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What sense do people make of a theory of planned behaviour questionnaire?

A think-aloud study

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Abstract

This study aimed to understand the processes of interpretation of, and responses to, the task of completing a theory of planned behaviour (TPB) questionnaire. Forty-five adults verbalized their thoughts while completing a full TPB questionnaire on walking behaviour. On average, participants' verbalizations indicated around 16 problems with the 52 questions. Further, problems as identified from verbalizations were associated with increased endorsement of the middle option on the questionnaire. Normative and intention questions were found to be particularly problematic. The current standardized method to develop TPB measures systematically yields problematic questions, as indicated by both talk and questionnaire responses.

Keywords

- *measurement*
- *theory of planned behaviour*
- *think aloud*
- *walking*

The theory of planned behaviour (TPB; Ajzen, 1991) has been used extensively to predict and understand a wide variety of behaviours. It has been highlighted recently that the numbers of published articles concerning the TPB has risen continuously over the last three decades (Marks, 2008), with the TPB being cited nearly 2000 times on ISI Web of Science by the end of 2007. The ability of the TPB to predict behaviour has been corroborated by numerous meta-analytic reviews across a range of behaviours (Armitage & Conner, 2001), health behaviours in general (Conner & Sparks, 2005) and specific health behaviours such as condom use (Albarracín, Johnson, Fishbein, & Muellerleile, 2001; Sheeran & Taylor, 1999), exercise (Hagger, Chatzisarantis, & Biddle, 2002) and screening attendance (Cooke & French, 2008).

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. In addition, the TPB suggests that perceived behavioural control (PBC) may also predict behaviour (Ajzen & Madden, 1986). 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 individual's 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 utilizing the TPB, Ajzen and Fishbein (1980) and Ajzen (1991, 2002) recommended 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 open-ended questions that are based on template questions specified by Ajzen (2002). The most common 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/principal components 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 many 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 verbalization 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. One of the major benefits of think-aloud protocols is that participants can report their thoughts while simultaneously being involved in the target task. In a review of over 40 studies that used the think-aloud method, there was no evidence that giving concurrent verbal expressions of one's thoughts

altered performance compared to participants who completed the same task silently (Ericsson & Simon, 1993). 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 verbalizable (Ericsson & Simon, 1993; Van den Haak, de Jong, & Schellens, 2003).

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 developed by different research teams, which concerned: (1) increasing physical activity (6 general public participants); and (2) 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 retrieval of information from memory and to participants answering different questions from 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 extends 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. A larger sample also allows quantitative analyses of the association between the problems identified from the verbalizations of participants, and responses on the TPB questionnaire items. Krosnick's (1991) satisficing model proposes a view of the participant's response where a participant may choose to carry out each cognitive operation either carefully or imprecisely. This model recognizes that in a survey interview, respondents often choose to edit their

answers and to make minimal cognitive effort to process information, such as choosing the neutral or middle response option (Shoemaker, Eichholz, & Skewes, 2002). The present study will therefore examine the extent to which the items that participants have problems with, as identified by their concurrent verbalizations, are more likely to elicit a questionnaire response of selecting the middle response option.

The present research also replicates the two previous studies by French et al. (2007) using a TPB questionnaire that was developed in accordance with the guidelines of Ajzen (2002). It is important to elucidate whether these previous exploratory findings are generalizable to other TPB questionnaires, examining a different behaviour. The TPB questionnaire in the present study assessed walking, which is a different behaviour from those explored in the previous two studies by French et al. (2007). Walking is an important health behaviour 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 everyday lifestyles and sustained into old age (Mutrie & Hannah, 2004). The questionnaire utilized followed the recommended guidelines outlined by Ajzen (2002) 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).

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 for their time.

Design and procedure

The study utilized a cross-sectional design, with all participants undergoing the same procedure. All participants agreed to be audio taped and informed consent was given. Ethical approval was obtained from the ethics committee of the School of Sport

and Exercise Sciences, University of Birmingham. 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 familiarize 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 minimize 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). Walking was defined as 'walking for recreation, fitness or for any other purpose' and this definition appeared on the cover page of the questionnaire. There were 52 items in total (see Table 1 for the number of items assessing each TPB construct). All direct measures of TPB constructs (i.e. Attitude, Subjective Norm, PBC and Intention) were reliable (all Cronbach $\alpha \geq 0.75$). The questionnaire was pretested on a convenience sample of 300 university students in order to assess the reliability of the items, and to detect any major problems in usability.

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 from a further six randomly selected transcripts coded by both authors, which 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). 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 overall 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 which of the different types of problems were more common when responding to each TPB construct. A series of χ^2 tests were carried out for each of the four direct TPB measures, to examine the association between: (a) whether participants had problem or not with each item (as coded from verbalisations); and (b) did they score 4 (middle score) or another score for that item (on questionnaires)?

Results

Overall, the 45 respondents had 729 problems with the 52 items in the questionnaire. Thus the respondents experienced a mean of 16.2 problems with the TPB measures. The number of problems per person ranged from 5 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

Table 1. Average number of problems each respondent 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 |

(see Table 1). The average person had problems with nearly one in two items assessing subjective norm, one in three items 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 items 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 Tables 2 and 3). Generally, respondents mostly spontaneously inferred their answers, were confused by the questions that

underscore the constructs and had an opinion of the questionnaire, in that order (see Table 2). Also, respondents encountered more basic response problems than reactivity problems when responding to questions (see Table 3). Respondents experienced significantly more interpretation problems than response problems with questions assessing all ten TPB constructs (all $p < 0.001$).

Association of coded problems and questionnaire responses

For items assessing Attitude towards walking, there was no observed relationship between verbalized problems, as coded from transcripts, and the endorsement of 4 (middle score) for that item on the TPB questionnaires. However, for items assessing

Table 2. Percentage of respondents who had interpretation problems with each construct within the TPB

| Construct | Interpretation problems | | | Total |
|-------------------------------|-------------------------|----------|-----------------------|-------|
| | Confusion | Opinions | Spontaneous inference | |
| Behavioural belief | 11.16 | 9.53 | 14.65 | 35.34 |
| Outcome evaluation | 11.86x | 11.39xy | 6.97y | 30.22 |
| Normative belief | 9.84x | 2.27y | 25z | 37.11 |
| Motivation to comply | 20.45x | 4.54y | 13.63x | 38.62 |
| Control belief | 7.55y | 5.33y | 12.88x | 25.76 |
| Power of control belief | 15.11x | 9.33xy | 8y | 32.44 |
| Attitude | 6.81 | 8.63 | 5 | 20.44 |
| Subjective norm | 14.77y | 10.79y | 30.68x | 56.24 |
| Perceived behavioural control | 11.36 | 9.09 | 7.38 | 27.83 |
| Intention | 14.39x | 17.42x | 7.57y | 39.38 |

Note: Means in the same row having different subscripts differ significantly at $p < 0.05$; ANOVA difference comparison.

Table 3. Percentage of respondents who had response problems with each construct within the TPB

| Construct | Response | | Total |
|-------------------------------|----------|-------------------|-------|
| | Basic | Problems Reactive | |
| Behavioural belief | 4.41x | 1.62y | 6.03 |
| Outcome evaluation | 4.88x | 1.39y | 6.27 |
| Normative belief | 3.03x | 0y | 3.03 |
| Motivation to comply | 7.57x | 0y | 7.57 |
| Control belief | 4x | 0.44y | 4.44 |
| Power of control belief | 2.22x | 0y | 2.22 |
| Attitude | 1.81x | 0y | 1.81 |
| Subjective norm | 2.84 | 0.56 | 3.40 |
| Perceived behavioural control | 1.70 | 0.56 | 2.26 |
| Intention | 6.06 | 4.54 | 10.60 |

Note: Means in the same row having different subscripts differ significantly at $p < 0.05$ *t*-test difference comparison.

Subjective Norm, PBC and Intentions, where problems were coded from transcripts of verbalizations, participants were more likely to endorse 4 (middle score) than for items where no problems were identified (see Table 4).

Discussion

This is the largest study which has asked participants to think-aloud while completing a TPB questionnaire. In line with previous research, a range of different problems were found (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 10 TPB constructs. This suggests that participants found questions generally difficult to interpret and to comprehend, but retrieval and formatting of a response was less problematic. Importantly, participants who experienced problems with questions relating to subjective norm, PBC and intention (identified by verbalizations) were also more likely to select the middle option on the scale for that item.

Association of coded problems and selecting the middle response option on questionnaires

Participants who verbalized a problem when completing items assessing subjective norms, PBC and intention were significantly more likely to select the middle response option for that item. To our knowledge, this is the first time that TPB direct measures have been shown to be affected in this way. Participants appear to be utilizing the middle option not as a indication of their neutrality of opinion concerning the phenomenon in question but instead as a means of opting out of effortful processing. This finding can be taken as a validation of the ‘think aloud’ method in general, and the coding frame employed in this particular study, as applied to studying people completing questionnaires. The problems identified from applying the coding frame to participants’ verbalizations are reflected in

Table 4. Association between number of respondents experiencing a problem and middle option selection within direct TPB measures

| Construct | No Problem | | Problem | | χ^2 | <i>p</i> |
|-------------------------------|------------------------|----------------------------|------------------------|----------------------------|----------|----------|
| | Middle option selected | Not middle option selected | Middle option selected | Not middle option selected | | |
| Attitude | 13 | 163 | 5 | 42 | 0.53 | 0.47 |
| Subjective norm | 12 | 80 | 29 | 58 | 10.42 | 0.001 |
| Perceived behavioural control | 5 | 118 | 6 | 41 | 4.25 | 0.039 |
| Intention | 3 | 75 | 8 | 46 | 5.03 | 0.025 |

participants' written responses to questionnaire items, i.e. these verbalized problems are associated with an objective indicator of cognitive effort (Shoemaker et al., 2002).

It should be noted that researchers utilizing a TPB measure would score the endorsement of the middle option as indicating a moderate standing on this item and take that as an account of the 'true' response. If the selection of the middle option is instead a consequence of being unwilling to exert mental effort to understand problematic questionnaire items, this may lead to a potentially false impression of the respondents' true opinion. The implications of this are discussed later.

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 think aloud research on the TPB measures (French et al., 2007).

Participants found difficulty in responding due to the variability of the opinions of others 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 a question about 'family members'. 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' that unambiguously includes some (e.g. parents) but excludes others (e.g. siblings). Vague phrases can have fuzzy or indistinct boundaries making it not very clear as to where to draw classification boundaries for what the phrase does and does not refer to (Wright, Gaskell, & O'Muircheartaigh, 1997). 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 following 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 spontaneously infer their answer to the question or else choose the middle option so as not to leave a response section blank. The present study has found evidence that the strategy of selecting the middle option when problems are encountered with questions is particularly common for normative items. 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 the influence of significant others' on their intention to perform a behaviour will not be recognized. This has the consequence of 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 responses 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, particularly the tendency of subjective norm items to be problematic for participants, and for these problems to lead to the selection of the middle response option. 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 lie 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 that 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 number of problems associated with intention questions. The participants found the intention questions to be both difficult to interpret and also to present difficulties when formulating 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, and 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 minimize 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.

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. This has been a previous criticism of social cognitive theories in general and the TPB in particular (Ogden, 2003). For example, a recent TPB study (Godin et al., 2008) found that simply being asked TPB intention questions was sufficient to bring about actual behaviour change. Future research is needed to delineate what factors determine the magnitude of the impact of questionnaire completion on subsequent cognitions and behaviour.

General issue

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.

Strengths and weaknesses of the current study Questionnaires are one of the most frequently utilized 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 (Conner & Sparks, 2005; Johnston, French, Bonetti, & Johnston, 2004; Marks, 2008; 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 by French et al. (2007) is that it has sufficient numbers to be able to quantify meaningfully the different kinds of problems encountered,

rather than baldly state that problems were found. The larger sample size has yielded the new finding of an association between verbalized problems in responding and selection of the middle item.

The present study had several limitations. First, it is not clear whether the participants in this study 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. Second, the presence of an interviewer can be distracting to respondents, and people may be reluctant to reveal beliefs unlikely to be endorsed by the researcher, leading to a social desirability bias.

The most important limitation is that the present study examined responses to one questionnaire, concerning a single behaviour, developed by one research group, which raises the issue of whether the findings are generalizable to other TPB questionnaires. In our opinion, there are several reasons to expect these findings to generalize to other TPB questionnaires. First, the findings were similar to that found in two previous studies of responses to TPB questionnaires, which were developed by two independent research groups and which concerned two different behaviours. Second, the questionnaire used in the present research was developed following the recommendations of Ajzen (2002), based on a belief elicitation study with a relevant sample (Darker et al., 2007). Third, think aloud studies of responses to non-TPB questionnaires reliably observe problems in participants, e.g. Boeije & Janssens, 2004; French & Hevey, 2008; Murtagh, Addington-Hall & Higginson, 2007; Westerman, et al., 2007. It therefore seems likely that TPB questionnaires would produce problems of a similar sort. Studies such as the present one therefore indicate the problems and limitations of the procedures recommended by Ajzen (2002). It is becoming increasingly clear that these procedures yield particularly problematic items for assessing normative issues.

Future directions

There is a need to pay greater 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 normative items to remove fuzziness and lack of clarity would allow participants to specify whom they are referring to would enable respondents to provide more meaningful responses for this construct. In practice, respondents should also be encouraged to admit that they do not have an opinion or that their beliefs are conflicted. This may help to address the problems that the participants in this study experienced with the direct measures of TPB constructs, resulting in a bias towards the middle response option. There is also a need to investigate 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 the need for multiple items that assess the same construct would reduce irritation, and engage participants more in the task of answering the questions themselves.

It is imperative to identify the extent of these problems within TPB research and ascertain effective solutions, to limit bias and eliminate confounding findings, as a result of flawed measures, in future TPB research. To test the efficacy of any solution, a traditional versus alternative/improved TPB questionnaire would need to be compared. Comparative psychometric studies could show which procedures yield measures with higher reliability and predictive validity, and which evoke fewest problems in respondents, assessed using think-aloud methods, and comparisons of questionnaire responses.

Conclusion

The current study has found a number of problems associated with constructs within a TPB questionnaire developed using current guidelines. This extends previous work by employing a larger sample, allowing problems to be quantified, and demonstrating an association between verbalized problems in responding and the ambiguity of a questionnaire response of selecting the middle item. A number of ways in which these problems could be alleviated have been proposed. Further experimental work is needed to assess how these problems can best be avoided. The current guidelines for developing TPB measures require revision to produce measures that are easier to use, more acceptable to participants, and more meaningful and valid from a methodological and theoretical perspective.

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