards a behaviour as being composed of affective (e.g. enjoyable/unenjoyable) and instrumental (e.g., beneficial/harmful) evaluations of that behaviour (e.g. Manstead & Parker, 1995). For example, a liking for physical activity

can be contrasted with its potential for improving the participant's health. It appears that affective rather than instrumental components of attitude (French, et al, in press) are usually the major predictors of intention to exercise (Ajzen & Driver, 1992; Eves, Hoppé & McLaren, 2003; Godin, 1987; Lowe, Eves & Carroll, 2002). Sutton, et al, (2003) found that using different wordings for the open-ended questions in an elicitation study may result in different kinds of beliefs being elicited. This research has mainly examined the instrumental and affective distinction in relation to forms of physical activity that are engaged in for recreational purposes e.g., team sports. It has not been investigated yet whether this distinction applies to walking behaviour.

In the present paper we report the first study which elicits salient beliefs about walking for at least an average of thirty minutes a day. We employ a sample which is broadly representative, by age and gender, of the UK adult population. The present study has the following specific aims:

1) To ascertain whether varying the order of the constructs within the TPB influences the number and types of beliefs that were elicited during the open-ended format of the questionnaire.
2) To investigate whether different salient behavioural beliefs about walking are elicited by questions designed to assess instrumental and affective beliefs.
3) To examine the effects of age and gender on the number and types of behavioural, normative and control beliefs that were elicited.

Method

Participants

The sample comprised 180 members of the public accessed within a central train station in a large city in the Midlands of England. Quota sampling was employed with respect to age and gender, with the aim of providing a broadly representative sample of an adult British population. Of the 180 questionnaires 51.7 % were completed by males and 46.1% were completed by females. The remaining 2.2 % of respondents were unable or unwilling to complete the questionnaires and therefore were excluded from analyses, giving a final sample of 176 adults. Of the 255 people approached, 75 people refused to participate in the study, resulting in a response rate of 70%. Quotas were fulfilled for five age categories; 18-24yrs (37 people); 25-34yrs (39 people); 35-44yrs (33 people); 45-54yrs (35 people) and 55+ yrs (32 people). Participant's ages ranged from eighteen to seven-six years (mean 39.27yrs, sd 14.70). The breakdown by ethnicity was: White 76.1 %; Black Caribbean 2.8 %; Black African 7.8 %; Black other 1.1 %; Indian 5 %; Pakistani 1.1 %; Chinese 1.1 %; other Asian 1.7 %; other group 1.1 %. The breakdown by marital status was: married 42.2 %; single 43.9 %; widowed 2.2 %; divorced 6.7 %; separated 2.8 %.

Design

A 3x2x2x2 mixed factorial design was employed. Each participant received one of three versions of the questionnaire which differed in terms of the order of questions concerning behavioural, control and normative beliefs (between-subjects variable; see Appendix for an example of the questionnaires). The orders were: (1) behavioural beliefs (bb), normative beliefs (nb), control beliefs (cb); (2) nb, bb, cb and (3) cb, nb, bb. All participants completed the affective and instrumental questions within the behavioural beliefs

questions (within-subjects variable), and the order was counterbalanced (between-subjects variable). All participants responded to both positive and negative questions (within-subjects variable) about behavioural, normative and control beliefs. There was no evidence of order effects according to whether questions about instrumental or affective behavioural beliefs, were asked first. We therefore collapsed responses to this question into a general behavioural belief category. So the final design which we report analysis on is a 3x2x2 mixed factorial design.

Procedure

The study was conducted in January 2005. The participants were approached by the researchers within the train station and asked whether they would participate in a study on "peoples' attitudes towards walking". Informed written consent was received from the participants before they started the questionnaire. The participants completed the questionnaire in the train station with the researchers present. In addition to demographic information, participants responded to standard TPB open-ended questions to elicit their salient beliefs about walking behaviour. They were also given an information sheet to take away with them, detailing more information about the study.

Materials and coding

Walking was defined as "walking for exercise, transportation or any other purpose". Within each of the open-ended questions, the participants were prompted to respond to walking for "at least thirty minutes on average a day over the next 7 days" when considering their answer. Questions about the "advantages" and "disadvantages" of walking and normative questions were based on those recommended by Ajzen and Fishbein (1980). The

"like or enjoy" and "dislike or hate" questions and the control questions were based on those used by Ajzen and Driver (1991). Each question was followed by blank lines in which the participants recorded their responses.

The first twenty-one questionnaires completed were used to develop the coding frames. The same frame was used for the "like or enjoy" and "advantages" questions. Similarly, identical coding frames were used for "dislike or hate" and "disadvantages" and for the "approve" and "disapprove" questions. However, different coding frames were used for the "easy" and "difficult" questions. Using these frames the remaining 155 questionnaires were independently coded by three researchers. The values of Cohen's kappa ranged from 0.83 to 0.94 across all sections of the questionnaire

Analysis

A mixed factors ANOVA was conducted to evaluate the effects of type of questions concerning behavioural, normative, control beliefs and positive versus negative questions on the number of beliefs that were elicited.

Chi-square tests (χ^2) were used to investigate associations between categories of behavioural, control and normative beliefs, and both order of questions within the questionnaire and groups defined by age. A median split (38 years and under; 39 years and over) was utilised when investigating age differences within the sample in relation to beliefs that were elicited.

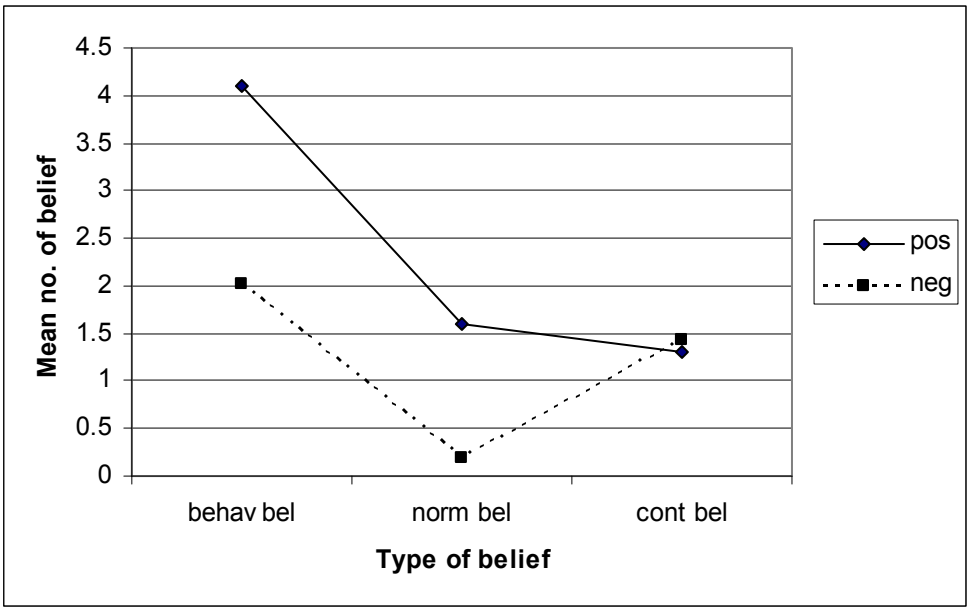
The test recommended by Newcombe & Altman (2000) was used to investigate differences in proportions of beliefs elicited in responses to the affective and instrumental questions for each category of beliefs.

Results

Total number of beliefs

The main effect of type of belief was significant [$F(2, 179)=413.84$, $p<0.001$]: there was a mean of 6.12 (sd 3.04) behavioural beliefs, 1.77 (sd 1.49) normative and 2.75 (sd 2.75) control beliefs elicited per person. The main effect of response to positive versus negative questions was significant [$F(1,179)=278.87$, $p<0.001$], with more positive than negative beliefs elicited. The interaction of type of belief and positive and negative responses was significant [$F(2,179)=153.21$, $p<0.001$]. A series of post-hoc 2x2 repeated measures ANOVAs was conducted to further test the exact nature of the observed effects.

Figure 1: Mean number of positive and negative beliefs in response to questions about behavioural, normative and control beliefs.



When comparing behavioural and normative beliefs, there was a main effect observed for type of belief [$F(1,179)=701.70$, $p<0.001$] and a main effect for positive versus negative responses [$F(1,179)=363.41$, $p<0.001$]. There was also an interaction effect observed between beliefs and positive and negative responses [$F(1,179)=19.43$, $p<0.001$]. This took the form that there were fewer positive normative beliefs than would be expected on the basis of the main effects alone.

When comparing behavioural beliefs and control beliefs, there was a main effect found for type of belief [$F(1,179)=413.84$, $p<0.001$] and a main effect found for positive and negative responses [$F(1,179)=129.88$, $p<0.001$]. There was an interaction effect observed

between these types of beliefs and positive and negative responses [F(1,179)=153.21, p<0.001] of the form that there were fewer positive control beliefs than would be expected on the basis of the main effects alone.

In the comparison of normative and control beliefs, there was a main effect observed for beliefs [F(1,179)=77.31, p<0.001] and a main effect observed for the positive and negative responses [F(1,179)=113.25, p<0.001]. There was an interaction effect observed between normative and control beliefs and the positive and negative responses to these beliefs [F(1,179)=166.33, p<0.001]. This interaction was of the form that there were more negative control beliefs than would be expected on the basis of the main effects alone.

Order effects for number of beliefs elicited

The analyses reported above were repeated with the addition of a between subjects factor reflecting order of constructs within the questionnaire. There was no significant main effect of questionnaire order on number of beliefs elicited [F(2, 177) =1.18, p=.31]. There were also no significant interactions between questionnaire order and category of belief [F(2,177)=.15, p=.86] and whether the responses were positive or negative [F(2, 177)=1.00, p=.37] on the number of beliefs elicited. The statistical significance of the other relationships described above was unaffected.

Order effects for categories of beliefs elicited

There were few differences found in the numbers of beliefs elicited within each category of positive behavioural beliefs, according to whether these questions preceded or

followed questions about control and normative beliefs (see Table 1). The exceptions to this were the "weight loss" and "fresh air/weather" categories.

Table 1: Number of reported positive behavioural beliefs (N=180) in relation to the order of behavioural, normative or control beliefs within the questionnaires.

Category	Behavioural Beliefs 1st Order 1: BB,NB,CB N=60	Normative Beliefs 1st Order 2: NB,BB,CB N=60	Control Beliefs 1st Order 3: CB,NB,BB N=60	x^2 (df=2)
Cardiovascular/ health benefits	37	37	33	.73
Fitness	27	20	25	1.80
Fresh air/weather	27	35	19	8.62**
Exercise	25	34	26	3.25
Weight loss	7	14	20	8.02**
Stress relief/ management	28	27	30	.31
Transport	13	6	12	3.35
Scenery	25	17	29	5.21
Miscellaneous	11	5	9	2.60
Nothing	8	7	12	1.83
Missing data	0	0	1	2.01

** = $p<0.01$

Similarly, whether negative behavioural beliefs questions preceded or followed questions about normative and control beliefs did not generally result in significantly different patterns of beliefs within each category (see Table 2). The exceptions to this were "inclement weather" and "boredom" beliefs.

Table 2: Number of reported negative behavioural beliefs (N=180) in relation to the order of behavioural, normative or control beliefs within the questionnaires.

Category	Behavioural Beliefs 1st Order 1: BB,NB,CB N=60	Normative Beliefs 1st Order 2: NB,BB,CB N=60	Control Beliefs 1st Order 3: CB,NB,BB N=60	x^2 (df=2)
Injury/illness	4	10	9	3.09
Inclement weather	36	33	20	9.64**
Boredom	1	4	8	6.13*
Time	23	16	23	2.41
Tiring	7	5	9	1.29
Unpleasant environments	16	10	15	1.95
Miscellaneous	6	6	11	2.49
Nothing	30	37	28	2.98
Missing data	0	0	1	2.01

* = $p<0.05$, ** = $p<0.01$

Responses to the "disapprove" and "easy" questions also produced few significantly different patterns of beliefs within each category dependent on questionnaire order. The exceptions to this were the "medical professionals", "friends" and "miscellaneous" categories for the positive normative beliefs (see Table 3) and the "illness/injury" category for the negative control beliefs (see Table 4).

Table 3: Number of reported normative (approve) beliefs (N=180) in relation to the order of the behavioural, normative or control beliefs within the questionnaire.

Category	Behavioural Beliefs 1st Order 1: BB,NB,CB N=60	Normative Beliefs 1st Order 2: NB,BB,CB N=60	Control Beliefs 1st Order 3: CB,NB,BB N=60	x^2 (df=2)
Medical professionals	30	26	16	7.22*
Community	15	15	10	1.60
Spouse/partner	12	7	11	1.68
Friends	7	4	14	7.33*
Family	21	27	29	2.36
Miscellaneous	1	1	6	6.54*
Nobody	7	6	13	3.86
Missing data	1	0	0	2.01

* = $p<0.05$

Table 4: Number of reported normative (disapprove) beliefs (N=180) in relation to the order of the behavioural, normative or control beliefs within the questionnaire.

Category	Behavioural Beliefs 1st Order 1: BB,NB,CB N=60	Normative Beliefs 1st Order 2: NB,BB,CB N=60	Control Beliefs 1st Order 2: CB,NB,BB N=60	X^2 Order 3:	x^2 (df=2)
Medical professionals	0	1	1	1.01	
Community	5	6	5	.13	
Spouse/partner	2	1	1	.51	
Friends	0	0	2	4.04	
Family	4	1	1	3.10	
Miscellaneous	0	0	0	0	
Nobody	49	51	52	.59	
Missing data	1	0	0	2.01	

Responses to the "disapprove" and "difficult" questions did not result in any significantly different patterns of beliefs dependent on the order in which the questions to elicit constructs were asked (see Tables 5 & 6).

Table 5: Number of reported control (difficult) beliefs (N=180) in relation to the order of the behavioural, normative or control beliefs within the questionnaire.

Category	Behavioural Beliefs 1st Order 1: BB,NB,CB N=60	Normative Beliefs 1st Order 2: NB,BB,CB N=60	Control Beliefs 1st Order 2: CB,NB,BB N=60	x^2 (df=2) Order 3:
Tiredness	2	2	2	0
Inclement weather	18	12	13	1.89
Injury/illness	12	9	24	11.20**
Work/family	19	16	16	.49
Motivation	4	3	5	.53
Time	24	15	17	3.47
Miscellaneous	12	4	8	4.61
Nothing	8	14	5	5.49
Missing data	1	0	2	2.03

** = $p<0.01$

Table 6: Number of reported control (easy) beliefs (N=180) in relation to the order of behavioural, normative or control beliefs within the questionnaire.

Category	Behavioural Beliefs 1st Order 1: BB,NB,CB N=60	Normative Beliefs 1st Order 2: NB,BB,CB N=60	Control Beliefs 1st Order 3: CB,NB,BB N=60	x^2 (df=2)
Work	13	12	9	.94
Time	17	19	15	.65
Friends	4	6	5	.43
Good weather	16	9	10	3.05
Environment	9	12	9	.72
Miscellaneous	9	13	12	.94
Nothing	5	6	10	2.26
Missing data	2	0	2	2.04

Beliefs elicited by instrumental versus affective questions

The beliefs elicited most often in response to questions about what people would like or enjoy and what people considered to be the advantages of walking for at least 30 minutes a day over the next seven days were “cardiovascular/ health benefits” and “exercise” (see Table 7). People responded more frequently with beliefs that were coded as “fresh air/weather”, “scenery” and “stress relief” to the question about what they would like or enjoy than to the question concerning advantages. By contrast responses that were coded as “cardiovascular/health benefit”, “weight loss”, “fitness” and “transport” were elicited more frequently in response to the question about what they thought were the advantages of walking.

Table 7: Coding frame for open-ended walking questions (n=180) for the "like or enjoy and advantages questions".

Category	Like or enjoy	Advantages	Significance
Cardiovascular/ health benefits	24 (13.3%)	97 (53.9%)	**
Exercise	45 (25%)	59 (32.8%)	
Stress relief	66 (36.7)	32 (17.7%)	**
Fresh air/weather	73 (40.6%)	14 (7.8%)	**
Fitness	20 (11.1%)	63 (40%)	**
Scenery	60 (33.3%)	18 (9.5%)	**
Weight loss	5 (2.8%)	39 (21.7%)	**
Transport	12 (6.7%)	26 (14.5%)	*
Miscellaneous	15 (8.4%)	9 (5%)	
Nothing	10 (5.6%)	4 (2.2%)	
Missing data	1 (0.6%)	0 (0%)	
Total no: beliefs	320	357	

Significance of difference in proportions: *= $p<0.05$ **=$p<0.01$

The most common responses to questions about what people would dislike or hate or considered to be the disadvantages of walking for at least 30 minutes a day over the next seven days, were "inclement weather" or "nothing", i.e., the participant did not produce any beliefs for that question (see Table 8). People responded more frequently with responses that were coded as "inclement weather", "unpleasant environments/ materials" and "boredom" to the question about what they would dislike or hate compared to the question about disadvantages. By contrast people responded more frequently to the disadvantages question with responses that were coded as (a lack of) "time". The question about disadvantages was more likely to not elicit any beliefs compared with the question about dislike or hate.

Table 8: Coding frame for open-ended walking questions (n=180) for the "dislike or hate and disadvantages questions".

Category	Dislike or hate	Disadvantages	Significance
Nothing	43 (23.9%)	75 (41.7%)	**
Inclement weather	76 (42.2%)	27 (15.1%)	**
Time	18 (10%)	55 (30.6%)	**
Unpleasant environment/materials	30 (16.6%)	14 (7.8%)	*
Injury/illness	10 (5.6%)	16 (8.9%)	
Tiring	8 (4.4%)	14 (7.8%)	
Miscellaneous	11 (6.2%)	10 (5.5%)	
Boredom	12 (6.7%)	1 (0.6%)	**
Missing data	1 (0.6%)	1 (0.6%)	
Total no: beliefs	165	137	

Significance of difference in proportions: * =$p<0.05$ ** =$p<0.01$

Demographic differences in beliefs elicited

The analyses reported above concerning the total numbers of beliefs elicited were replicated with the addition of (a) gender and (b) age as between subjects variables. For gender, there was no significant main effect on number of beliefs elicited [($F(1, 174) = 1.02$, $p=.31$]. There were also no significant interactions between gender and category of belief [$F(1,174)=.92$, $p=.33$] and whether the responses were positive or negative [$F(1, 174)=.02$, $p=.88$] on the number of beliefs elicited. There were no significant differences in any category of beliefs between groups defined by gender.

For groups defined by a median split on respondents' age, there was a significant main effect on number of beliefs elicited [($F(1,178) = 4.62$, $p<0.05$], with younger participants reporting more beliefs. There were no significant interactions between age and category of belief [$F(1,178)=1.91$, $p=.16$] and whether the responses were positive or negative [$F(1, 178)=.05$, $p=.82$] on the number of beliefs elicited.

There were few significant differences in categories of beliefs between groups defined by a median split on respondents' age. The older group (44) mentioned the positive behavioural belief "scenery" more frequently than the younger group (27) ($x^2 = 6.11$, df = 1, N = 180, p = 0.01) and the older group (2) mentioned the negative behavioural belief "boredom" less than the younger (10) group ($x^2 = 5.90$, df = 1, N=180, p = 0.04). The younger group (19) cited the positive normative category "friends" more than the older group (6) ($x^2 = 8.19$, df = 1, N = 180, p = 0.01). Younger people (46) also cited the positive normative category "family" more than the older group (31) ($x^2 = 5.70$, df = 1, N = 180, p = 0.01). The older group (30) cited the control belief of "injury/illness" more than the younger group (15) in response to questions concerning what would make it difficult ($x^2 = 6.23$, df = 1, N=180, p = 0.01).

Discussion

Our sample of adult participants yielded an average of eleven salient beliefs about walking for at least an average of 30 minutes a day over the next seven days. The most common positive behavioural beliefs that were elicited concerned cardiovascular/health benefits, exercise, stress relief, fresh air/weather, fitness and scenery. The most common negative behavioural beliefs elicited concerned inclement weather and time. The affective/instrumental attitude distinction was upheld for this behaviour: questions about affective aspects of walking (like or enjoy/ dislike or hate) elicited different patterns of beliefs than questions about instrumental aspects (advantages/disadvantages). We found little evidence that the order of questions to elicit the standard TPB constructs of behavioural, normative and control beliefs affected the number and type of beliefs elicited. There were few

differences between the number and type of beliefs elicited according to respondents' age or gender.

Beliefs elicitation studies

A recent review by Symons-Downs & Hausenblas (2005) of the use of belief elicitation studies in TPB research into physical activity identified 47 studies conducted over a 22 year period. The present study elicited the beliefs of more participants than any study included in this review. In addition, to our knowledge there have been no previous belief elicitation studies investigating walking. There is a puzzling lack of a belief elicitation phase with many TPB studies that aim to understand and explain physical activity (Hagger, et al, 2002). These salient beliefs are held to underlie overall attitude, subjective norm and PBC towards the behaviour in question (Ajzen & Fishbein, 1980). Identifying people's behavioural beliefs is an important step in determining the factors that may promote or restrict changes in those constructs that determine intentions to be more physically active. For instance, there is a wealth of evidence that attitude towards physical activity strongly predicts intention to be more physically active (Hagger, et al, 2002). According to Sutton (2002) attitudinal change requires the beliefs underlying attitude to be altered. For health promotion messages to encourage positive beliefs about walking and discourage negative beliefs for not walking, it is essential to first identify the most common beliefs within the general population. The present study has achieved this by virtue of employing a sample which is broadly representative of the UK adult population and which is sizeable for this type of study.

In the Symons Downs and Hausenblas (2005) review the most salient behavioural, normative and control beliefs were that exercise improves physical and psychological health,

family members have the strongest normative influence on exercise and physical limitations obstruct exercise, respectively. Consistent with conclusions from previous studies on physical activity (e.g., Collette, Godin, Bradet & Gionet, 1995; Terry & O'Leary, 1995), the most salient perceived advantage of walking in the present study is that it improves peoples' physical and psychological health. Within the Symons Downs & Hausenblas (2005) review the most common disadvantages were experiencing health problems such as pain, soreness and illness. By contrast, the most common disadvantages within the present study were inclement weather or the participants stated having no negative beliefs in relation to walking for 30 minutes a day on average over the next seven days. These differing beliefs highlights the importance of conducting a belief elicitation study, as people have different salient beliefs about different types of physical activity, in line with Ajzen and Driver (1991).

Order effects

In the present TPB belief elicitation study, we examined whether the order of the questions have an effect on the types or numbers of beliefs that are elicited. An ongoing debate within questionnaire research concerns the extent to which questionnaires are neutral measurement instruments or are reactive, altering beliefs they are intended to assess (see Johnston, French, Bonetti & Johnston, 2004). The particular issue of whether responding to questionnaire items based on social cognition models such as the TPB creates cognitions rather than measuring existing ones was recently debated by Ogden (2003) and Ajzen & Fishbein (2004). For example, Budd (1987) found that traditionally structured Theory of Reasoned Action (Ajzen & Fishbein, 1980) questionnaires produced considerably stronger correlations between components than questionnaires which presented the same items in a random order.

In response to these issues raised by Ogden (2003) Ajzen & Fishbein (2004) emphasise that behavioural, normative and control beliefs should be elicited in a free response format (Ajzen. 1991; Ajzen & Fishbein, 1980). They state that if this procedure is followed, it minimises the possibility that the assessment itself will create or change the cognitions of interest. In the present study, the salient beliefs of the participants were elicited in a free response format as suggested. Our findings indicated that the order of questions to elicit the standard TPB constructs of behavioural belief, normative and control beliefs do not have much effect on the number and type of beliefs elicited. These findings are similar to those of Armitage & Conner (1999) who found that questionnaire format has only a small impact on the relationships between components of the TPB assessed using closed items. They suggest that the potential problems outlined by Ogden (2003) are not applicable to TPB belief elicitation studies, although it is still not clear whether participants are retrieving existing salient beliefs as Ajzen & Fishbein (2004) suggest or are generating new ones. These two hypotheses still need to be tested and the results presented here need to be replicated with other behaviours and using closed measures of beliefs.

Further, the results of the present study show that the small differences produced by the ordering of the belief questions on beliefs elicited would have no, or negligible, effects on the modally salient set of beliefs that should be included in a "full" TPB study questionnaire (for further discussion see Sutton, et al, 2003).

Although the number of responses to most categories of behavioural, normative and control beliefs was not affected by the order in which the questions were asked, there were

some discrepancies. There were some minimal effects observed within the belief categories. Responses to the positive behavioural beliefs questions saw effects within the "weight loss" and "transport" categories. The negative behavioural beliefs saw exceptions in the "injury/illness", "inclement weather" and "boredom" categories. The location of the normative belief questions within the questionnaire, showed effects within "medical professionals", "friends" and "miscellaneous" approve thematic categories and "friends" within the disapprove category. Responses to the difficult questions within the control belief section effected only the "injury/illness" and "nothing" items. The most parsimonious explanation is that these are chance findings due to multiple comparisons; approximately 50 tests yielded 10 significant results.

The largest order effect in the present study was that 24/60 participants who first responded to control belief questions cited "injury/illness", compared with 21/120 participants who had previously responded to behavioural belief questions. Given that 23 participants mentioned "injury/illness" as a negative behavioural belief these participants may have been reluctant to repeat this belief in response to questions about control. This explanation is congruent with the "maxim of quantity and relation" (Grice, 1975). The maxim of quantity discourages the reiteration of information that has already been provided earlier, whereby, the maxim of relation enjoins the speaker to make their contribution relevant to the aims of the ongoing conversation. These maxims would predict that, for example, "injury/illness" should be cited less in response to the control questions by those people who also cited this category in response to the behavioural belief questions, then by those who did not. However, the reverse was found; "injury/illness" was cited more in response to the control questions by those who had already cited it. The correct explanation for these order effects seems to be

simply that beliefs elicited by certain questions (e.g. behavioural beliefs) remains salient and are also cited in response to other questions (e.g. control beliefs).

Future examination of participants' cognitions when completing a TPB questionnaire is necessary to further understand the underlying processes of how people approach the task of completing them. A think-aloud protocol analysis (Ericsson & Simon, 1993) is a dominant method in usability testing (van den Haak, de Jong & Schellens, 2003). It would be prudent to investigate people's beliefs about walking behaviour elicited by TPB questionnaires using this method. This method would also allow a test of the hypotheses that these order effects can be explained by beliefs elicited by some questions remaining salient or by Grice's (1975) maxims.

Affective/ instrumental distinction

Behavioural beliefs are thought to be the basis of attitudes (Ajzen & Fishbein, 1980). The distinction between affective and instrumental components of attitudes has received empirical support for many behaviours (Manstead & Parker, 1995; Breckler, 1984; Trafimow & Sheeran, 1998) including physical activity in general (French, et al, in press; Lowe, Eves & Carroll, 2002; Eves, Hoppe & McClaren, 2003). Within the current study we found support for the idea that the affective and instrumental attitudinal distinction also applies in relation to walking behaviour. With regards to positive behavioural beliefs, people responded more frequently with responses that were coded as "fresh air/ weather" and "scenery" to the questions about what they would like or enjoy (affective) than to the question concerning advantages (instrumental). By contrast, responses that were coded as "cardiovascular/ health benefit", "weight loss" and "fitness" were elicited more frequently in response to the question

about what they would consider to be the advantages of walking. With regards to negative behavioural beliefs, people responded more frequently with factors such as “inclement weather” and “unpleasant environments/ materials” to the questions about what they would dislike or hate compared to the question about the disadvantages of walking. By contrast people responded more frequently to the disadvantages question with responses that were coded as (a lack of) “time”.

In line with previous research (e.g. Sutton, et al., 2003) the above findings suggest that the recommendations of Ajzen and Fishbein (1980) for conducting belief elicitation studies do not sufficiently elicit affective behavioural beliefs about physical activity. In recognition of this insufficiency Ajzen (2002) recently amended this advice to include affective “like or enjoy” and “dislike or hate” questions when eliciting behavioural beliefs in relation to the target behaviour in addition to questions about “advantages” and “disadvantages”. The findings of the present study indicate that it is essential for the affective and instrumental distinction to be considered in future studies on physical activity behaviour. However, these recommendations have not been put into practice by researchers who have recently applied the TPB methodology in the area of physical activity. Symons Downs and Hausenblas (2005) found that 85% of the 47 studies reviewed elicited salient behavioural beliefs but only the instrumental attitudes were examined and the affective elements were not considered at all.

In the present study, we have demonstrated that questions designed to elicit instrumental and affective beliefs about walking do indeed elicit different categories of beliefs. It has not yet been established whether this distinction would be supported in relation to direct measures of attitude nor whether instrumental and affective attitudes would be

differentially predictive of intention to walk for 30 minutes a day. Future research should consider these issues.

Implications

Two of the most prevalent behavioural beliefs that were cited by the participants were cardiovascular/ health benefits and exercise. This particular type of health benefit is routinely promoted by organisations such as the British Heart Foundation (2001). The rationale for these types of campaigns appears to be based on the traditional biomedical model (Engel, 1977) which focuses on physiological determinants of health to the exclusion of social and psychological factors. Traditional campaigns, based on this model, may explain why these beliefs are most salient in peoples' minds when asked about physical activity. However, other types of behavioural beliefs were cited by the participants, such as stress relief, fresh air and scenery. These factors receive little or no consideration in health promotion campaigns, which may fall into the trap of trying to promote a health-related behaviour such as walking by emphasising only the health benefits instead of including other potential benefits e.g., enjoying fresh air and scenery. People engage in healthy behaviour for reasons other than to be healthy.

It is also important that relatively few negative behavioural beliefs were cited by participants when asked to consider walking for 30 minutes a day over the next seven days. Where negative beliefs were raised, it was factors such as a lack of time and inclement weather which came foremost to the individuals mind. It is important to note that this study was conducted in January, which might explain why "inclement weather" was a popular response. Relative to other forms of physical activity there do not appear to be many negative

behavioural beliefs to be overcome in promoting walking in an adult population (Symons Downs & Hausenblas, 2005).

In terms of normative beliefs, only half the participants stated that their own families would approve of them walking for 30 minutes a day and only around 15% of participants stated that friends and partners would approve. This is a notable finding considering that the respondents feel that those closest to them would not support them in participating in such an effective and health beneficial activity such as walking. However, it must be noted that when asked who would disapprove most participants responded that no one would disapprove of them walking for 30 minutes a day. The effects of this perceived lack of social support needs future investigation.

Many of the control beliefs elicited from this sample were also cited as behavioural and normative beliefs. For instance, when asked about the perceived difficulty of walking, time, work/family and inclement weather were factors most cited by participants. Time, and inclement weather were the most popular negative behavioural beliefs and family was the most popular normative belief. Thus, the factor of time was cited as both a difficulty and an element that would make it easier for the respondents to walk for 30 minutes a day in addition to being cited as a disadvantage. Time therefore appears to be a crucial aspect of an individuals' decision as to whether or not to walk for an average of 30 minutes a day or other forms of physical activity. This finding also merits further investigation.

It is also noteworthy that neither gender nor age had any substantial impact on the types and numbers of beliefs elicited in relation to walking. This suggests that walking

interventions should concentrate not on tailoring its campaigns to specific demographics but to invest in the range of behaviour, normative and control beliefs that individuals have in relation to walking when designing health promotion campaigns in the future.

The focus of this study was to elicit the salient beliefs of the UK adult population. Consequently, a measure of actual or usual walking behaviour was not garnered. However, it is possible that if the participant was already walking at least 30 minutes a day on average, this may well have influenced the number and type of salient beliefs. Identifying the salient beliefs held by those participants that are not already walking 30 minutes a day would be an important next step in developing a TPB based intervention.

Conclusions

Walking is a behaviour which is acceptable to most adults; there are a few demographic differences in beliefs about walking. For these reasons walking appears to be an ideal target for interventions to promote physical activity. We have identified the most common beliefs about this behaviour in a broadly representative sample of UK adults. The next challenge is to identify effective means to alter these common beliefs and examine whether this results in changes in actual levels of walking.

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Appendix

In the following questions "walking" is defined as

"walking for exercise, transportation or any other purpose"

What would you **like** or **enjoy** about walking for at least 30 minutes a day on average over the next seven days?

_____

_____

_____

_____

_____

What would you **dislike** or **hate** about walking for at least 30 minutes on average a day over the next seven days?

_____

_____

_____

_____

_____

What would the **advantages** be of walking for at least 30 minutes on average a day over the next seven days?

_____

_____

_____

_____

_____

What would the **disadvantages** be of walking for at least 30 minutes on average a day over the next seven days?

_____

_____

_____

_____

_____

Is there anything **else** you associate with you walking for at least 30 minutes on average a day over the next seven days?

_____

_____

_____

_____

_____

Are there any individuals or groups of people who would **approve** of you walking for at least 30 minutes on average a day over the next seven days?

Are there any individuals or groups of people who would **disapprove** of you walking for at least 30 minutes on average a day over the next seven days?

Are there any **other** individuals or groups who come to mind when you think about walking for at least 30 minutes on average a day over the next seven days?

What factors or circumstances would make it **difficult** for you to walk for at least 30 minutes on average a day over the next seven days?

_____

_____

_____

_____

_____

What factors or circumstances would make it **easy** for you to walk for at least 30 minutes on average a day over the next seven days?

_____

_____

_____

_____

_____

Are there any **other** issues that come to mind when you think about the difficulty of walking for at least 30 minutes on average a day over the next seven days?

_____

_____

_____

_____

_____

In the following questions walking is defined as

"walking for exercise, transportation or any other reason".

For me to walk for at least an average of 30 minutes a day for the next 7 days would be

harmful 1 2 3 4 5 6 7 beneficial

For me to walk for at least an average of 30 minutes a day for the next 7 days would be

pleasant 1 2 3 4 5 6 7 unpleasant

For me to walk for at least an average of 30 minutes a day for the next 7 days would be

good 1 2 3 4 5 6 7 bad

For me to walk for at least an average of 30 minutes a day for the next 7 days would be

worthless 1 2 3 4 5 6 7 valuable

For me to walk for at least an average of 30 minutes a day for the next 7 days would be

enjoyable 1 2 3 4 5 6 7 unenjoyable

For me to walk for at least an average of 30 minutes a day for the next 7 days would be

impossible 1 2 3 4 5 6 7 possible

If I wanted to walk for at least an average of 30 minutes a day for the next 7 days I could

definitely true 1 2 3 4 5 6 7 definitely false

How much control do you have over you walking at least an average of 30 minutes a day over the next 7 days?

no control	1	2	3	4	5	6	7	complete control

It is mostly up to me whether or not I walk for at least an average of 30 minutes a day for the next 7 days

strongly agree	1	2	3	4	5	6	7	strongly disagree

People who are important to me think that I

should	1	2	3	4	5	6	7	should not

Walk at least an average of 30 minutes a day for the next 7 days

It is expected of me to walk at least an average of 30 minutes a day for the next 7 days

Extremely likely	1	2	3	4	5	6	7	Extremely unlikely

Most people who are important to me will walk at least an average of 30 minutes a day over the next 7 days

Completely true	1	2	3	4	5	6	7	completely false

The people in my life whose opinions I value

will walk	1	2	3	4	5	6	7	will not walk

at least an average of 30 minutes a day over the next 7

CHAPTER 4

What sense do people make of a theory of planned behaviour questionnaire? A think-aloud study.

Abstract

The purpose of this study was to understand the processes of interpretation and responses that individuals go through when they complete a theory of planned behaviour (TPB) questionnaire. A full TPB questionnaire on walking behaviour was developed, based on current TPB recommendations. Forty-five English adults were required to verbalise their thoughts as they completed the measure. Participants found some questions to be difficult to interpret, resulting in confusion, spontaneous inferences and a negative opinion of the questions. Participants also had some basic overall response difficulties and some questions to generated new thoughts. There were no questions that were deemed completely unproblematic. The average participant experienced around 16 problems with the 52 questions. Normative aspects of the TPB i.e., normative beliefs, motivation to comply and subjective norm were most problematic, followed by questions relating to intentions. The current standardised method to develop TPB measures appears to systematically yield problematic questions. All participants found it difficult to understand and make sense of at least some TPB questions. Suggestions are made for improving this procedure.

Keywords: theory of planned behaviour; measurement; think aloud; walking.

The theory of reasoned action (TRA; Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975) and its extension, the theory of planned behaviour (TPB; Ajzen, 1991), have been used extensively to predict and understand a wide variety of behaviours. The capacity of the TPB to predict behaviour has been corroborated by numerous meta-analytic reviews across a range of behaviours (Armitage and Conner, 2001), health behaviours in general (Conner & Sparks, 2005) and specific health behaviours such as condom use (Albarracín, Johnson, Fishbein, & Muellerleile, 2001; Sheeran and Taylor, 1999), exercise (Hagger, Chatzisarantis, & Biddle, 2002) and screening attendance (Cooke & French, in press).

The TPB proposes that intention to engage in a specific behaviour is the proximal determinant of performing the actual behaviour itself. Intention represents the motivational antecedent of behaviour and indicates how much effort a person is likely to devote to performing a behaviour. The TPB suggests that perceived behavioural control (PBC) may also predict behaviour (after intention has been taken account) when perceptions of control accurately reflect the amount of actual control over the behaviour (Ajzen & Madden, 1986; Sheeran, Trafimow, & Armitage, 2003). The model further proposes that intention is influenced by three constructs: attitude, subjective norm and PBC and that these constructs are in turn underpinned by beliefs. Attitudes towards the behaviour are proposed to arise from a combination of beliefs about its consequences (behavioural beliefs) and evaluations of those consequences (outcome evaluations). Subjective norms are based on perceptions of the views about the behaviour of other individuals or groups (normative beliefs) and the strength of the individuals desire to gain approval of these groups (motivation to comply). PBC is underpinned by a set of beliefs which refer to the perceived presence of factors that may influence or impede performance of a behaviour (control beliefs) and the perceived impact

that facilitating or inhibiting factors may have on performance of behaviour (power of control beliefs).

There is a clearly specified procedure for developing measures of these TPB constructs for any behaviour, which has been described in detail by Ajzen (1991; 2002) and Ajzen and Fishbein (1980). When utilising the TPB, Ajzen and Fishbein (1980) and Ajzen (1991; 2002) recommend conducting a belief elicitation study with each new target behaviour and new population of interest. In such a study, the modal set of salient behavioural, normative and control beliefs for a population can be identified by asking a sample of participants from the target population well defined open-ended questions. The most popular responses to these questions form the basis of the questions concerning behavioural, normative and control beliefs in the full TPB questionnaire. There are also clear recommendations for developing the direct measures of attitude, subjective norm, PBC and intention. The resulting questions can then be used in a predictive study with a sample of people drawn from the target population to identify the determinants of the behaviour of interest.

The issues of reliability and validity are central to the understanding of results derived from questionnaires. These issues underpin questionnaire development from item generation, to subsequent factor analysis. TPB questionnaires are seldom investigated for evaluations of reliability to the same extent as other psychometric tools and very rarely is their validity assessed thoroughly. Most TPB questionnaires are developed and used only once or a few times within a specified population and behaviour. If there are any problems with the recommended procedure to develop a TPB questionnaire, these problems could remain undetected and affect study findings. Given the lack of thorough psychometric work with

TPB questionnaires, it is possible that the same problems have affected hundreds of TPB studies conducted to date.

The purpose of this study is to understand the processes that individuals go through when they complete a TPB questionnaire to shed light on the adequacy of the procedure for developing TPB questionnaires. To achieve this aim, participants were asked to "think-aloud" as they completed a TPB questionnaire concerning walking. This procedure requires the verbalisation of thoughts that would normally be silent (Ericsson & Simon, 1993). Self-report methodologies using think-aloud protocols have been an important means for researchers to investigate the cognitive processing strategies of participants during problem-solving, decision-making and judgement tasks (Johnson, 1993). Participants are not asked to explain the reasons for their thoughts or provide any commentary but just report the information that they are currently thinking about. Such concurrent think-aloud reports can provide a highly accurate and complete index of the current contents of short-term memory, in that whatever is consciously attended to by a participant, is also verbalisable (Ericsson & Simon, 1993; Van den Haak, de Jong & Schellens, 2003). Direct concurrent reports are generally accurate and reasonably complete and have little reactive effect beyond some slowing of performance (Gilhooly & Green, 1996). Consequently, the elicitation of verbal protocols from people engaging in problem solving and reasoning has become a respected method of cognitive enquiry (Lucas & Ball, 2005). They have also been used to examine questionnaire completion with diverse questionnaires and populations such as quality of life measures with cancer patients (Westerman, et al., 2007), risk perception items with multiple sclerosis patients (Boeije & Janssens, 2004) and depression scales with palliative care patients (Murtagh, Addington-Hall & Higginson, 2007).

Two studies by French, Cooke, McLean, Williams and Sutton (2007) examined the nature and extent of problems that people have when completing TPB questionnaires, using a think-aloud approach. Both studies required participants to think-aloud as they completed TPB questionnaires about: (a) increasing physical activity (six general public participants); and (b) binge drinking (13 students). They found that most people had no identifiable problems with the majority of questions. There were, however, problems common to both studies, relating to information retrieval and to participants answering different questions form those intended by researchers. The main limitation of these two studies was a small sample size, resulting in a lack of statistical power for quantitative analyses, but with data that was not rich enough for detailed qualitative analysis. The present study will attempt to extend this previous exploratory work by employing a larger sample size to allow meaningful quantification of the different kinds of problems that participants have when answering a TPB questionnaire on walking behaviour.

Walking is important because it has been identified as the lifestyle physical activity that most people undertake (Morris & Hardman, 1997). Walking is a familiar, convenient and free form of activity that can be incorporated into every day lifestyle and sustained into old age (Mutrie & Hannah, 2004). The questionnaire that was utilised within this study followed the recommended guidelines outlined above and was based on a belief elicitation study on walking behaviour conducted with 180 members of the general public in the midlands of England (Darker, French, Longdon, Morris, & Eves, 2007). Walking is a different behaviour than has been explored in the previous two studies by French, et al. (2007). It is important to

elucidate whether these previous exploratory findings are generalised to a TPB questionnaire on a different behaviour, such as walking.

Methods

Participants

Participants (N=45) were members of the general public and administrative staff of a large university in England, who were recruited through various media outlets including local newspapers and university websites. There were 26 females and 19 males, with a mean age of 32.6 years (sd =11.7). The inclusion criteria stated that each participant must be between the ages of 16-65 years. Sessions lasted around an hour and participants were reimbursed £20 (approximately 30 €) for their time.

Design

The study utilised a cross-sectional design looking at the processes and strategies involved in completing a TPB based questionnaire on walking behaviour. All participants underwent the same procedure.

Procedure

All participants agreed to be audio taped and informed consent was given. Before beginning, they were read the following instructions, which were adapted from Green and Gilhooly (1996) and French, et al. (2007):

We will shortly be beginning a study to encourage people to be more active and walk. For this study, we have developed some questionnaires about people's beliefs and goals in relation to walking. We want to check that people understand the questions in the way that we meant them. To do this, I am going to ask you to

"think-aloud" as you complete the questionnaires. So I want you to tell me everything that you are thinking as you read each question and decide how to answer it. I would like you to talk constantly. I do not want you to plan out what you say or try to explain to me what you are saying. Just act as if you are alone in the room. If you are silent for any long period of time, I will ask you to "keep talking".

Participants were given a warm up task to familiarise them with the think-aloud method by answering questions about their general health. Any questions were dealt with at this time. The researcher sat out of the line of sight of participants to minimise influence. Once participants began completing the questionnaire, they were not interrupted, unless they fell silent for about 10 seconds, in which case they were instructed to "keep talking". Each session was transcribed verbatim.

Measures

A full theory of planned behaviour questionnaire on walking behaviour was used, developed using a belief elicitation study with 180 members of the general public (Darker, et al., 2007, see Appendix A). The questionnaire was modelled on the recommendations of Ajzen (1991; 2002) and Ajzen and Fishbein (1980), and used a seven point response format. Walking was defined as "walking for recreation, fitness or for any other purpose". There were 52 items with ten behavioural beliefs and ten outcome evaluations**.** Normative beliefs and motivation to comply was assessed by three items each**.** Control beliefs and power of control beliefs was assessed by five items each**.** Attitude was assessed by five items (Cronbach's α = .85). The item stem was "Walking for 30 minutes on average a day over the next 7 days will be.." which was followed by the items harmful/beneficial, pleasant/unpleasant, good/bad, worthless/valuable and enjoyable/unenjoyable. Subjective norm was assessed by four items (Cronbach's α = .75), for example, "Most people who are important to me think that I

should/should not walk for 30 minutes on average a day over the next 7 days". Perceived behavioural control was assessed by four items (Cronbach's α = .85), for example "For me to walk for 30 minutes on average a day over the next 7 days would be difficult/easy". Intention was assessed by three items (Cronbach's α = .80), for example, "I intend to walk for 30 minutes on average a day over the next 7 days, strongly agree/strongly disagree.

Analysis

Four transcribed think-aloud protocols, selected at random, were used to develop and refine a detailed coding frame. This iterative process involved independent coding of transcripts by both authors and subsequent discussion of disagreements and revision of the coding frame. Inter-rater reliability was estimated by both authors coding a further six randomly selected transcripts and yielded an overall Cohen's kappa of 0.76. The final coding frame consisted of interpretation problems (IP) and response problems (RP) and no problems (NP) (see Appendix B). Interpretation problems consisted of (1) confusion; (2) opinions on the questionnaire; and (3) spontaneous inference (i.e., the participant would not know the answer to a question, and would generate a possible hypothetical solution). Response problems consisted of (1) basic overall response problems with questionnaires; and (2) questionnaires being reactive. The first author coded the remaining 35 transcripts.

The frequency of the number of overall problems versus no problems with each construct was calculated, along with the proportions of different types of problems within each of the constructs. A series of related samples t-tests were performed to determine the differences differences in the number of respondents who experienced different types of problems within each TPB construct.

Results

Overall, the 45 respondents had 729 problems with the 52 items in the questionnaire. Thus the average person experienced 16.2 problems with the TPB measures. The number of problems per person ranged from five to 27. The most problematic item was a subjective norm item "The people in my life whose opinion I value will walk/not walk" which resulted in 34 problems. There were two items that both yielded the least problems, a control belief item "I will feel pain in my legs, feet or back when I am walking" and a power of control belief item "Walking through threatening areas would make it more likely/less likely that I would walk for 30 minutes a day" which resulted in five problems each. There was no item that was found to be completely unproblematic.

Distribution of problems identified with each TPB construct

Questions relating to the normative questions in the TPB i.e., normative beliefs, motivation to comply and subjective norm, were particularly problematic (see Table 1). The average person had problems with nearly one in two items assessing subjective norm, one in three problems assessing behavioural beliefs, normative beliefs, motivation to comply and intention items, one in four with control beliefs, power of control beliefs, perceived behavioural control and outcome evaluation items and one in five problems with attitude questions.

Nature of problems identified with each TPB construct

A greater number of respondents had more overall interpretation problems with each measure than response problems (see Table 2). Respondents experienced significantly more

interpretation problems than response problems with questions assessing all ten TPB constructs (all $p<0.001$).

Within outcome evaluations, a significantly greater number of respondents experienced more problems within the confusion category than the spontaneous inferences category [$t(43)=2.69$, $p<0.01$]. There were no significant differences in the number of people experiencing problems between the opinions category and either of the opinions and spontaneous inference categories. Within motivation to comply, a significantly greater number of respondents experienced more problems within both the confusion category [$t(44)=3.60$, $p<0.001$] and the spontaneous inference category than in the opinions category [$t(44)=2.60$, $p<0.01$]. There was no significant difference in the number of people experiencing problems within the confusion and spontaneous inference category for motivation to comply questions. Within the power of control beliefs, a significantly greater number of respondents experienced problems within the confusion category then within the spontaneous inference category [$t(44)=2.14$, $p<0.05$]. There were no significant differences in the number of people experiencing problems between the confusion and opinions category and between the opinions and spontaneous inference category.

A significantly greater number of respondents experienced more basic response problems than reactive problems for each of behavioural beliefs [$t(43)=2.56$, $p<0.01$], normative beliefs [$t(44)=2.07$, $p<0.05$], control beliefs [$t(44)=2.43$, $p<0.01$], outcome evaluations [$t(43)=2.47$, $p<0.01$], motivation to comply [$t(44)=3.16$, $p<0.01$] and with power of control beliefs [$t(44)=2.34$, $p<0.05$].

Within subjective norms, a significantly greater number of respondents experienced more problems within the spontaneous inference category than the confusion category [$t(43)=2.77$, $p<0.01$] and the opinions category [$t(43)=3.33$, $p<0.01$]. There was no significant difference between the numbers of people experiencing problems between confusion and opinions category within subjective norms. There were no significant differences between the numbers of respondents experiencing interpretation problems between categories for attitude, PBC and for intention items.

Within normative beliefs, a significantly greater number of respondents experienced problems within the spontaneous inference category than within the confusion category [$t(44)=3.01$, $p<0.01$] and the opinions category [$t(44)=4.69$, $p<0.001$]. A significantly greater number of respondents experienced problems within the confusion category than within the opinions category [$t(44)=2.34$, $p<0.05$] for normative beliefs. Within control beliefs, respondents experienced more problems within the spontaneous inference category than within either the confusion [$t(44)=2.13$, $p<0.05$] or the opinions category [$t(44)=3.70$, $p<0.001$]. There were no significant differences in the types of interpretation problems that respondents experienced for behavioural beliefs.

A significantly greater number of respondents experienced more basic response problems than reactive response problems for attitude items [$t(43)=2.34$, $p<0.05$]. There were no significant differences between the numbers of people experiencing response problems between categories for subjective norms, PBC and intention items.

Discussion

This is the largest study which has asked participants to think-aloud while completing a TPB questionnaire about walking. In line with previous research a range of different problems were encountered (French, et al. 2007). While no problems were encountered with over two thirds of the questions, the average participant experienced over 16 problems with the questionnaire. All 45 participants found at least one type of problem with at least one type of question. There were no questions that were found to be completely unproblematic for all respondents. Participants experienced the most problems with questions pertaining to the normative aspects of the TPB i.e., normative beliefs, motivation to comply and subjective norm and with questions relating to behavioural beliefs and intentions items. The fewest problems per person per item were for attitude questions. Participants experienced more overall interpretation problems than response problems with all ten TPB constructs. This suggests that participants found questions relating to the underlying beliefs of walking were difficult to interpret and to comprehend, but retrieval and formatting a response was less problematic.

Distribution and nature of problems identified with each TPB construct

Normative questions

Participants in the present study found subjective norm questions to be the most problematic. This was the case even though the subjective norm items within the current study were reliable (Cronbach's $\alpha = .75$) multi-item measures that comprised both descriptive and injunctive norms, that would be considered good by a standard TPB psychometric analysis. The problems associated with subjective norms are consistent with previous

exploratory work on the TPB measures (French, et al., 2007). Three types of problems were found within that study in relation to the normative questions : (a) participants indicated that groups such as “friends” or “people who are important to me” are comprised of sub-groups who have differing opinions, making it difficult to give a single answer; (b) participants answering normative belief questions by including their motivations to comply with salient referents; (c) answering all types of normative questions by verbally indicating disagreement, then choosing the middle response option.

Similar issues arose for the participants within the current study. Participants found difficulty in the variability of the opinions of other in relation to walking and in variability of whether those others, actually walked for 30 minutes a day or not themselves. Participants’ also found it difficult to know which of the sub-groups of their family to draw from when answering the question. For example, one family member may be very active with their walking and have many positive thoughts in relation to walking, whereas another family member may have opposite feelings. Participants were uncertain as to which family member to use as a frame of reference. Further, there is no clear distinction in the category of “family members” which unambiguously includes some, (e.g., parents) but excludes others (e.g., siblings). Vague phrases can have fuzzy or indistinct boundaries making it not very not clear as to where to draw classification boundaries for what the phrase does and does not refer to (Wright, Gaskell & O’Muircheartaigh, 1997). The implication of this lack of boundaries within normative type questions resulted in participants in the current study using conjecture and hypothetical or spontaneous inferences to answer the questions.

There were particular problems with participants spontaneously inferring answers to normative questions. There is some evidence that respondents may not have ready made opinions or answers to report when responding to surveys in general (Krosnick, 1988). With normative questions, participants may not have a specific belief about the opinions or behaviour of others but may respond on the basis of a more global impression. The result is such that respondents are recalling and integrating generic information about the global topic, along the lines, 'my family want me to be healthy, walking is a healthy thing to do, therefore my family would want me to walk more'. Responses to normative questions may reflect an overall impression that a participant feels would reflect their families or friends opinions on walking but not knowing their actual true opinion, they draw from a hypothetical opinion.

The consequence of this internal debate appears to be that participants would either choose the middle option or else spontaneously infer their answer to the question so as to not leave a response section blank. Either type of response is not desirable. The implication of participants fabricating responses based on plausibility rather than knowledge is that the true extent of significant others influence on their intention to perform a behaviour will not be recognised thereby attenuating, inflating or moderating estimates of relationships between variables. The implication of a response set of a construct that is based around a series of middle response on a rating scale will diminish the variability of that construct and diminish that measures' contribution to prediction.

A commonplace observation on the TPB literature is that subjective norm constructs have much less predictive power than do attitude and perceived behavioural control

(Armitage & Conner, 2001; Conner & Sparks, 2005). This may be due to some of the issues outlined above. Typically, such items tap the extent to which the individual wants to do what this individual or group wishes them to do in general (Fishbein & Ajzen, 1975). A potential solution to this problem may lay in simply reformatting questions within this construct so as to allow for participants to indicate a certain amount of specificity as to whom they are referring to when thinking about answering normative beliefs. This would have the additional benefit of tapping individually salient normative beliefs which should be more predictive than modally salient beliefs (Fishbein & Ajzen, 1975). Alternatively, drawing from social identity theory (Terry & Hogg, 1996), a measure of group identification (e.g., "I identify with my partner in regards to walking") rather than motivation to comply might be more appropriate. Such an approach would also suggest combining such identification with a different measure of group norm (i.e., descriptive norm or group attitude rather than injunctive norm).

Intentions

There were also a high number of problems associated with intention questions. The participants found the intention questions were both difficult to interpret and also difficult to formulate a response. In accordance with the recommended guidelines as outlined by Ajzen (1991) the present study assessed intention using three items. These intention items provided a high Cronbach's alpha of .80, indicating that the items are measuring the same construct. The weaknesses of relying upon a single-item measure of intention have been noted (Sutton, 1998). Multi-scales are generally used in preference to single item scales to avoid bias, misinterpretation and reduce measurement error (Bowling, 1997). The majority of studies reviewed by Armitage and Conner (2001) employed similarly multiple measures of intention

(combining measures of intention, self-prediction and/or desire) and noted the high correlation between these items. The participants within the current study found a high degree of similarity of the intention questions and found the repetition of the questions to be quite odd. A possible way to minimise this effect would be to reduce the number of questions to assess a construct or informing participants about why there is a need to ask a question in a number of similar albeit slightly different ways. These approaches may reduce the participants' difficulty when tackling intention questions.

In line with current recommendations for the development of TPB measures (Ajzen, 2002) there is not only a use of multi-item measures but also heavy repetition in the present study "Walking for more than 30 minutes on average a day over the next 7 days…". This item stem does not change throughout the entire questionnaire. Therefore, with a full 52-item TPB questionnaire on walking behaviour, the participant must read this phrase 52 times. A potential way to limit this repetition would be to place it on the cover of the questionnaire and at the top of each of the pages of the questionnaire and instruct the participant to refer to it when needed. This may reduce some of the repetition with reading questions, reducing irritation and engaging participants, while retaining multi-item measures.

The largest number of response problems occurred with intention questions than any other TPB construct. For example, when answering one of the three intention questions, several participants would use another one of the previous intention questions to answer the present question. This probably relates to the issue noted above of participants not distinguishing between measures. Some problems with responding to items were also present.

For example, some participants found that the questionnaire itself was a catalyst for a new thought that the participant did not previously possess.

Attitude

Similar response problems were observed for attitude questions, whereby, participants would use another question to answer the current question. A review of the literature (Sudman, Bradburn & Schwarz, 1996) suggested that when faced with an ambiguous question, respondents often refer to the surrounding questions to infer the meaning of the ambiguous one. This causes the answers to the surrounding questions to be systemically related to the answer to the ambiguous question. An ambiguous question refers to multiple concepts, not a single fuzzy concept. For example, one of the items underlying attitude is "Walking for 30 minutes on average a day over the next 7 days will be good/bad". The problem ensues when the participant must make a judgement as to what context should the walk be considered good or bad. For example, walking could be deemed good for their physical and/or psychological health, walking may be perceived as a "good" behaviour to perform, or walking may be bad because of inclement weather or potential for injury. The respondent has interpret the perceived context of the anchor and to opt for one of the meanings and for the associated response. Participants may then look at the questions surrounding this ambiguous item in order to delineate meaning and answer the question.

Conner and Sparks (2005) have noted that attitude items do tend to generate a very high level of internal reliability (Cronbach's $\alpha = .90$). As per Ajzen's (2002) recommendations, attitude was assessed in the current study using a mixture of affective and

instrumental items which demonstrated a high degree of internal consistency (Cronbach's α = .85). However, this high degree of internal consistency may reflect a systematic relationship not due to positive item consistency but consistency to a response to an ambiguous question. It is typical in surveys to ask related questions in topical block and often the introduction to the items reinforces the connections among them (Tourangeau & Rasinski, 1988). Attitude questions within TPB questionnaires tend to be blocked together, as was the case in the current study. This may have strengthened the association between the attitude items. Moreover, when a self-administered questionnaire is used, subsequent questions may also influence preceding ones (Schwarz & Hippler, 1995) because self-administered questionnaires allow respondents to go back and forth between questions. Alternatively, when a question is highly ambiguous, respondents may respond either systemically by using some heuristic (e.g., some people may respond neutrally, whereas others may agree or disagree) or randomly without using any heuristic at all. To the extent that people rely on heuristics when responding to ambiguous questions, it could increase common method variance between an ambiguous predictor and an ambiguous criterion variable (Podsakoff, MacKenzie, Lee & Podsakoff, 2003).

Eagly (1992) has stated that "interest in attitude theory is widespread and quite intense because of the desire of many groups to change attitudes and behaviours". However, if the items that underscore attitude are producing a consistent response bias, then this will have a serious negative consequence on studies that rely on the predictive power of attitude within the TPB framework. One possible solution to this may be that in a laboratory situation, participants complete TPB questionnaires on a computer which only displays the questions

item by item after the participant has made their response, thereby eliminating their ability to return to a previous question of the same construct to check an earlier response.

Strengths and weaknesses of the current study

Questionnaires are one of the most frequently utilised media within social, behavioural and psychological sciences to access participants' cognitive and social processes (Harrison, McLaughlin & Coalter, 1996). The TPB is one of the most widely applied theoretical frameworks within health psychology (Godin, Conner, & Sheeran, 2005; Johnston, French, Bonetti & Johnston, 2004; Ogden, 2003). To develop valid interventions based on predictive studies using questionnaire based methods, it is vital that the questionnaire has been sufficiently developed. It is important to reduce any problems that participants may experience in both understanding and responding to TPB questionnaires. The main area where the present study improves on the earlier TPB "think aloud" study is that it has sufficient numbers to be able to meaningfully quantify the different kinds of problems encountered, rather than baldly state that problems were found.

The main limitation of the present study, is that it studied responses to one measure, of one behaviour, which was developed by one research group. Also the participants in this study were recruited to think-aloud about a questionnaire based on walking behaviour, it is not clear whether these participants had any prior interest in walking. Participants recruited to take part in an intervention to encourage walking may have approached the questionnaire differently as their motivation on the topic would have been higher and cognitions more fully developed. The presence of an interviewer can be distracting to respondents, people may be

reluctant to reveal beliefs unlikely to be endorsed by the researcher, leading to a social desirability bias. However, in the current study the researcher sat out of the line of sight of the respondent and only spoke when necessary to prompt the participant to "keep talking", so as to minimise distraction. Despite these limitations, this study extends the exploratory work of French, et al. (2007) with two independent research groups, confirming problems previously found with a larger sample size and extending our knowledge of different types of problems that participants experience when completing a TPB questionnaire.

Future directions

There is a need to pay more attention to respondents' perceptions of TPB questionnaires and the contextual demands involved in their completion. Future studies of TPB questionnaire methodology need to address issues of interpretation and comprehension of items, in particular items relating to normative aspects of the TPB. For example, reformatting questions within this construct so as to allow for participants to indicate a certain amount of specificity as to whom they are referring to when thinking about normative items may help to crystallise the fuzzy boundaries that respondents experience within this construct. In practice, respondents should be encouraged to admit that they do not have an opinion or that their beliefs are conflicted. Ambiguous phrases (i.e., good/bad) should be identified and re-written so as to make sense to the participants. There is also a need to formally test whether removing the heavy repetition of the TPB item stem (i.e., "Walking for more than 30 minutes on average a day over the next 7 days…") and explaining to participants why there is a need for multiple items that assess the same construct (i.e., intention) would reduce irritation within the participants, thus engaging them more with the task of answering the questions themselves. The efficacy of presenting the items via computer in a manner which limits a

respondents ability to use a previous answer to respond to a subsequent answer also needs to be tested. It is imperative to identify the extent of these problems within TPB research and ascertain effective solutions, so as to limit bias and eliminate confounding findings, as a result of flawed measures, in future TPB based research. To test the efficacy of any solution, a traditional versus a TPB questionnaire designed using alternative procedures would need to be compared. Comparisons could be made in terms of which procedure yields measures that have the better reliability, predictive validity and which evoke fewest problems in respondents, assessed using think-aloud methods.

Conclusion

The current study has found a number of different types of problems associated with different constructs within a TPB questionnaire that was developed according to current guidelines, in line with previous research assessing different behaviours. This previous work has been extended by a more fine-grained description of the kinds of problems encountered with questions assessing each construct, and has suggested a number of ways in which these problems could be alleviated. Further experimental work is needed to assess how these problems could be avoided. The guidelines for developing measures to be used with the TPB may require revision to produce measures that are easier to use.

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Appendix A: Theory of planned behaviour questionnaire on walking behaviour

Walking for 30 minutes on average a day over the next 7 days will be good for my heart								
Very unlikely	1	2	3	4	5	6	7	Very likely
Being good to my heart is								
Unimportant	1	2	3	4	5	6	7	Important
Walking for 30 minutes on average a day over the next 7 days will help me manage the stresses of life								
Strongly agree	1	2	3	4	5	6	7	Strongly disagree
Managing the stresses of life is								
Extremely bad	1	2	3	4	5	6	7	Extremely good
Walking for 30 minutes on average a day over the next 7 days is a good source of exercise								
Strongly agree	1	2	3	4	5	6	7	Strongly disagree
For me exercising is								
Very important	1	2	3	4	5	6	7	Very unimportant
Walking for 30 minutes on average a day over the next 7 days will provide me with fresh air								
Strongly disagree	1	2	3	4	5	6	7	Strongly agree
Having fresh air is important to me								
Definitely false	1	2	3	4	5	6	7	Definitely true

Walking for 30 minutes on average a day over the next 7 days will improve my overall fitness

Very unlikely	1	2	3	4	5	6	7	Very likely

Improving my overall fitness is

Unimportant	1	2	3	4	5	6	7	Important

Walking for 30 minutes on average a day over the next 7 days will allow me to see a variety of places and scenery

Strongly agree	1	2	3	4	5	6	7	Strongly disagree

Seeing a variety of places and scenery is important to me

Definitely true	1	2	3	4	5	6	7	Definitely false

If I walk for 30 minutes on average a day over the next 7 days I will probably encounter bad weather

Strongly disagree	1	2	3	4	5	6	7	Strongly agree

Bad weather would make it

Pleasant	1	2	3	4	5	6	7	Unpleasant

to walk for 30 minutes on average a day over the next 7 days

Walking for 30 minutes on average a day over the next 7 days is a waste of my time

Strongly agree	1	2	3	4	5	6	7	Strongly disagree

Not wasting my time is important to me

Very important	1	2	3	4	5	6	7	Very unimportant

If I walk for 30 minutes on average a day over the next 7 days, I would walk through unpleasant environments

Strongly agree	1	2	3	4	5	6	7	Strongly disagree

Not walking through unpleasant environments is important to me

Very unimportant	1	2	3	4	5	6	7	Very important

If I walk for 30 minutes on average a day over the next 7 days, I could injure myself

Strongly agree	1	2	3	4	5	6	7	Strongly disagree

Avoiding injuring myself is important to me

Definitely false	1	2	3	4	5	6	7	Definitely true

Walking for 30 minutes on average a day over the next 7 days will be

Harmful	1	2	3	4	5	6	7	Beneficial
Pleasant	1	2	3	4	5	6	7	Unpleasant
Good	1	2	3	4	5	6	7	Bad
Worthless	1	2	3	4	5	6	7	Valuable
Enjoyable	1	2	3	4	5	6	7	Unenjoyable

My family thinks that I

Should not	1	2	3	4	5	6	7	Should

walk for 30 minutes on average a day over the next 7 days

With regards to walking, doing what my family thinks I should do is important to me

Not at all	1	2	3	4	5	6	7	Very much

My doctor would

Approve 1 2 3 4 5 6 7 Disapprove

of my walking for 30 minutes on average a day over the next 7 days

With regards to walking, my doctors' approval matters to me

Very much 1 2 3 4 5 6 7 Not at all

People within my community would

Disapprove 1 2 3 4 5 6 7 Approve

Of my walking for 30 minutes on average a day over the next 7 days

With regards to walking, acting in a way that my community would approve is important

Definitely false 1 2 3 4 5 6 7 Definitely true

Most people who are important to me think that

I should 1 2 3 4 5 6 7 Should not

walk for 30 minutes on average a day over the next 7 days

The people in my life whose opinion I value would

Approve 1 2 3 4 5 6 7 Disapprove

Of my walking for 30 minutes on average a day over the next 7 days

Most people who are important to me will themselves walk for 30 minutes on average a day
over the next 7 days

Completely False 1 2 3 4 5 6 7 Completely True

The people in my life whose opinions I value will

Walk 1 2 3 4 5 6 7 Not walk

For 30 minutes on average a day over the next 7 days

I will have the time to walk for 30 minutes on average a day over the next 7 days

Never 1 2 3 4 5 6 7 Regularly

If I have enough time to do so, it is

Much easier 1 2 3 4 5 6 7 Much more difficult

to walk for 30 minutes on average a day over the next 7 days

My work and family commitments will place high demands on my time over the next 7 days

Strongly agree 1 2 3 4 5 6 7 Strongly disagree

My work and commitments placing high demands on my time over the next 7 days would make it

Much easier 1 2 3 4 5 6 7 Much more difficult

to walk for 30 minutes on average a day over the next 7 days

I will feel pain in my legs, feet or back when I am walking for 30 minutes on average a day over the next 7 days

Unlikely 1 2 3 4 5 6 7 Likely

If I feel pain in my legs, feet or back I am

Less likely 1 2 3 4 5 6 7 More likely

to walk for 30 minutes on average a day over the next 7 days

There is likely to be good weather over the next 7 days

Strongly agree 1 2 3 4 5 6 7 Strongly disagree

Good weather would make it

Much easier 1 2 3 4 5 6 7 Much more difficult

to walk for 30 minutes on average a day over the next 7 days

If I walk for 30 minutes on average a day over the next 7 days, I may walk through threatening areas

Strongly agree 1 2 3 4 5 6 7 Strongly disagree

Walking through threatening areas would make it

More likely 1 2 3 4 5 6 7 Less likely

that I would walk for 30 minutes on average a day over the next 7 days

For me to walk for 30 minutes on average a day over the next 7 days would be

Difficult 1 2 3 4 5 6 7 Easy

If I wanted to I could walk for 30 minutes on average a day over the next 7 days

Definitely true 1 2 3 4 5 6 7 Definitely false

How much control do you believe you have over walking for 30 minutes on average a day over the next 7 days?

No control 1 2 3 4 5 6 7 Complete control

It is mostly up to me whether or not I walk for 30 minutes on average a day over the next days

Strongly agree 1 2 3 4 5 6 7 Strongly disagree

I intend to walk for 30 minutes on average a day over the next 7 days								
Strongly agree	1	2	3	4	5	6	7	Strongly disagree
I will walk for 30 minutes on average a day over the next 7 days								
Definitely false	1	2	3	4	5	6	7	Definitely true
I plan to walk for 30 minutes on average a day over the next 7 days								
Strongly agree	1	2	3	4	5	6	7	Strongly disagree

Interpretation problems (IP)

IP1) Confusion

Examples:

- uncertainty of how to answer the question

"*If I have enough time to do so it's much easier/much more difficult to walk thirty minutes on average over the next seven days. Well that's a bit weird. If I have enough time to do so it's much easier to walk/much more difficult to walk….I presume it's easier if you've got plenty of time to be doing thirty minutes walking. I don't really. I don't really... That doesn't make sense to me so I'll just put number four because if I don't understand something I'll go in the middle. And not commit myself*".

- lack of clarity
- problems with scale/anchors swapping
- problem with the negatively phrased questions
- re-reads the question
- stumble or flounder with the answer

IP2) Odd questions & opinions or remarks on the questionnaire

Examples:

- questions that are silly or do not make sense

"*Erm... managing the stresses of life is extremely bad to extremely good. I'm... I'm laughing because it seems... It seems unlikely that anyone's gonna say that managing stress is bad so I'm gonna put that as a seven. I think it's quite unusual for me to use the extreme... If I was filling in a questionnaire I think I'd very rarely fill in the extremes of the rating scales which makes me think that these answers might be a bit obvious. Erm... Yeah. I think... I think some of these questions are a little bit... I guess simplistic perhaps.*"

- similarity of questions
- repetition of the TPB phrase
- anchors swapping

IP3) Spontaneous inferences- not knowing the answer, so generates possible solutions

Examples:

- not knowing the true opinions of others on the topic, so using conjecture to answer the question

"*Most people who are important to me think that I should/should not walk for thirty minutes on average a day over the next seven days. Most people who are important to me think that... Well I've never discussed it so I don't know er.... What do they think. But I feel that they think that I should walk for thirty minutes to make my health better. So I choose, maybe 3. Maybe 3 because I am not sure about that."*

- difficulty due to the variability of the opinions of others or else the realities of others
- questions are not personally relevant to them
- being asked for information that they do not possess
- respondent explicitly makes an assumption, i.e., walking accumulated/additional etc.
- question is not fully specified - lack of context or "depends" ; generates hypothesis

Response Problems (RP)

RP1) Basic overall response problems with questionnaires

Examples:

- using another question to answer the current question

"*Okay. Improving my overall fitness is unimportant or important? Erm... yes... similar to the earlier question. Well it is important, but I'm not very committed to it so therefore I can't believe that it's as important as I like to think it is. Erm... Erm... I think that's... What did I say to the other one? Hmm. That's a five. Improving my overall fitness is... erm... erm... erm... I s-... Erm what was the earlier one? For me exercising is... Oh well I... Yes, maybe I'll say it's six because I do feel that I ought to. I kind of feel that doing it in the future is still a goal. Okay*".

- opinion not really matching the response written down
- answers that are different from the question that was asked

RP2) Questionnaires being reactive

- questionnaire being a catalyst for a new thought

"*Walking for thirty minutes on average a day over the next seven days will provide me with fresh air. Yes. Well... I have never thought about it before but I strongly agree about it. 7.*"

Non-problems (NP)

Examples:

- questions are not problematic but that a certain amount of reasoning goes into them
- questions that pose no problem at all – automated response

Table 1: Average number of problems each participant experienced with direct and indirect measures of the TPB.

Construct	N	Number of q'aire items	Total number of problems	Total number of "no problems"	Mean problems per person per item	Mean "no problems" per person per item
Behavioural belief	43	10	150	298	0.33	0.69
Outcome evaluation	43	10	126	323	0.28	0.75
Normative belief	44	3	48	87	0.36	0.65
Motivation to comply	44	3	47	88	0.34	0.66
Control belief	45	5	61	164	0.26	0.72
Power of control belief	45	5	63	162	0.26	0.72
Attitude	44	5	46	175	0.20	0.79
Subjective norm	44	4	87	92	0.48	0.52
Perceived behavioural control	44	4	47	133	0.26	0.75
Intention	44	3	54	78	0.40	0.59
Overall	43	52	729	1600	729	1600

Table 2: Percentage of people who had different types of problems with each construct within the TPB.

Construct	Interpretation problems				Response problems		
	Confusion	Opinions	Spontaneous inference	Total	Basic	Reactive	Total
Behavioural belief	11.16	9.53	14.65	35.34	4.41	1.62	6.03
Outcome evaluation	11.86	11.39	6.97	30.22	4.88	1.39	6.27
Normative belief	9.84	2.27	25	37.11	3.03	0	3.03
Motivation to comply	20.45	4.54	13.63	38.62	7.57	0	7.57
Control belief	7.55	5.33	12.88	25.76	4	0.44	4.44
Power of control belief	15.11	9.33	8	32.44	2.22	0	2.22
Attitude	6.81	8.63	5	20.44	1.81	0	1.81
Subjective norm	14.77	10.79	30.68	56.24	2.84	0.56	3.40
Perceived behavioural control	11.36	9.09	7.38	27.83	1.70	0.56	2.26
Intention	14.39	17.42	7.57	39.38	6.06	4.54	10.60

CHAPTER 5

Prologue to study four: Development of an intervention to promote walking.

A meta-analysis of 72 studies that used the theory of reasoned action (TRA; Ajzen & Fishbein, 1980) and the theory of planned behaviour (TPB; Ajzen, 1991) have demonstrated the theories efficacy in predicting a wide range of health related behaviours in general (e.g. Armitage & Conner, 2001) and to predict physical activity behaviour in particular (Hagger, Chatzisarantis, & Biddle, 2002). In a recent review, intention to engage in physical activity was strongly predicted by attitudes and perceived behavioural control (PBC) but less strongly predicted by subjective norm (Hagger, Chatzisarantis, & Biddle, 2002).

In the present context, it is important to note that when more specific forms of physical activity have been investigated using the TPB, it has been found that there is variation in the predictors of these more specific activities (Ajzen & Driver, 1992; Bryan & Rocheleau, 2002; Eves, Hoppé, & McLaren, 2003). Seven empirical studies were identified that have examined the predictors of intentions to walk and/ or walking behaviour itself, the findings of which are summarised in Table One. The most striking feature of the results shown is that in six out seven studies, PBC has the largest relationship with intentions to walk. This is impressive consistency, given the variation in samples employed, namely students (Darker, unpublished data; Eves et al, 2003; Scott, Eves, French, & Hoppé, in press [study 1],), military personnel (Scott et al, in press [study 2]), patients (Galea & Bray, 2006) and general public samples (Darker & French, submitted; Rhodes, Brown, & McIntyre, 2006).

On the basis of this literature review and previous formative research by the current authors, clear guidance was emerging for the intervention: to increase intentions to walk, PBC was the construct we should be aiming to change. The findings in Table One are somewhat in opposition to common sense ideas of why people do or do not intend to walk. Campaigns to

encourage people to walk often stress the health benefits of walking (British Heart Foundation, 2001). The data reported here suggest that there is little relationship between attitudes to walking and intentions to walk. According to the TPB, the underlying cause of attitudes towards walking should be expectations of the consequences of walking (such as health benefits) and the evaluation of these consequences. There is some qualitative evidence to suggest that the lack of association between attitudes towards walking and intentions to walk may be because people do not see walking as constituting "proper" exercise (Darker, French, & Larkin, in press).

Using the TPB to develop an intervention: Overall approach

The authors of the TRA and TPB gives explicit guidance on how the overall approach one should take in using the TPB to develop interventions and the mechanism by which change should occur (Ajzen & Fishbein, 1980; Ajzen, 2002). To achieve behaviour change, it has been argued that one needs to follow a chain of causation backwards through the proximal determinant, i.e. intention, to the ultimate determinants, i.e. the beliefs underlying the immediate determinants of intention, i.e. attitude, subjective norm and PBC (Ajzen, 2002; Sutton, 2002). According to Ajzen (2002), it is an individual's salient beliefs that determine whether or not they perform a behaviour and so interventions should aim to alter these beliefs.

Ajzen (2002) argues that the relative ability of attitude, subjective norm or PBC in predicting intention does not necessarily provide a useful guide to which construct should be the target of a behaviour-change intervention. He argues that one should aim to target the construct which has low mean levels and for which there is consequently room for improvement. However, Ajzen also states that a weak relationship between a TPB construct

and intention may correctly indicate that the construct is not an important factor in determining the behaviour of the population of interest. Despite this, the main point of predictive studies is to identify which constructs are most strongly predictive and hence which constructs should be targeted in behaviour change interventions. In the case of walking, evidence has been presented that PBC is the most important predictor of intentions. Accordingly, PBC is the target of our intervention.

Having identified the construct one wishes to alter, according to Ajzen (2002), one should aim to alter the beliefs held to underlie this construct, i.e. control beliefs. Control beliefs are the beliefs an individual holds about the likely presence or absence of factors that impede or facilitate performance of walking and the perceived power of these factors to affect walking. Ajzen (2002) proposes three main strategies of altering control beliefs: (a) altering salient beliefs about the likelihood of facilitating factors or barriers, (b) altering perceptions of the likelihood that these factors will affect walking if present, or (c) introduce new salient beliefs. A more complicated scheme based on these ideas has been proposed by Sutton (2002).

Commentators have noted that there is a lack of evidence endorsing whether changes in beliefs lead to changes in behaviour (Conner & Armitage, 1998). There is now good evidence that altering intentions is an effective means of changing behaviour (Webb & Sheeran, 2006). However, although changes in beliefs may alter the construct they are held to underpin, these effects would have to be large in order to influence intentions and then behaviour. For instance, a recent intervention study with British teenagers showed that an intervention group receiving a communication targeting modal salient behavioural beliefs

concerning exercise lead to a significant change in attitudes but not intentions or behaviour, in comparison to a control group (Chatzisarantis & Hagger, 2005).

Development and refinement of specific strategies to change behaviour

The major limitation of Ajzen's (2002) guidance on how to develop behaviour-change interventions is that it does not give a great deal of guidance on which are the most appropriate methods for altering the beliefs underlying TPB constructs. According to Ajzen (2002), the determinants of TPB constructs are beliefs. Consequently, it is perhaps not surprising that the most popular behaviour change methods in the studies identified in the Hardeman, et al. (2002) review were persuasion and information, with skills training and goal setting used less often. However, there is very little evidence that suggests these techniques are efficacious.

The similarity between the PBC construct of the TPB and the self-efficacy construct of social cognitive theory (Bandura, 1986; 1991) has been noted (Ajzen, 1991). Of the four strategies to alter self-efficacy discussed in the social cognitive theory literature, it is often noted that persuasion is the weakest (Bandura, 1997). Consequently, the strategy employed in developing the current intervention is that it would attempt to alter PBC using what has been proposed as generally the strongest method, i.e. mastery experience, whereby a person draws from relative previous successful experiences (Bandura, 1997). If a person can perform a behaviour, this should be expected to lead to a much greater increase in PBC than a persuasive message encouraging them to do so. This deviation from the recommendations of Ajzen (2002) is justified. There is currently insufficient evidence to map specific intervention

techniques onto change mechanisms, i.e., theory-specified psychological changes explaining the effects of behaviour change interventions (Michie & Abraham, 2004).

Once the overall strategy for attempting to promote walking by altering control beliefs-PBC/ self-efficacy had been decided, numerous techniques were considered and piloted. For instance, as noted above, a barrier to walking that is often cited is a lack of time. Given the number of hours a day the average person spends watching television per week, we believe that in most cases, people do have sufficient time to walk for 30 minutes per day but choose not to do so. Self-monitoring tools were considered, such as diaries or log books to increase conscious awareness while conducting behaviour. This method of "mindful behaviour" could be utilised as a catalyst within the motivational phase to increase intention in the context to help participants to allocate their time to include the recommended duration of daily physical activity. However, it became apparent during piloting that participants did not need such complicated techniques to identify time(s) when they could walk more; they were perfectly capable of identifying such times themselves.

Equally, where a barrier such as inclement weather was identified as a barrier to walking more, the solutions to this were usually obvious to participants, e.g. carry an umbrella or leave one at work. More generally, it was felt that to point out such solutions out to participants would be patronising and insulting. Consequently, the best people to identify how to overcome barriers to walking were the people who identified the barriers. In these regards, our intervention therefore was influenced by the thinking behind motivational interviewing (Miller & Rollnick, 2002).

It has been observed in research on people with addictions that when the interventionist cites the reasons for change, the client in turn cites the reasons for not changing: each person takes on one side of the argument. This can be seen as the client "resisting or "in denial". By contrast, the more people talk about their own reasons for change during interventions, the more likely they are to do so (Miller & Rollnick, 2002). Thus, getting the participants to rehearse the reasons why they were capable of walking more and how they could overcome barriers, was a potentially very effective method of increasing PBC. The overall aim of this motivational phase of the intervention therefore became to elicit the participants' intrinsic desire and reasons for change. The present intervention attempted to promote increases in walking by communicating in a way that elicited the participants' own reasons why they could change and how they could bring this change about.

Providing information and persuasion are also unlikely to be sufficient to result in behaviour change as there is often a "gap" between intentions and behaviour (Orbell & Sheeran, 1998). The problem here is not so much an absence of intentions, which changes in beliefs could reasonably be expected to bring about but an absence of skills to translate those good intentions into behaviour. In line with this, the intervention included not only a motivational arm, to increase the intention to walk more but also a volitional arm to enact those intentions (Heckhausen, 1991; Schwarzer, 1992). This may be particularly important for walking, as the association between intentions and behaviour has been found to be low in past research (Scott et al, 2007).

Content of the intervention to increase walking

The motivational arm of the intervention had three components. First, there was a "warm up" task, where the participants were each shown 10 statements derived from previous participants about what would make it easier for them to walk more, i.e., "when I felt like I have enough time to walk"; "when I can walk in pleasant surroundings". They then had to use a ten-point scale to indicate how confident they would be that they could bring about their walking in that specific situation. The researcher asked them to elaborate on any of incidences where they indicated a high level of confidence, i.e. where they endorsed a rating towards the higher end of the scale. This "warm up" task had the dual aims of engaging the participants with the intervention, and rehearsing their reasons why they believed they could walk more. Note that this task conforms to the principles behind motivational interviewing of getting participants to rehearse their own reasons why they believe they can carry out the behaviour.

The second component of the motivational arm of the intervention required participants to think of three occasions where they felt like they had personal control over their walking. They were then asked to explicitly state what they felt that the helpful factor in each situation had been. Here, the aim was to get participants to recall previous mastery experiences, i.e. occasions where they felt they not only could but did manage to walk. Participants were also asked to thinking of the opposite situation, i.e. to generate an example of a time when they felt like they had no control over their walking and state the unhelpful factor. By completing both tasks, we aimed to encourage participants to realise what were the important barriers to them in walking more.

The second component of the motivational arm of the intervention fed into the final component of this arm. Participants were required to develop what we called a facilitative plan. On the basis of what they had already talked about, participants generated three helpful factors that would make it easier for them to implement their physical activity plans. Participants were then required to produce ideas for how they could successfully bring about these factors. For instance, if they indicated that having a free period at lunchtime was a particularly helpful factor in determining whether they walked, they made a plan to block out time in their diaries to this end, to prevent other activities taking priority. These facilitative plans can be thought of as analogous to coping plans (Sniehotta, Scholz & Schwarzer, 2005; 2006) but with the focus on encouraging helpful factors rather than overcoming difficulties. We anticipated that this focus should not only result in higher feelings of control over the behaviour but also was more congruent with the principles behind motivational interviewing, of focussing on reasons why the participants could successfully enact the behaviour.

The volitional arm also had three components. First, participants were informed of the average amount of walking that they currently did during a usual day, based on their responses to the Neighborhood Physical Activity questionnaire (Giles-Corti et al, 2006). On the basis of this, they were asked to decide whether their goal was to increase their walking by an additional 10 minutes a day or an additional 20 minutes a day. They were asked to consider this choice carefully and to be realistic when selecting their goal.

Participants were given this freedom to choose their goals for two reasons which pulled in opposite directions. First, there is evidence that allowing people to choose their own goals results in more engagement with those goals and intrinsic motivation than assigning

goals (Locke & Latham, 2002). Consequently, allowing participants some degree of choice was felt to be a good thing. On the other hand, we felt that allowing participants a completely free rein in terms of their chosen goals had its drawbacks. First, participants might choose unrealistically difficult goals for themselves, which they were unlikely to achieve and consequently experience as setbacks. Second, allowing participants a completely free choice does not allow a satisfactory evaluation of the effects of the intervention based on changes aggregated across groups: if the goals are highly heterogeneous, then comparisons of beliefs and behaviour over time becomes less meaningful.

Having decided on which goal they were aiming to achieve, participants were then asked to make three action plans to incorporate their additional walking into their everyday lives. Action planning can help initiate action by specifying when, where, how and with whom to act (Sheeran, Milne, Webb & Gollwitzer, 2005). People who form action plans are more likely to act in the intended way and can help people to implement their intentions (Gollwitzer & Brandstatter, 1997). Participants were also asked to consider what potential barriers or obstacles could interfere with the success of their action plans and to revise them if necessary.

The final component of the volitional arm of the intervention involved participants developing coping plans to overcome with the possible barriers they had just identified. Coping plans can help a person overcome obstacles and to cope with difficulties by anticipating potential barriers to performing this behaviour i.e., feeling too tired or lazy to walk (Sniehotta, et al., 2006).

Both action planning and coping planning have been shown to be effective in promoting physical activity with cardiac rehabilitation patients (Sniehotta, et al., 2005; 2006), a group who often do not alter this behaviour in spite of strong intentions to do so (Johnston, Johnston, Pollard, Kinmonth, & Mant, 2004). In line with these previous successful interventions, participants were asked to make a commitment to act as they had planned to over the next seven days. They also received copies of all of their plans at the end of the intervention session to take home with them, to act as prompts.

The final study evaluates the success of this intervention.

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Table 1: Summary of raw correlations between walking intentions with attitude, subjective norm and PBC in the theory of planned behaviour studies.

Study	N	Attitude	Subjective norm	PBC
Eves, Hoppé, & McLaren (2003)	233	.06	-.01	.37**
Scott, Eves, French, & Hoppé (in press [study one])	41	.31	.45**	.50**
Scott, Eves, French, & Hoppé (in press [study two])	200	.06	.04	.69**
Darker & French (unpublished)	295	.37**	.49**	.49**
Darker & French (submitted)	46	.33*	.29	.50**
Rhodes, Brown, & McIntyre (2006)	351	.55**	.41**	.33
Galea & Bray (2006)	62	.74**	.59**	.74**

* $p<0.05$ ** $p<0.01$

CHAPTER SIX

A theory of planned behaviour intervention to promote walking amongst the general population: A waiting list randomized controlled trial.

Abstract

Objective: Perceived behavioral control (PBC) has been identified as the key determinant of walking behavior. The present study investigated whether altering PBC increases intention to walk more and objectively measured walking behavior, in line with the theory of planned behavior (TPB). Design: A waiting-list randomised control trial, 130 UK adults. The intervention consisted of three strategies to boost PBC, action planning, coping planning and facilitative planning. Main Outcome Measures: Pedometer minutes spent walking. Results: The intervention increased PBC, intentions and objectively measured walking from 20 minutes to 32 minutes a day. The effects of the intervention on PBC were not mediated by control beliefs, although the effects on intentions and behavior were mediated by PBC. At one month follow up, participants maintained their increases in walking. Conclusion: The findings of this study partially support the proposed causal nature of the TPB as a framework for developing and evaluating health behavior change interventions. This is the first study using the TPB to develop, design and evaluate the components of an intervention that has shown mediated effects on objectively measured behavior.

Keywords: theory of planned behavior; walking; physical activity; intervention

In recent years there has been a dramatic increase in obesity levels globally, a major cause of which is people not engaging in sufficient physical activity (Kopelman, 2000). The current England and Wales (Department of Health, 2004) and United States (Department of Health and Human Services, 1996) governmental guidelines are for adults to accumulate at least 30 minutes of moderate or vigorous physical activity on at least five days in every week. However, 60% of males and 70% of females in England do not reach this level of physical activity required to benefit their health (Department of Health, 2005). The US Surgeon General's office estimates that 25% of American adults are "completely sedentary", and that less than 40% maintain regular physical activity at the recommended levels of 30 minutes or more per day (Department of Health and Human Services, 2000). In a recent report, the Chief Medical Officer for England recognized the difficulty many people have in translating a physical activity recommendation into a meaningful behavior pattern that can fit into daily life (Department of Health, 2005).

Walking is especially promising as a focus of public health interventions. A meta-analysis found that increases in walking led to increased fitness, decreased body weight, BMI, percentage body fat and resting diastolic blood pressure in previously sedentary adults (Murphy, Nevill, Murtagh & Holder, 2007). Walking is the most common form of lifestyle physical activity that adults perform. Most importantly, walking is acceptable and accessible, particularly among populations who are the most physically inactive (Morris & Hardman, 1997).

A recent systematic review of 19 randomized controlled trials and 29 non-randomized controlled studies supports the efficacy of walking interventions (Ogilvie, et al. 2007).

Interventions encouraged people to walk more especially those tailored to peoples' needs, targeted at the most sedentary or at the most motivated to change and delivered either at the level of the individual or household or through groups. Despite this, the evidence on how sustainable and generalisable these interventions would be to improve public health is still inconclusive. The National Institute for Health and Clinical Excellence in the UK has stated that currently there is not enough evidence to support the use of walking interventions within primary care (NICE, 2006). The Ogilvie et al. (2007) meta-analysis included a mix of different types of interventions targeted at different populations, utilizing different modes of delivery and different assessments of change in walking, making interpretation in terms of policy difficult. More work is needed to identify effective intervention components concerning walking. It has been argued that a cornerstone of effective behavioral change is basing interventions on a sound basis of evidence and theory (Michie & Abraham, 2004). Theory based interventions can provide an explanation of how an intervention works, developing an understanding of the causal processes and mechanisms which account for any observed behavior change.

The theory of planned behavior (TPB; Ajzen, 1991; Fishbein & Ajzen, 1975), is a social cognition model commonly used to predict intentions and behavior. The TPB suggests that the proximal determinants of volitional behavior are a persons' intention to engage in that behavior and perceived behavioral control (PBC), i.e., the extent to which a person feels that the behavior is easy to perform and/or under their control. In turn, intentions are determined by attitude towards the behavior, subjective norm i.e., the perceived views of important others, and PBC. The basis of attitude, subjective norm and PBC are posited to be behavioral, normative and control beliefs. Attitude is determined by behavioral beliefs i.e., the perceived

consequences of engaging in that behavior, and the evaluation of these consequences (Ajzen & Fishbein, 1980). Subjective norms are determined by normative beliefs i.e., perceptions of whether important others think a person should or should not engage in a behavior, and by a persons motivation to comply with the perceived wishes of these important others (Ajzen & Fishbein, 1980). Perceived behavioral control is determined by control beliefs, i.e., factors or conditions that make it difficult or easy to perform the behavior, and by the perceived power of these factors or conditions to facilitate or inhibit the behavior (Ajzen, 1991).

Meta-analytic reviews of correlational studies using the TPB have provided empirical support in terms of its capacity to predict many behaviors (Armitage & Conner, 2001) including physical activity (Hagger, Chatzisarantis & Biddle, 2002). To date, the TPB has been mainly used to measure process and outcome variables and to predict intention and behavior. It has less commonly been used to develop interventions to change behavior. One potential reason for this is that although the TPB can help to identify key beliefs that interventions could focus on, it does not however provide guidelines about how to change beliefs (Norman & Conner, 2005). A systematic review of interventions based on the TPB (Hardeman, et al. 2002) identified 12 studies that used the TPB to develop a behavior change intervention. Seven of these studies were found to change self-reported behavior, further only two conducted mediation analysis to establish whether the effects of the intervention on behavior was mediated by TPB constructs. Since the Hardeman review, only two studies have been published, to our knowledge, examining whether the TPB constructs mediate the effects of interventions on behavior (Chatzisarantis & Hagger, 2005; Vinokur, Merion, Couper, Jones & Dong, 2006). However, as with the studies included in the Hardeman, et al., (2002) review, neither of these studies that conducted mediation analyses also objectively measured

behavior. So, critically the TPB has rarely been used to develop, design or evaluate interventions and no study has demonstrated an effect on objectively measured behavior that was shown to be mediated by TPB constructs.

To provide a rigorous test of the theory, we therefore designed an intervention with the aim of improving and expanding our understanding of the utility of the TPB as a framework on which to base interventions to encourage members of the general public to walk more. Importantly, mediation analyses were conducted to test the proposed casual pathway of the TPB (Sutton, 2002**)**. The intervention itself was developed during an extended period of formative research, which included an interpretative phenomenological analysis on walking behavior (Darker, Larkin & French, in press), a review of TPB walking studies (described below), a TPB belief elicitation study (Darker, French, Longdon, Morris & Eves, 2007), and a piloting of intervention components and TPB measures (Darker & French, submitted).

The TPB has been used to predict intentions or actual walking behavior in only six empirical studies, to our knowledge. Eves, Hoppé and McLaren (2003) found that PBC emerged as the only significant predictor of walking intentions within a sample of students. In another study with students, TPB constructs explained 21.7% of the variance in reported intentions to walk during the coming week, with PBC the only unique predictor (Scott, Eves, French & Hoppé, in press). In a follow-up study, with military personal, PBC again had the strongest relationship with intention (Scott et al, in press). Darker and French (submitted) and Rhodes, Brown and McIntyre (2006) with samples of members of the general public, also found a significant relationship between PBC and intention. Galea and Bray (2006) examined the efficacy of the TPB to predict intentions to walk in individuals with intermittent

claudication. Intention and PBC explained 8% of the variance in self-reported walking behavior, however, PBC was found to be the sole significant predictor of walking. Across diverse samples therefore, PBC was found to be the strongest predictor of intention in all but one study (namely that of Rhodes et al, 2006). PBC therefore appears to be the construct that behavior change interventions should aim to alter in order to increase intentions to walk more.

Altering intentions may not be sufficient to alter actual walking behavior as there is a "gap" between intentions and actions for many behaviors (Orbell & Sheeran, 1998). Scott, et al., (in press) found that TPB predicted self-reported intention to walk but failed to predict objectively measured behavior. Consequently, the focus of the present intervention was not only to enhance PBC in order to increase intention to walk more (motivational phase), but also to facilitate planning to help individuals to bridge the gap between having a "good intention" and actually translating that into behavior (volitional phase; Heckhausen, 1991).

According to Ajzen (1991), anything that changes the key underlying behavioral, normative and/or control beliefs in the appropriate direction will increase the likelihood of behavior change by increasing intention to change. In line with Ajzen's (2002a) recommendations Hardeman, et al., (2002) found that the behavior change methods most commonly used in TPB intervention studies were persuasion and providing information. By contrast, Bandura (1997) has argued that these techniques are limited in their power to create enduring increases in perceived self efficacy. Following Ajzen (1991), the current intervention will target control beliefs in order to bring about a change in PBC, which should then evoke a change in intention, leading to a subsequent change in actual behavior. The motivational stage of the intervention was based on techniques to alter PBC that were derived

from motivational interviewing (Miller & Rollnick, 2002). Motivational interviewing focuses on eliciting the person's internal motivation for change. Behavioral change is facilitated by communicating in a way that elicits the person's own reasons for change.

The volitional phase of the current intervention used action planning and coping planning. These have been shown to be effective in promoting physical activity interventions with cardiac rehabilitation patients (Sniehotta, Scholz & Schwarzer, 2006). Action planning can help initiate action by specifying when, where, how and with whom to act (Gollwitzer & Brandstatter, 1997; Sniehotta, Schwarzer, Scholz & Schűz, 2005). Coping plans (Sniehotta, Scholz & Schwarzer, 2006) can help a person overcome obstacles and to cope with difficulties by anticipating and overcoming potential barriers to performing this behavior i.e., feeling too tired to walk or bad weather.

The present study provides a rigorous test of an intervention to promote objectively measured walking behavior, based on the TPB and associated formative research, with a focus on using mediation analyses to test the hypothesized causal processes of the TPB. In line with Ajzen (1991), we hypothesis that (i) the intervention will lead to a change in control beliefs; (ii) the intervention will result in an increase in perceived behavioral control, mediated by a change in control beliefs; (iii) the intervention will result in an increase in intention to walk, mediated by a change in PBC and that (iv) the intervention will lead to an increase in the number of minutes spent briskly walking assessed by pedometers, mediated by a change in intention and/or PBC.

Method

Participants

This study was publicized via newspapers and radio station interviews local to the large city in the Midlands of England where the intervention took place. Participants were recruited from September 2006 until April 2007. This resulted in 176 people expressing interest and being given information about the study. The inclusion criteria stated that each participant must be between the ages of 16-65 years. Participants who walked for more than a self-reported 90 minutes a day in a usual week prior to the study taking place were excluded. All participants who wished to participate were screened, by the first author, using a general health questionnaire, to assess medical reasons why they could not engage in moderate physical activity, i.e., a brisk walk. Twelve people were excluded for not being within the age range or for diverse medical reasons. Power analysis indicated a need to recruit and retain 130 participants, giving 80% power to detect a medium effect size. After 42 people decided not to take part in the study, the final sample (N=130) included 92 females (70.8%) and 38 males (29.2%) with a mean age of 40.60 years (sd=10.84). A CONSORT diagram (Moher, Schulz & Altman, 2001) is used to show the flow of participants through the study (Figure 1).

Design

The study used a "waiting-list control" form of randomized controlled trial. Participants were individually randomly allocated to one of four experimental conditions via a random numbers generator. Half of the participants received the intervention immediately (at t1) and filler task (one week later at t2) and half received the filler task at t1 and the intervention at t2. Within the intervention session, half of the participants received the motivational intervention first and half of the participants received the volitional intervention

first. All participants received two face-to-face sessions and two postal follow-ups. The main outcome measure was number of minutes spent briskly walking, as assessed by pedometers.

Procedures

All sessions took place in a laboratory. At the beginning of the first session (t1), informed consent was obtained from all participants. Self-reported walking was assessed using the Neighborhood Physical Activity questionnaire (NPA; Giles-Corti, et al., 2006; see Appendix A), along with a full TPB questionnaire (see Appendix B). The participants were then randomly allocated to either the intervention group or the waiting-list control group. The experimental group received the motivational and the volitional components of the intervention at the same session, counterbalanced according to experimental condition. At the mid-point of the experimental session between the intervention components, participants received a four-item PBC scale. The control group received a filler task, which elicited their beliefs in relation to recycling. At the end of the session all participants completed the short version of the TPB questionnaire. All participants were given a pedometer, were instructed on its use and asked to wear it over the next week.

One week later (t2) all participants again completed the NPA and the full TPB questionnaire. Those participants that had previously received the intervention now received the filler task and the previous control participants received the intervention. Participants were given another pedometer to wear for a further week, which they were asked to return via the post using a stamped addressed envelope provided, along with the NPA and brief TPB questionnaire. The return of these items constituted t3. One month later (t4) all participants received another follow up measure comprising the NPA and the full TPB questionnaire.

Intervention components

The behavioral change intervention had two distinct components that aimed to alter either motivation to walk or to develop volitional plans to walk.

The motivational phase focused on prior instances of success towards the external and internal factors that may surround walking and consisted of three activities. First, a warm up task was used, whereby the participants were shown 10 statements about what would make it easier for them to walk more, i.e., "when I felt like I have enough time to walk"; "when I can walk in pleasant surroundings" (see Appendix C). They then had to use a scale to indicate how confident they would be that they could bring about their walking in that specific situation. The researcher asked them to elaborate on why they indicated a high level of confidence for any of the instances (Miller & Rollnick, 2002). Second, the participants were then asked to recall an occasion where they felt like they had personal control over their walking and explicitly state what they felt was the helpful factor in that situation (see Appendix D). Conversely, the participants were asked to recall an occasion when they felt like they had no control over their walking and state the unhelpful factor. Finally, the participants then used this information to develop a facilitative plan. This plan consisted of the participants generating three helpful factors that would make it easier for them to implement their physical activity plans. They also produced ideas for how they could successfully bring about these factors (see Appendix E).

At the start of the volitional phase of the intervention, participants were informed of the average amount of walking that they currently did during a usual day, based on estimates

derived from the NPA. Following discussion with the researcher, they were then asked to decide whether to increase their walking by an additional 10 minutes a day or an additional 20 minutes a day. Participants were given a choice of goals because goal theories have indicated that participants given a certain amount of choice are more likely to be successful in implementing their goals (Gollwitzer, 1993).

Participants were required to develop up to three action plans to incorporate their additional walking into the next seven day period. Each entailed deciding when, where, with whom and how the walking was to take place (see Appendix F). The participants were asked to think about what potential barriers or obstacles that they could anticipate occurring and if necessary revise their action plan. They then developed coping plans which involved the participant anticipating any potential barriers or obstacles to their action plans and generating ideas as to how to successfully cope with each barrier in turn so as that their walking could still take place (see Appendix G).

The interviewer emphasized throughout the session that all of the plans were for the participants own benefit and that the additional walking goal chosen was entirely a personal choice, with the emphasis on the feasibility of goals and plans. Participants were asked to make a commitment to act as they had planned to over the next seven days. They also received copies of all of their plans at the end of the intervention session to take home with them.

Measures

Self-reported walking was assessed via the Neighborhood Physical Activity questionnaire (Giles-Corti, et al., 2006), which measures the frequency and duration of recreational and transport related walking within and outside the neighborhood. Reliability estimates for the NPA are comparable with other traditional self-report physical activity instruments (Brown, Bauman, Chey, Trost & Mummery, 2004; Sallis & Saelens, 2000).

A full TPB questionnaire on walking behavior was developed based on a belief elicitation study with 180 members of the general public (Darker, et al., 2007) and was modeled on the recommendations of Ajzen (1991; 2002a) and Ajzen and Fishbein (1980). There were 52 items, with ten behavioral beliefs, three normative beliefs and five control beliefs. There were five attitude questions (Cronbach's $\alpha = .85$), four subjective norms questions (Cronbach's $\alpha = .75$), four perceived behavioral control questions (Cronbach's $\alpha = .85$) and three intention questions (Cronbach's $\alpha = .80$). All responses were on a 1-7 rating scale.

The brief eight item TPB questionnaire had one attitude, one subjective norm, four perceived behavioral control and two intention items, which were derived from the full TPB questionnaire. The four item PBC scale utilized the same PBC items which appeared in the full TPB questionnaire. Action planning was measured by four items (Cronbach's $\alpha=.99$), for example, "I have made a detailed plan regarding when to walk" and "I have made a detailed plan of where I am going to walk" (Sniehotta, Schwarzer, Scholz, & Schűz, 2005).

The NL-1000 pedometer (New Lifestyles Inc. USA) provides an objective measure of walking and records both step count and the number of minutes activity at a set intensity. The pedometer was set to record moderate activity (i.e., brisk walking) and above to the exclusion of light or low intensity activity, i.e., at least four or above on its nine settings. Pedometer data were cleaned (Rowe, Mahar, Raedeke & Lore, 2004), all pedometer scores below 1,000 steps and above 30,000 were treated as missing data and mean scores for the same participant on other days was substituted.

Analysis

For all the analyses, the four experimental conditions were collapsed into two groups (intervention and control). Analyzes were conducted to compare those that received the intervention versus those participants allocated to the control group. A series of 2x2 mixed design ANOVAs were conducted to evaluate the effects of the intervention on the constructs within the theory of planned behavior. The repeated measure factor was measurements at t1 and t2 and the between subject factor was the experimental condition i.e., the control or intervention group.

Given the absence of baseline pedometer measures, independent samples t-tests were conducted to examine whether the objective measure of pedometer walking of the participants had increased after receiving the intervention. Maintenance of walking was assessed by a 2x4 mixed factor ANOVA. The repeated measures factor was NPA scores throughout t1, t2, t3 and t4; the between subjects factor was the experimental condition. Post hoc paired sample t-tests were performed to determine the differences between the intervention group and the control group over the four time points of the NPA.

Mediation analyses were conducted to test the causal hypotheses derived from Ajzen (1991). Mediation implies a causal relationship whereby an independent variable causes a change in a mediator variable, which in turn causes a dependent variable. The Baron and Kenny (1986) form of mediation analyses was followed. Steps one, two and three involves establishing that the independent variable (experimental group) predicts the dependent variable (e.g. intention); testing to see whether the independent variable is correlated with the mediator (e.g. control beliefs); and testing whether the mediator predicts the dependent variable, when the independent variable is also included in the regression equation. If steps one to three are significant, then at least partial mediation is established. Step four tests whether the independent variable predicts the dependent variable, when the mediator is also included in the regression equation. Full mediation is established if the contribution of the independent variable is non-significant. A more recent approach was also followed to test the mediation hypothesis, based on the bootstrapped sampling distribution model (Preacher & Hayes, 2004). Bootstrapping is a nonparametric approach to effect-size estimation and hypothesis testing that makes no assumptions about the shape of the distribution of variables, nor about the sampling distribution of the statistics. Mediation analyses of the effects of attitude, subjective norm and PBC on intention were conducted on the brief TPB measures taken at end of t1, as were the effects of intention, PBC and action planning on pedometer scores. The effects of beliefs on direct TPB measures were based on full TPB measure taken at the beginning of t2.

Results

Did the intervention change behavioral, normative and control beliefs?

Behavioral, normative and control beliefs did not change as a result of the intervention (see Table 1).

Did the intervention change attitude, subjective norm, PBC and intention?

Attitude increased as a result of the intervention with a very large effect size of Cohen's d =1.55 (see Table 1). There were no significant effects for subjective norms. Perceived behavioral control scores increased as a result of the intervention with a very large effect size of Cohen's d =1.86. Changes in intention scores increased as a result of the intervention, with a very large effect size of Cohen's d =1.55.

Did the intervention change behavior?

There was a significant difference [$t(116)=4.86$, $p<0.001$] in the number of minutes spent walking, as assessed by pedometers, in the week up to t2 between the control group (M=138.7, SD=93.9) and the intervention group (M=225.7, SD=100.3), with a large effect size of Cohen's d =.90.

There was a significant difference [$t(116)=5.850$, $p<0.001$] in the number of steps, as assessed by pedometers, in the week up to t2 between the control group (M=48643.3, SD=11515.7) and the intervention group (M=62751.7, SD=14555.5), with a large effect size of Cohen's d =1.07.

Did beliefs mediate the effects of the intervention on PBC, attitude and subjective norm?

Mediation analyses were conducted to assess whether the effects of the intervention on attitude, subjective norm and PBC were mediated by respectively behavioral, normative and control beliefs in line with the TPB theoretical framework (refer to Table 2). According to the Baron and Kenny (1986) criteria, the effect on attitude was not mediated by behavioral beliefs, PBC was not mediated by control beliefs and subjective norm was not mediated by normative beliefs. The Preacher and Hayes (2004) method supported these findings with the amount of variance accounted for by the indirect (mediation) path in all cases was not significant.

Did PBC and attitude mediate the effects of the intervention on intentions?

The effect of the intervention on intention was partially mediated by PBC and by attitude (see Table 2). A statistically significant amount of the effects of the intervention on intention was accounted for via the indirect effects of the intervention on PBC ($p<0.01$) and on attitude ($p<0.01$).

What mediated the effects of the intervention on behavior?

Mediation analyses were conducted to determine the potential mediating effects of intention, PBC and action planning (shown in Table 2). According to the Baron and Kenny method, the impact of the intervention on pedometer scores was partially mediated by intention. However, according to the Preacher and Hayes method, there was no significant mediation by intention scores of the intervention effects on pedometer scores. According to the Baron and Kenny method, the effects of the intervention on pedometer scores were partially mediated by PBC. The amount of variance accounted for by the indirect PBC

pathway was significant ($p<0.05$) as indicated by the Preacher and Hayes method. According to the Baron and Kenny method, the impact of the intervention on pedometer scores was fully mediated by action planning. However, according to the Preacher and Hayes (2004) method, there was no significant mediation of the effects of the intervention on the action planning-pedometer effects.

Were these effects maintained?

Maintenance of walking was assessed using NPA scores (Giles-Corti, et al., 2006) (see Figure 2). Minutes spent walking as assessed by pedometers over the first week of measurement correlated strongly with this self-report measure (r=.58), supporting its validity. The intervention had a significant interaction effect on self-reported walking over time [$F(3,94)=33.88$, $p<0.001$].

Post hoc paired sample t-tests for the intervention group indicated that there was a significant increases in number of minutes spent walking between t1 (mean=139.6, sd=126.5) and t2 (mean=313.6) [$t(46)=11.38$, $p<0.001$], between t1 and t3 (mean=305.0, sd=139.6) [$t(46)=8.12$, $P<0.001$], between t1 and t4 (mean=287.3, sd=129.4) [$t(46)=6.53$, $p<0.001$]. There was no observed difference between t2 and t3 for the intervention group [$t(46)=0.46$, $p=.643$] but there was a significant decrease between t2 and t4 for the intervention group [$t(46)=1.96$, $p<0.05$]. Post hoc tests for the control group indicated that there was a significant increase in the number of minutes spent walking in t2 (mean=147.7, sd=114.4) and t3 (mean=293.7, sd=111.8) [$t(50)=9.53$, $p<0.001$] and between t2 and t4 (mean=259.0, sd=158.2) [$t(50)=5.67$, $p<0.001$] and a significant decrease between t3 and t4 [$t(50)=2.07$, $p<0.05$]. The intervention resulted in a large increase in the number of minutes spent

walking. Although, this level of increase was not fully maintained at t4, it was still significantly higher than at baseline.

Discussion

The results of this study were only partially supportive of the hypotheses derived from the TPB (Ajzen, 1991). The intervention did not lead to a change control beliefs (Hypothesis 1 not supported). The intervention resulted in a large increase in perceived behavioral control but this change was not mediated by the change in control beliefs (Hypothesis 2 not supported). The intervention resulted in a large increase in intention to walk which was mediated by a change in PBC (Hypotheses 3 supported). Finally, the intervention led to an increase in the number of minutes spent briskly walking mediated by a change in PBC but not by a change in intention (Hypothesis 4 supported). The increase in walking was from a mean of 20 minutes to a mean of 32 minutes a day, as assessed by pedometers. These differences were still observed, albeit with a smaller effect size one month later. This is also the first study, to our knowledge, that shows an effect on any objectively measured behavior that has been shown to be partially mediated in line with the TPB, i.e. effects on intention and behavior mediated by PBC.

There were a number of major strengths to this study. Firstly, this study had a sound theoretical basis. The TPB has previously mainly used to measure process and outcome variables and to predict intention and behavior and less commonly to develop the intervention (Hardeman, et al., 2002). The TPB was used in the current study as the theoretical framework to design, implement and evaluate the intervention. Critically, the TPB has rarely been used to develop or evaluate the interventions. The second major strength of the current study was

the extensive formative research that was conducted on walking behavior and a review to identify PBC as the major determinant of whether members of the general public walk. This included following the recommended guidelines for developing the TPB measures, based on a large belief elicitation study (Darker et al, 2007), and tested for understandability and ease of use, utilizing a think-aloud protocol, within a similar type of sample of 45 members of the community (Darker & French, submitted). The third strength of this study was the development and piloting of key intervention components such as the behavioral change techniques (Darker & French, submitted). Fourthly, this is the only study, to our knowledge, to utilize the TPB to develop and evaluate a walking intervention in a community sample. The fifth strength of this study is that each participant was required to wear a pedometer over the course of the intervention to obtain an objective measure of behavior change. This allowed us to determine whether the effects of the intervention were having a real change on actual behavior or just affecting subjective estimates of walking. Finally, the present study recruited and retained an adequate sample size, based on power calculations, to have sufficient power to detect medium-sized changes in outcome measures. Attrition rates were very low, indicating the acceptability of such an intervention to a community sample.

There were also a number of limitations to the present study. Firstly, a waiting list design was employed in order to increase acceptability of the research protocol to the participants and to decrease attrition effects. With this type of design, all participants whom entered into the study, will receive the intervention, half will just “wait” to receive the intervention. However, the limiting factor with this type of design is that comparisons of objectively measured behavior between groups can not be obtained after both the groups have received the intervention. Secondly, the follow-up data collection points in this study were

conducted via self-report only. However, there was a strong correlation between the pedometer scores and self-report data suggesting that the self-report measure used is indicative of objective behavior. Thirdly, also related to limitations due to the design, we can not extrapolate if the results are due to the motivational or the volitional aspects of the intervention. Therefore, we can not disentangle which of the components of intention, PBC or action planning is *the* mediator due to the study design. Future research is needed, with the central components of this study delivered to separate groups in order to ascertain the principal mechanism by which walking behavior was increased. Fourthly, the sample within this study was a healthy community volunteer sample, which may have resulted in a sample who were more willing to increase their walking than a selected community sample. However, this limitation has little effect on our main aim which was to test the TPB, although it does mean that generalisability, as well as maintenance, of the effects of our intervention, are not proven.

The findings of the mediational causal processes and subsequent discussion are based more on the Preacher and Hayes (2004) bootstrapping method and not that of Baron and Kenny (1986) where the results of the two methods differ. This choice was based on a recent review of mediational analysis (MacKinnon, Fairchild & Fritz, 2007). There is evidence that methods of mediation such as the steps outlined by Baron and Kenny (1986) have a very low power to detect mediated effects, especially in the case of complete mediation (i.e., direct effect is zero)and are more likely to produce spurious results (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002). Bootstrap tests, such as those of Preacher and Hayes are most likely to yield more accurate probability estimates (MacKinnen, et al, 2007; Shrout and Bolger, 2002).

The proposed mechanism of the TPB as outlined by Ajzen (1991) suggests that behavior change is brought about by changing behavioral, normative or control beliefs. However, in the present study, there was no mediating effect of the intervention on PBC via causal beliefs as proposed by Ajzen (1991 – see also Sutton, 2007). The findings of the present study therefore do not support this part of the proposed causal pathway of the TPB. Instead, PBC appears to have been affected directly.

Ajzen has commented that PBC "owes its greatest debt to Bandura's work on self-efficacy" (Ajzen, 2002b, p. 3). Social cognitive theory (Bandura, 1986) suggests four methods to increase a persons self-efficacy; verbal persuasion, enactive mastery experiences, vicarious experience and physiological and affective states. Enactive mastery experiences are considered the most influential source of efficacy because they provide the most authentic evidence of whether a person can gather what it takes to succeed at performing the behavior (Bandura, 1997). Enactive mastery produces stronger and more generalized efficacy beliefs than do modes of influence relying solely on vicarious experiences, cognitive simulations or verbal instruction (Bandura, 1997). In line with motivational interviewing techniques, recall of previous enactive mastery experiences was utilized in the current study in the motivational phase of the intervention session with participants. Each participant had to recall a time of walking whereby they felt focused on prior incidences of success towards the external and internal factors that may surround walking. In sum, these results are inconsistent with Ajzen (1991), but instead support the position of Bandura (1997) on the sources of self-efficacy.

Attitude and perceived behavioral control mediated the effects of the intervention on intentions to walk, with the mediating effects being stronger for PBC than for attitude. On examination of the results of the Baron and Kenny (1986) steps, it is clear that PBC is having a much stronger effect on intention than attitude. First, it is affected much more strongly by the intervention (step 2), second PBC is much more strongly related to intention, once the intervention is partialled out (step 3) and third, the relationship between the intervention and intention is reduced considerably when PBC is controlled for (difference between steps 1 and 4); whereas, it is hardly affected when attitude is controlled for (also difference between steps 1 and 4). The intervention having an effect on attitude may be explained by evidence for the empirical and conceptual association between attitude and PBC. Kraft, Rise, Sutton and Roysamb (2005) have demonstrated that PBC could be conceived of as consisting of three separate but inter-related factors (perceived control, perceived confidence and perceived difficultly), with perceived difficulty items overlapping substantially with affective attitude. It may be that individuals have the greatest commitment to perform a behavior when they hold favorable beliefs about the behavior and they believe that they can successfully perform the behavior. In other words, individuals like performing behaviors that they find easy. The mediating effects of the intervention on attitude and PBC on intentions to walk is in support of Ajzen's (2002a) conceptualization of the TPB's causal mechanisms.

In the present study, there was a very large effect on behavior which was not mediated by a very large effect on intentions. This is contrary to a recent meta-analysis of 47 experimental test of intention-behavior relations which found that a medium to large change in intention led to a small to medium change in behavior (Webb & Sheeran, 2006). Contrary to the findings of Ziegelmann, Lippke & Schwarzer (2006), action planning did not mediate

the effects of the intervention using the Preacher and Hayes (2004) method. It therefore appears that for walking, altering PBC is the key ingredient for promoting walking behavior. Several studies (Johnston, Johnston, Pollard, Kinmonth & Mant, 2004; Sniehotta, Schwarzer, Scholz & Schuz, 2005) have previously found that motivation is not enough to alter lifestyle physical activity and that there is a need to develop methods to help individuals to increase their physical activity. The current intervention was successful in increasing PBC. Perceived behavioral control is held to exert both a direct and interactive (with intentions) effects on behavior. This is based on the rationale that however strongly held, the implementation of intention into action is at least partially determined by personal and environmental barriers, thus, "The addition of perceived behavioral control should become increasingly useful as volitional control over behavior decreases" (Ajzen, 1991, pp. 185). Therefore, in situations where prediction of behavior from intention is likely to be hindered by the level of actual (i.e., volitional) control, PBC should predict behavior directly (Armitage & Conner, 2001). Sheeran, Trafimow, and Armitage (2003) have shown that where measures of PBC proved to be accurate proxy measures for actual control, PBC provided stronger predictions of behavior. In the current study, behavior was mediated by PBC but not by intention, suggesting that it was the interventions effects on PBC were having a direct effect on increases in walking behavior. PBC may have been responding to the enactive mastery technique that was utilized in the motivational component of the intervention. Perhaps in comparison to other forms of physical activity, walking is easy and individuals struggle not with implementing walking plans but with initial motivation to walk.

This is the first study that shows an effect on any objectively measured behavior that has been shown to be partially mediated in line with the TPB, i.e. effects on intention and

objectively measured behavior mediated by PBC. There is still a need however to disentangle *how* it works. There is a need for further such evaluative tests of the TPB, with other objectively measured behaviors, to examine whether the TPB is a sound theoretical framework that can be used to develop other health behavior interventions. There is also a need to examine in the future whether this type of behavioral change intervention could be generalized to a wider population of people and potential clinical samples. Objectively measured follow-up information at different time points, such as one month, three months, and six months would need to be gathered to assess longer term effectiveness. It would be of interest to test this intervention within a different setting, delivered by different individuals such as a health practice nurse and also with a different type of health behavior to determine if the effects could be replicated under different circumstances.

Conclusion

We have reported a theory-based intervention, which was developed on the basis of an extended period of formative research, tailored to the individual, and which has rigorously tested the efficacy of the TPB as a framework for use within a health behavior change context. Increasing individuals' sense of personal control over aspects of their walking, leading to an increase in an intention to walk more, encouraged them to *actually* walk more. Walking continues to show promise as an avenue of intervention within public health.

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Table 1: Mean scores of direct and indirect measures during time 1 and time 2 of the intervention and significance of 2x2 ANOVA's.

	Time 1		Time 2		Probabilities			Interaction
	Intervention Mean (sd)	Control Mean (sd)	Intervention Mean (sd)	Control Mean (sd)	Time	Group	Interaction	effect size Cohen's d
Behavioural beliefs	246.60(48.99)	241.32(49.59)	255.87(47.24)	243.29(49.70)	.16	.27	.16	.25
Normative beliefs	70.47(23.51)	69.23(22.44)	73.61(27.17)	69.18(22.34)	.09	.49	.09	.17
Control beliefs	64.58(24.94)	65.62(21.14)	64.77(19.90)	62.57(21.20)	.40	.86	.34	.05
Intention	**15.72(2.98)**	**15.28(2.96)**	**19.70(2.57)**	**15.43(2.91)**	**.01**	**.01**	**.01**	**1.55**
Attitude	**29.56(4.35)**	**29.18(3.89)**	**32.63(3.43)**	**29.14(3.65)**	**.01**	**.01**	**.01**	**.98**
Subjective norm	20.82(4.21)	21.10(3.90)	21.04(4.06)	21.07(3.67)	.56	.81	.44	0
PBC	**19.89(4.57)**	**19.56(4.36)**	**26.09(3.00)**	**19.46(4.03)**	**.01**	**.01**	**.01**	**1.86**

Table 2: Mediation effects of the intervention between the intervention and the control group as assessed by Baron and Kenny (1986) method and Preacher and Hayes method (2004) method.

		Baron & Kenny					Preacher & Hayes	
Mediator	DV	Step1 IV&DV	Step2 IV&Med	Step 3 DV& Med/IV	Step4 DV&IV/Med	Med	N	Mean
Behavioral beliefs	Attitude	-.44***	-.13	.53***	-.37***	None	129	.52
Normative beliefs	Subjective norm	-.00	-.08	.53***	.04	None	128	.39
Control beliefs	PBC	-.68***	-.07	.10	-.68***	None	128	.05
Attitude	Intention	-.64***	.-32***	.27***	-.55***	Part	125	.42**
Subjective norm	Intention	-.64***	.01	.08	-.64***	None	129	.00
PBC	Intention	-.64***	-.63***	.55***	-.29***	Part	128	1.70**
Intention	Pedometer	-.41***	-.64***	.21*	-.27**	Part	117	30.44
PBC	Pedometer	-.41***	-.63***	.27**	-.23*	Part	116	37.64*
Action plan	Pedometer	-.41***	-.96***	.49***	.06	Full	116	84.44

* $p<0.05$ ** $p<0.01$ *** $p<0.001$

Figure 1: CONSORT flow diagram of participants throughout the intervention.

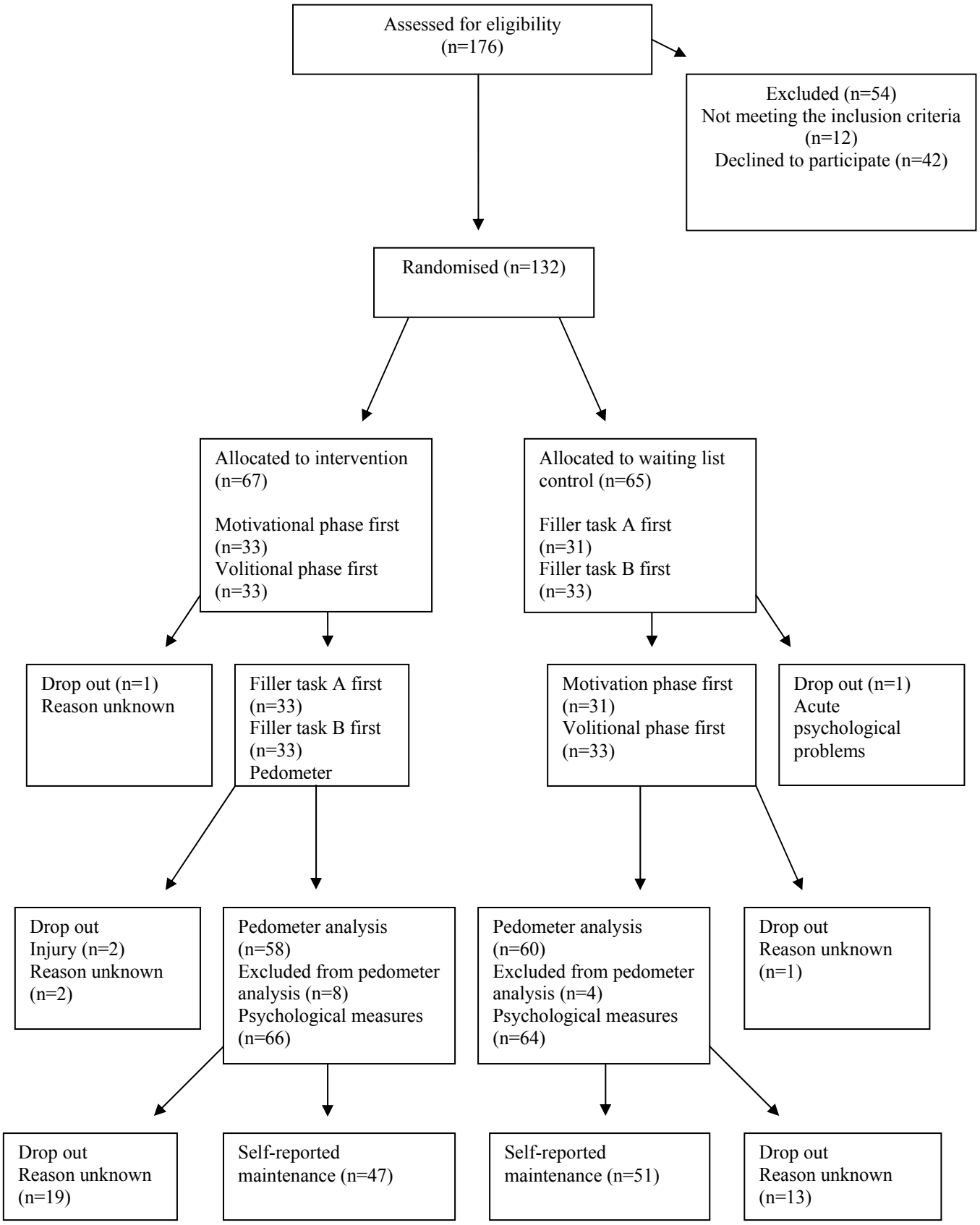
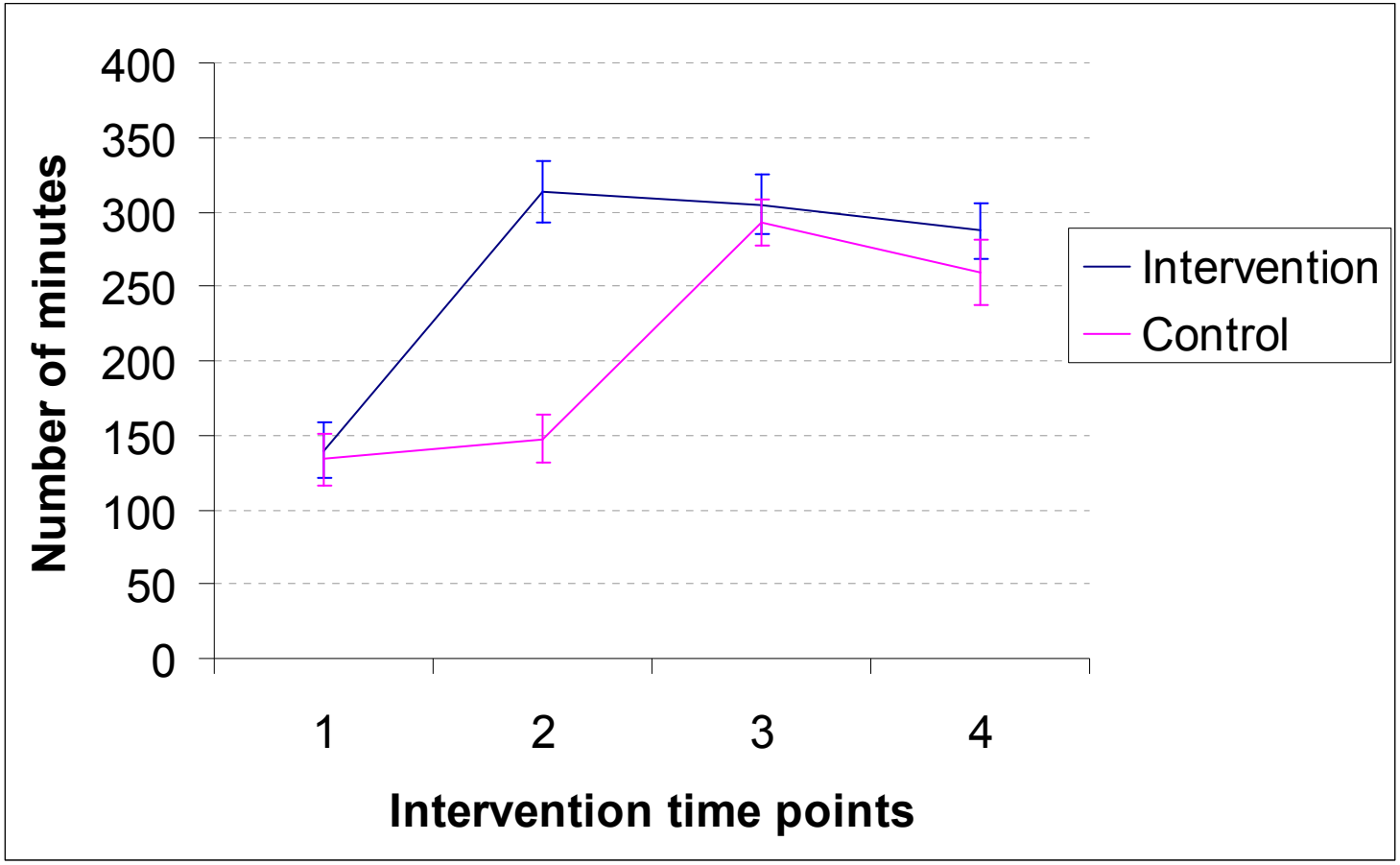


Figure 2: Self-reported maintenance of walking across all four time points for the intervention group (N=47) and the control group (N=51).



Appendix A: Neighbourhood Physical Activity Questionnaire

In the next section, we ask you about walking in and around your neighbourhood, then in section B, we ask about walking outside your neighbourhood.

In both sections we ask you about two types of walking: walking for transport (e.g. to the shop), *then* walking for recreation, health and fitness. If the walking that you do for transport is also for recreation, health or fitness, please record it only once.

For example:

Linda lives 20 minutes away from work. She chooses to walk there rather than drive mainly because she wants to improve her fitness. If Linda records that she walks for transport (3 times per week for a total of 120 minutes), she would not repeat that information under walking for recreation, health or fitness.

Section A: This section is about walking IN AND AROUND your neighbourhood or local area – we mean *everywhere within a 10-15 minute walk of your home.* Section B is about walking OUTSIDE you neighbourhood.

1 In a **USUAL WEEK**, do you walk in or around your neighbourhood or local area to get to or from somewhere (such as walking to a shop or to public transport) or for recreation, health or fitness (including walking your dog)?

No ☐ **→ GO to question 8**

Yes ☐

WALKING FOR TRANSPORT IN AND AOUND YOU NEIGHBOURHOOD

2 In a **USUAL WEEK**, how many times do you walk **as a means of transport**, such as going to and from work, walking to the shop or walking to public transport in your neighbourhood or local area?

Write in number of times

☐ ***If 0 → Go to question 5***

3 Please estimate the total time you spend walking **as a means of transport** in your neighbourhood or local area in a **USUAL WEEK.** (e.g. 5 times by 10 minutes = 50 minutes).

☐ **Hours** ☐ **Minutes**

4 Tick all the places where you walk to as a means of **transport** in and around you neighbourhood or local area in a **USUAL WEEK**.

Tick all the places you might walk to as a means of transport IN your neighbourhood or local area in a USUAL week	
E.g. To or from shops	☐
To or from work [or study]	☐
To or from public transport	☐
To or from shops (1)	☐
To or from shops (2)	☐
To or from school	☐
To or from café or restaurant	☐
To or from friends house	☐
Somewhere else (1): **Please write where** _____	☐
Somewhere else (2): **Please write where** _____	☐

WALKING FOR *RECREATION, HEALTH OR FITNESS* IN AND AROUND YOU NEIGHBOURHOOD. If you have included recreational walking in the previous section, please do not repeat it in this section.

5 In a **USUAL WEEK**, how many times do you walk **for recreation, health or fitness** (including walking your dog) in or around your neighbourhood or local area?

Write in number of times

☐ ***If 0 → Go to question 8***

6 Please estimate the total time you spend walking for **recreation, health or fitness** in or around your neighbourhood or local area in a **USUAL WEEK**. (E.g. 5 times by 20 minutes = 100 minutes).

☐ ☐

Hours **Minutes**

7 Please tick all the places where you walk for **recreation, health or fitness** in or around your neighbourhood or local area in a **USUAL WEEK**.

Tick all the places might walk for recreation, health or fitness IN your neighbourhood or local area in a USUAL week	
E.g. Park, oval or bushlands	☐
Beach	☐
Park, oval or bushlands (1)	☐
Park, oval or bushlands (2)	☐
Park, oval or bushlands (3)	☐
Around the neighbourhood using streets/footpaths (no specific destination)	☐
Walking trails/paths NOT in a park or beach	☐
To or from café or restaurant	☐
To or from a shop	☐
Somewhere else (1): **Please write where** _____	☐
Somewhere else (2): **Please write where** _____	☐

Section B: This section is about walking OUTSIDE your neighbourhood or local area – we mean *everywhere further than a 15 minute walk from your home*. For example, somewhere you walk to in the next suburb, or somewhere you drive to).

8 In a **USUAL WEEK**, do you walk outside your neighbourhood or local area to get to or from somewhere (such as walking to a shop or to public transport) or for recreation, health or fitness (including walking your dog)?

No ☐ → ***You have finished the questionnaire***

Yes ☐ → ***Go to question 9***

WALKING FOR *TRANSPORT* OUTSIDE YOUR NEIGHBOURHOOD

9 In a **USUAL WEEK**, how many times do you walk **as a means of transport**, such as going to and from work, walking to the shop or walking to public transport outside your neighbourhood or local area?

Write in number of times

☐ ***If 0 → Go to question 12***

10 Please estimate the total time you spend walking **as a means of transport** outside your neighbourhood or local area in a **USUAL WEEK**. (E.g. 5 times by 10 minutes = 50 minutes).

☐ ☐

Hours **Minutes**

11 Tick all the places where you walk to as a means of **transport** outside your neighbourhood or local area in a **USUAL WEEK**.

Tick all the places you might walk to as a means of transport OUTSIDE your neighbourhood or local area in a USUAL week	
E.g. To or from shops	☐
To or from work [or study]	☐
To or from public transport	☐
To or from shops (1)	☐
To or from shops (2)	☐
To or from school	☐
To or from café or restaurant	☐
To or from friends house	☐
Somewhere else (1): **Please write where** _____	☐
Somewhere else (2): **Please write where** _____	☐

WALKING FOR RECREATION, HEALTH OR FITNESS OUTSIDE YOUR NEIGHBOURHOOD. If you have included recreational walking in the previous section, please do not repeat it in this section.

12 In a **USUAL WEEK**, how many times do you walk for **recreation, health or fitness** (including walking your dog) outside your neighbourhood or local area?

Write in number of times

☐ ***If 0 → You have finished the questionnaire***

13 Please estimate the total time you spend walking for **recreation, health or fitness** outside your neighbourhood or local area in a **USUAL WEEK**. E.g. 1 time for 30 minutes = 30 minutes).

☐ **Hours** ☐ **Minutes**

14 Tick the places where you walk for **recreation, health or fitness** outside your neighbourhood or local area in a **USUAL WEEK**.

Tick all the places you might walk for recreation, health or fitness OUTSIDE your neighbourhood or local area in a USUAL week	
E.g. Park, oval or bushlands	☐
Beach	☐
Park, oval or bushlands (1)	☐
Park, oval or bushlands (2)	☐
Park, oval or bushlands (3)	☐
Around the neighbourhood using streets/footpaths (no specific destination)	☐
Walking trails/paths NOT in a park or beach	☐
To or from café or restaurant	☐
To or from a shop	☐
Somewhere else (1): **Please write where** _____	☐
Somewhere else (2): **Please write where** _____	☐

Appendix B: Full theory of planned behaviour questionnaire

Thank you for completing this questionnaire on walking. By walking we mean walking for *" exercise, transportation or any other purpose".*

As you move through the questions on the following pages you will notice that you are responding to amount of walking that you have reported that you did over the last 7 days with the phrase *"_____ minutes on average a day over the next 7 days".*

Please keep these definitions in mind when answering the following questions.

Walking for ____ minutes on average a day over the next 7 days…

…Will be good for my heart

Very unlikely	1	2	3	4	5	6	7	Very likely

Being good to my heart is

Unimportant	1	2	3	4	5	6	7	Important

…Will help me manage the stresses of life

Strongly agree	1	2	3	4	5	6	7	Strongly disagree

Managing the stresses of life is

Extremely bad	1	2	3	4	5	6	7	Extremely good

…Is a good source of exercise

Strongly agree	1	2	3	4	5	6	7	Strongly disagree

For me exercising is

Very important	1	2	3	4	5	6	7	Very unimportant

…Will provide me with fresh air

Strongly disagree	1	2	3	4	5	6	7	Strongly agree

Having fresh air is important to me

Definitely false	1	2	3	4	5	6	7	Definitely true

Walking for ____ minutes on average a day over the next 7 days…

…Will improve my overall fitness

Very unlikely 1 2 3 4 5 6 7 Very likely

Improving my overall fitness is

Unimportant 1 2 3 4 5 6 7 Important

…Will allow me to see a variety of places and scenery

Strongly agree 1 2 3 4 5 6 7 Strongly disagree

Seeing a variety of places and scenery is important to me

Definitely true 1 2 3 4 5 6 7 Definitely false

…I will probably encounter bad weather

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

Bad weather would make it

Pleasant 1 2 3 4 5 6 7 Unpleasant

…Is a waste of my time

Strongly agree 1 2 3 4 5 6 7 Strongly disagree

Not wasting my time is important to me

Very important 1 2 3 4 5 6 7 Very unimportant

Walking for ____ minutes on average a day over the next 7 days

…Means that I would walk through unpleasant environments

Strongly agree	1	2	3	4	5	6	7	Strongly disagree

Not walking through unpleasant environments is important to me

Very unimportant	1	2	3	4	5	6	7	Very important

…Means that I could injure myself

Strongly agree	1	2	3	4	5	6	7	Strongly disagree

Avoiding injuring myself is important to me

Definitely false	1	2	3	4	5	6	7	Definitely true

Walking for ___ minutes on average a day over the next 7 days will be

Harmful	1	2	3	4	5	6	7	Beneficial
Pleasant	1	2	3	4	5	6	7	Unpleasant
Good	1	2	3	4	5	6	7	Bad
Worthless	1	2	3	4	5	6	7	Valuable
Enjoyable	1	2	3	4	5	6	7	Unenjoyable

My family thinks that I

Should not	1	2	3	4	5	6	7	Should

walk for ____minutes on average a day over the next 7 days

With regards to walking, doing what my family thinks I should do is important to me

Not at all	1	2	3	4	5	6	7	Very much

Walking for ____ minutes on average a day over the next 7 days

My doctor would

Approve	1	2	3	4	5	6	7	Disapprove

With regards to walking, my doctors' approval matters to me

Very much	1	2	3	4	5	6	7	Not at all

People within my community would

Disapprove	1	2	3	4	5	6	7	Approve

With regards to walking, acting in a way that my community would approve is important

Definitely false	1	2	3	4	5	6	7	Definitely true

Most people who are important to me think that

I should	1	2	3	4	5	6	7	Should not

The people in my life whose opinion I value would

Approve	1	2	3	4	5	6	7	Disapprove

Most people who are important to me will themselves walk for ___ minutes on average a day over the next 7 days

Completely False	1	2	3	4	5	6	7	Completely True

Walking for ____ minutes on average a day over the next 7 days

The people in my life whose opinions I value will

Walk 1 2 3 4 5 6 7 Not walk

For ___ minutes on average a day over the next 7 days

I will have plenty of free time

Never 1 2 3 4 5 6 7 Regularly

If I have enough time to do so, it is

Much easier 1 2 3 4 5 6 7 Much more difficult

To walk for ___ minutes on average a day over the next 7 days

I will have a lot of work and family commitments over the next 7 days

Strongly agree 1 2 3 4 5 6 7 Strongly disagree

Having a lot of work and family commitments over the next 7 days would make it

Much easier 1 2 3 4 5 6 7 Much more difficult

To walk for ___ minutes on average a day over the next 7 days

I will feel pain in my legs, feet or back if I walk for ____ minutes on average a day over the next 7 days

Unlikely 1 2 3 4 5 6 7 Likely

If I feel pain in my legs, feet or back I am

Less likely 1 2 3 4 5 6 7 More likely

to walk for 30 minutes on average a day over the next 7 days

Walking for ____ minutes on average a day over the next 7 days

There is likely to be good weather over the next 7 days

Strongly agree 1 2 3 4 5 6 7 Strongly disagree

Good weather would make it

Much easier 1 2 3 4 5 6 7 Much more difficult

to walk for ____ minutes on average a day over the next 7 days

If I walk for ___ minutes on average a day over the next 7 days, I may walk through threatening areas

Strongly agree 1 2 3 4 5 6 7 Strongly disagree

Walking through threatening areas would make it

More likely 1 2 3 4 5 6 7 Less likely

that I would walk for ____ minutes on average a day over the next 7 days

For me to walk for ____ minutes on average a day over the next 7 days would be

Difficult 1 2 3 4 5 6 7 Easy

If I wanted to I could walk for ____ minutes on average a day over the next 7 days

Definitely true 1 2 3 4 5 6 7 Definitely false

How much control do you believe you have over walking for ____ minutes on average a day over the next 7 days?

No control 1 2 3 4 5 6 7 Complete control

It is mostly up to me whether or not I walk for ____ minutes on average a day over the next 7 days

Strongly agree 1 2 3 4 5 6 7 Strongly Disagree

Walking for ____ minutes on average a day over the next 7 days

I intend to								
Strongly agree	1	2	3	4	5	6	7	Strongly disagree
I will								
Definitely false	1	2	3	4	5	6	7	Definitely true
I plan to								
Strongly agree	1	2	3	4	5	6	7	Strongly disagree

Appendix C: Motivational warm up

A number of situations are described below that can make it easier to walk. Please rate in each of the blanks in the column how certain you are that you can get yourself to perform your walking regularly.

Rate your degree of confidence by recording a number from 1 -10 using the scale given below:

1	2	3	4	5	6	7	8	9	10
Not at all Confident									Extremely Confident

	Confidence (1-10)
When I felt like I have enough time to walk	____
When I feel like I have less time pressures at work	____
When I feel like I have satisfied any family and/or friends commitments	____
During good weather	____
When I feel like I do not have a lot of work to do at home	____
When I can plan my walks in safe well lit places	____
When I can walk in pleasant surroundings	____
When I can walk with other people	____
With support from my family and friends	____

Appendix D: Facilitative worksheet

Situation No1:

Think of an occasion where you were able to successfully have control over your walking:

What was the specific feature that helped you in this instance?

Think of an occasion where you did not have control over your walking:

What was the specific feature that did not help you in this instance?

What in your opinion is the main difference between the features that you found helpful and unhelpful?

Situation No 2:

Think of an occasion where you were able to successfully have control over your walking:

What was the specific feature that helped you in this instance?

Think of an occasion where you did not have control over your walking:

What was the specific feature that did not help you in this instance?

What in your opinion is the main difference between the features that you found helpful and unhelpful?

Appendix E: Facilitative plan

Which helpful factors might make it easier to implement your physical activity plans? How could you successfully bring about these factors? Please write down your plans in the following table. The more precise, concrete and personally you formulate your plans, the more they will help you.

Helpful factor 1:
Plan to successfully bring about this factor:
Helpful factor 2:
Plan to successfully bring about this factor:
Helpful factor 3:
Plan to successfully bring about this factor:

Memorise your plans carefully. Visualise the situations and your planned actions and make firm commitment to act as planned.

Appendix F: Action plan

Please think about the time after you leave this session. *Where, when, how* and *with whom* do you plan to walk ***more***? You are more likely to carry out your intentions to walk if you make a decision about when, where, with whom and how you will do so. Please write down your plans in the following table. The more precise, concrete and personally you formulate your plans, the more they can help you.

Plan	**When**	**Where**	**With whom**	**How** (i.e., how are you going to make the this plan happen?)
Plan 1				
Plan 2				
Plan 3				

Memorise your plans carefully. Visualise the situations and your planned actions and make firm commitment to act as planned.

Appendix G: Coping plan

Which obstacles or barriers might interfere with the implementation of your physical activity plans? How could you successfully cope with such problems? Please write down your plans in the following table. The more precise, concrete and personally you formulate your plans, the more they will help you.

Barrier/s to Plan 1:
Plan to cope successfully with problem:
Barrier/s to Plan 2:
Plan to cope successfully with problem:
Barrier/s to Plan 3:
Plan to cope Successfully with problem:

Memorise your plans carefully. Visualise the situations and your planned actions and make firm commitment to act as planned.

CHAPTER 7

General Discussion

The theory of planned behaviour (TPB; Ajzen, 1991, 2002) is one of the most popular theories in health psychology to understand and predict a range of health related behaviours (Conner & Sparks, 2005). Walking is a familiar, convenient and free form of activity that can be incorporated into everyday lifestyle and sustained into old age. Walking is important because it has been identified as the lifestyle physical activity that most people undertake (Morris & Hardman, 1997). This research had three main aims. One, to develop a clear understanding of walking behaviour within a general population. Two, to utilise the theory of planned behaviour (TPB) as a theoretical framework in which to develop and evaluate an intervention to encourage people to walk more. Three, to explore methodological issues in the TPB which may bias evaluation of intervention research.

The initial study is the first study which utilised the qualitative method of interpretative phenomenological analysis (IPA) in which to develop a rich and detailed account of participants' experiences of walking. The second study reports on the first belief elicitation of salient beliefs about walking within a general population sample. The third study is the largest study to date that has investigated the processes of interpretation and responses that individuals go through when they complete a TPB questionnaire. The final paper reports on the first study to provide a rigorous test of a TPB intervention to promote objectively measured walking behaviour, based on formative research, with a focus on using mediation analyses to test the hypothesised causal processes of the TPB.

Description of studies included

The initial study, explored how members of the general public understood the meaning of walking and examined whether this perception of walking was congruent with

current health promotion campaigns. The findings emphasised how the benefits of walking depend not only on the individual and beliefs about the activity itself but also on the social context in which the activity takes place. This also highlighted key elements such as efficiency and distance for some participants when considering walking as a mode of transport.

An important area of health promotion recommendations has been to emphasise that slight but crucial changes to a person's lifestyle can have a positive health outcome. Our participants viewed walking in rather different terms. Participants reported walking as not being "proper" exercise and that it is not a goal in itself. These findings challenge the current theme of health promotion campaigns which focus on encouraging activity through evidence that activity is a "good" thing to do and will bring about health protective benefits. People engage in healthy behaviour for reasons other than to be healthy. Within exercise literature, it has been demonstrated that people are motivated to intend to do exercise because they enjoy elements of it not because they think that it is "good for them" (Eves, Hoppé & McLaren, 2003; Lowe, Eves & Carroll, 2002, French, et al. 2005). Also other types of reasons are cited, such as stress relief, fresh air and scenery. These factors receive little or no consideration in health promotion campaigns, which tend to focus on the physical benefits of engaging in a more active lifestyle.

Alongside possible physical benefits, walking contributes to psychological well being. Psychological benefits may derive from the physical activity itself, from the outdoor environment in which the walking takes place and from the social experience of walking with another person. It is likely that multiple mechanisms are effective in any one situation. The

importance of any one mechanism will be determined by the walking characteristics such as intensity and duration, characteristics of the individual and environmental factors surrounding the walk. This suggests that future health promotion campaigns and interventions should focus more on and include the experiences of psychological benefits from walking itself, engaging people through walking for transport reasons and the social setting of the activity. Perceived barriers to walking must also be dealt with in order to facilitate long-term behaviour change.

The purpose of study two was to elicit salient beliefs about walking for an average of 30 minutes per day, with the further aim of investigating whether the order of TPB belief elicitation questions affects the number and types of beliefs elicited and whether affective and instrumental questions elicit different beliefs. To our knowledge this is the largest published belief elicitation study of physical activity. In turn, it is the only published belief elicitation study investigating walking behaviour (Symons-Downs & Hausenblas, 2005). Our sample of adult participants yielded an average of eleven salient beliefs (out of eight questions) about walking for at least an average of 30 minutes a day over the next seven days. It is important to identify the salient physical activity beliefs of a population because not all individuals share the same set of thoughts and feelings towards physical activity (Conner & Sparks, 2005). There is a lack of a belief elicitation phase within other studies which compromise the theory of planned behaviour's utility for understanding and explaining physical activity in general and walking behaviour in particular. The importance of conducting a belief elicitation study for each new physical activity under investigation is further highlighted when examining the different types of beliefs elicited in other physical activity studies. A recent review by Symons-Downs & Hausenblas (2005) of the use of an elicitation study when conducting a

TPB study into exercise behaviour examined 47 studies over a 22 year period. It was found that the most salient behavioural, normative and control beliefs were, respectively, that exercise improves physical and psychological health, family members have the strongest normative influence on exercise and physical limitations obstruct exercise. In the current study, the most common positive behavioural beliefs that were elicited concerned cardiovascular/health benefits, exercise, stress relief, fresh air/weather, fitness and scenery. The most common negative behavioural beliefs elicited concerned inclement weather and time. The most common normative beliefs were family and medical professionals. The most common control beliefs were a lack of time and inclement weather. Interestingly, time was cited as both a difficulty and an element that would make it easier for the respondents to walk for 30 minutes a day in addition to being cited as a disadvantage. Time therefore appears to be a crucial aspect of an individuals' decision as to whether or not to walk for an average of 30 minutes a day. These activity specific beliefs would have been neglected had a set of beliefs from previous physical activity studies using the TPB been utilised.

The affective and instrumental attitude distinction was upheld for walking behaviour. Questions about affective aspects of walking (like or enjoy/ dislike or hate) elicited different patterns of beliefs than questions about instrumental aspects (advantages/disadvantages). This finding warrants the distinction between affective and instrumental beliefs and attitudes to be included in future studies on physical activity behaviour. We found little evidence that the order of questions to elicit the standard TPB constructs of behavioural, normative and control beliefs affected the number and type of beliefs elicited. There were few differences between the number and type of beliefs elicited according to respondents' age or gender. These findings support the validity of the currently implemented guidelines for developing TPB

questionnaires. They do not address the issue of how people experience the process of responding to TPB questionnaires.

The third study addresses the concept of how people make sense of a TPB questionnaire on walking. It built on previous research by French, Cooke, McLean, Williams and Sutton (2007) which examined the nature and extent of problems that people have when completing theory of planned behaviour questionnaires, using a think-aloud approach. This study was limited due to a small sample size, resulting in a lack of statistical power adequately quantifying the nature of the problems encountered. Thus, the third paper employed a much larger sample size which allowed quantitative analysis to be more meaningfully applied, in order to detail the processes that participants go through in answering a TPB questionnaire on walking behaviour making it to date, the largest study to conduct such an investigation. While no problems were encountered with over two thirds of the questions, the average participant experienced over 16 problems with the questionnaire. All 45 of the participants found at least one type of problem with at least one type of question. There were no questions that were found to be completely unproblematic for all respondents.

The most problematic questions encountered were the normative aspects of the TPB i.e., normative beliefs, motivation to comply and subjective norm. Questions relating to intentions items also presented a high number of problems. Attitude questions were the least problematic. The issues ranged from participants having problems in interpreting the questions and also responding to questions. For example, they were confused about how to interpret some of the questions due to problems such as a lack of clarity as to what the question was actually asking. Participants found some questions oddly phrased and therefore

making little sense. There were also some issues in relation to the repetition that occurs with the definition of the behaviour outlined in a typical TPB questionnaire. Participants found the repetition of questions in general also to be problematic. There were problems of not actually knowing the answer to a question that was asked, so participants would spontaneously infer the answer from other information possessed, so as to not leave a response section blank. In relation to the questions pertaining to normative components of the TPB (i.e., questions relating to the approval of family members; members of the community; and the approval of your doctor), participants struggled with the variability of the opinions of important others in their lives or with knowing their opinions. In this situation, participants would use conjecture to answer the question. A commonplace observation on the TPB literature is that subjective norm constructs have much less predictive power than do attitude and perceived behavioural control (Armitage & Conner, 2001; Conner & Sparks, 2005). This may be due to some of the issues outlined above. Problems such as these could affect study findings if left undetected. Our participants found it difficult to understand and make sense of many of the items used within a typical TPB questionnaire formulated on the recommendations of Ajzen (2002). This implies that the current standardised method to develop TPB measures appears to yield problematic questions. A number of suggestions for improving this procedure were made.

The final study reports on the first study ever to provide a rigorous test of an intervention to promote objectively measured walking behaviour, based on the TPB, with a focus on using mediation analyses to test the hypothesised causal processes of the TPB. The intervention to increase walking was based on theory, literature and piloting of measures and techniques. An initial stage in development was to conduct a literature review which indicated that the TPB construct that best predicts intention to walk is PBC. These results provided

clear guidance for our intervention; to increase intentions to walk, PBC was the construct we should be aiming to change. That is, those who walk less are those who feel less in control of their walking and expect to find it more difficult. According to Ajzen (2002) in order to alter a TPB construct, one should alter the beliefs held to underlie this construct (i.e., control beliefs). Our previous research on eliciting the range of beliefs that people hold in relation to walking, indicated that the most common factors that were seen to make it difficult to walk were time, work/ family commitments, injury or illness and inclement weather (Darker, French, Longdon, Morris, & Eves, 2007). The content of the intervention to increase walking centred on conceptualising the TPB as having two phases: a motivational and a volitional phase. The set of techniques that were utilised within the final study related to these phases. The intervention techniques within the motivational phase drew from motivational interviewing (Miller & Rollnick, 2002) and a facilitative plan which was based on mastery experiences (Bandura, 1991). The volitional phase concentrated on action planning (Sheeran, Milne, Webb & Gollwitzer, 2005) and coping planning (Sniehotta, Scholz & Schwarzer, 2006). Contrary to our original hypothesis and the proposed causal mechanisms of the TPB (Ajzen, 2002), the intervention did not lead to a change in control beliefs. The intervention did lead to an increase in perceived behavioral control but this increase was not mediated by a change in control beliefs. The intervention also resulted in an increase in intention to walk and this increase was mediated by a change in PBC. The intervention did lead to an increase in the number of minutes spent briskly walking assessed by pedometers, which was mediated by a direct effect of PBC on behaviour. The results of the study only partially supported the causal mechanism of the TPB.

Limitations of the research

The studies that comprise this thesis naturally suffer from several limitations. The first study was based on an interpretative analysis of interviews with a small number of participants. It is not the purpose of IPA to achieve a representative sample in terms of either population or probability given that the objective is to understand social processes (Mays & Pope, 1995). However, future research should aim to establish whether the concerns and issues identified here apply more generally to a wider selection of members of the general public and could use this current study to provide guidance to further research in the area of physical activity. Despite this limitation, the study provided a rich and detailed understanding of the phenomenology of walking.

The focus of the second study was to elicit the salient beliefs of the UK adult population. Consequently, a measure of actual or usual walking behaviour was not gathered. However, it is possible that if a participant was already walking at least 30 minutes a day on average, this may well have influenced the number and type of salient beliefs that they held. Measures of intention to walk more were not taken, which was an oversight. However, the aim of the paper was to elicit salient beliefs about walking, which was achieved regardless.

The main limitation of the third study to examine the processes that individuals go through to answer a TPB based walking questionnaire, was that it studied responses to one measure, of one behaviour, which was developed by one research group. Also the participants in this study were recruited to think-aloud about a questionnaire based on walking behaviour, it is not clear whether these participants had any prior interest in walking. Participants recruited to take part in an intervention to encourage walking may have approached the

questionnaire differently as their motivation on the topic would have been higher and cognitions more fully developed. Despite these limitations, this study extends the exploratory work of French, et al. (2007) with two independent research groups, thus confirming problems previously found but with a larger sample size and extending our knowledge of different types of problems that participants experience when completing a TPB questionnaire.

There were a number of limitations to the final study which outlines the TPB based randomized controlled trial intervention to promote walking amongst the general population. First, a waiting list randomized controlled trial design was employed in order to increase acceptability of the research protocol to the participants and to decrease attrition effects. With this type of design, all participants whom entered into the study, will receive the intervention, half will just "wait" to receive the intervention. However, the limiting factor with this type of design is that comparisons of the effects of the intervention on objectively measured behaviour cannot be ascertained after both the groups have received the intervention. Second, the follow-up data collection points in this study were conducted via self-report only. However, there was a strong correlation between the pedometer scores and self-report data suggesting that the self-report measure used is indicative of objective behaviour. Third, also related to limitations due to the design, we can not extrapolate if the results are due to the motivational or the volitional aspects of the intervention. Therefore, we can not disentangle which of the components of intention, PBC or action planning is *the* mediator due to the study design. Fourth, the sample within this study was a healthy community volunteer sample, which may have resulted in a sample who were more willing to increase their walking than a selected community sample. However, this limitation has little effect on our main aim which

was to test the TPB, although it does mean that generalisability, as well as maintenance, of the effects of our intervention, are not proven.

Future research

Future research in the area of walking, should aim to establish whether the concerns and issues identified within the interpretative phenomenological study apply more generally to a wider selection of members of the general public such research could use this current study to provide guidance to further research in the area of physical activity.

Future research in the area of measurement issues within the TPB needs to establish whether instrumental and affective attitudes would be differentially predictive of intention to walk for 30 minutes a day. There is a need to pay more attention to respondents' perceptions of TPB questionnaires and the contextual demands involved in their completion. Future studies of TPB questionnaire methodology need to address issues of interpretation and comprehension of items, in particular items relating to normative aspects of the TPB. For example, reformatting questions within this construct so as to allow for participants to indicate a certain amount of specificity as to whom they are referring to when thinking about normative items may help to crystallise the fuzzy boundaries that respondents experience within this construct. In practice, respondents should be encouraged to admit that they do not have an opinion or that their beliefs are conflicted. Ambiguous phrases (i.e., good/bad) should be identified and re-written so as to make sense to the participants. It is imperative to identify the extent of the problems, outlined in study three, within TPB research and ascertain effective solutions, so as to limit bias and eliminate confounding findings, as a result of flawed measures, in future TPB based research. To test the efficacy of any solution, a

traditional versus a newly designed TPB questionnaire would need to be trialled, in order, to delineate if significant improvements are made with reliability and validity.

The TPB based intervention paper, is the first study that shows an effect on any objectively measured behaviour that has been shown to be partially mediated in line with the TPB, i.e. effects on intention and objectively measured behaviour mediated by PBC. There is still a need however to disentangle *how* it works. There is a need for further such evaluative tests of the TPB, with other objectively measured behaviour's, to examine whether the TPB is a sound theoretical framework that can be used to develop other health behaviour interventions. There is also a need to examine in the future whether this type of behavioural change intervention could be generalised to a wider population of people and potential clinical samples. Objectively measured follow-up information at different time points, such as one month, three months and six months would need to be gathered to assess longer term effectiveness. It would be of interest to test this intervention within a different setting, delivered by different individuals such as a health practice nurse and also with a different type of health behaviour to determine if the effects could be replicated under different circumstances.

Implications of the research

The present studies demonstrate a number of important implications for health promotion campaigns that aim to promote walking for people. Future campaigns should focus more on and include the experiences of psychological benefits from walking itself, engaging people through walking for transport reasons and the social setting of the activity. Perceived barriers to walking must also be dealt with in order to facilitate long-term behaviour change.

Walking is a behaviour which is acceptable to most adults; there are few demographic differences in beliefs about walking. For these reasons walking appears to be an ideal target for interventions to promote physical activity. We have identified the most common beliefs about this behaviour in a broadly representative sample of UK adults which future intervention endeavours can target in encouraging individuals to walk. The guidelines for developing measures to be used with the TPB may require revision to produce measures that are easier to use. More stringent psychometric evaluation of measures relating to the TPB should be employed in future research, to minimise interpretation and response biases. We have reported a theory-based intervention, which was developed on the basis of an extended period of formative research, tailored to the individual and which has rigorously tested the efficacy of the TPB as a framework for use within a health behavior change context. Increasing individuals' sense of personal control over aspects of their walking, leading to an increase in an intention to walk more, encouraged them to *actually* walk more. Walking continues to show promise as an avenue of intervention to achieve major public health benefits.

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