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The development of a reliable theory-based psychological instrument to measure cognitions relating to participation in university recreational sports

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ABSTRACT

Background: It is important that theoretically informed questionnaires developed using guidelines outlined within the Theory of Planned Behaviour demonstrate reliability. **Objective:** The aim of the study was to assess the reliability of direct and indirect items examining perceptions towards recreational sports participation by university students. **Method:** A convenience sample of 28 participants undertaking various degree programmes was used (age $M = 18.89$, $SD = 0.62$, female $n = 18$, male $n = 10$). Participants completed a theory-based questionnaire at time 1 and two weeks later at time 2. Internal consistency between direct items and correlations between indirect items was conducted. **Results:** Results showed all constructs measured through direct items had Cronbach's alphas over 0.8 and all indirect items measuring beliefs were significantly correlated ($p < 0.01$). **Conclusion:** The findings demonstrate the reliability of a questionnaire to be used for a future study aimed at identifying specific belief-based intervention targets. The result of such work provides the foundations for interventions promoting participation in recreational university student sport, an expanding yet under-researched population of study. **Key words:** THEORY OF PLANNED BEHAVIOUR, QUESTIONNAIRE RELIABILITY, SPORTS PARTICIPATION, COGNITIONS.

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INTRODUCTION

Students participating in university sport experience a number of benefits (Huesman, Brown, Lee, Kellogg, & Radcliffe, 2009; Kampf & Teske, 2013). Despite this, a decrease in participation rates is often found when students enter higher education (Gucciardi & Jackson, 2015). Sport England, the leading body for promoting sport in the United Kingdom (UK), placed significant investment into two projects aimed at attracting higher education students to participate in sport at least once a week for thirty minutes (Sport England, 2012). Although the Active Universities (project 1) showed a 2% increase in participation across three years, these changes occurred predominantly during the first year (2011-2012). Such marginal findings have been replicated in the Sport Activation Fund (project 2) to date. These results are not surprising, particularly as the interventions did not utilise theory in their development. Indeed, the effectiveness of interventions is increased when underpinned by health psychological theory (Taylor, Conner, & Lawton, 2012).

One of the most widely used theories in behaviour change is the Theory of Planned Behaviour (TPB; Ajzen, 1985). The theory suggests attitude (affective and instrumental), subjective norm (descriptive and injunctive) and perceived behavioural control (PBC) (self-efficacy and controllability) results in a behavioural intention, which then leads to behaviour if under volitional control. These determinants are underpinned by behavioural, normative and control beliefs, respectively (Ajzen, 2011). To understand the importance of these constructs, a main quantitative study is required through the distribution of questionnaires. These findings can then inform the development of an intervention.

It is important that psychological instruments demonstrate reliability (Padilha, Gallani, & Colombia, 2004). Specific to the TPB, psychometric principles must be observed within a pilot study before the main questionnaire study is undertaken (Ajzen, 2011). There are different approaches to ensuring the reliability of TPB items. As a number of direct items measure each construct, an index of internal consistency can be used to ensure similarity amongst scores (Ajzen, 2006). Items demonstrating higher Cronbach's alpha coefficients (ranging between 0 and 1) suggests internal consistency amongst constructs, with items not contributing to reliability to be deleted (Ajzen, 2005). Francis et al. (2004) suggests that a score greater than 0.6 can be used to represent internal consistency. Relating to physical activity, Newham, Allan, Leahy-Warren, Carrick-Sen and Alderdice (2016) found Cronbach's alphas of 0.94, 0.67, 0.84 and 0.90 for attitude, subjective norm, PBC and intention, respectively. Similarly, Mendez, Rodrigues, Cornélio, Gallani and Goding (2010) reported alphas of 0.77, 0.68, 0.69 and 0.95 for the same constructs. Internal consistency, however, is not a useful measure of indirect items' reliability because there is no assumption that beliefs will be consistent. That is, both positive and negative responses can be given. Test-retest reliability (temporal stability) can thus ensure reliability at the level of beliefs. Correlations can be found between responses at time 1 (T1) and time 2 (T2) using Pearson's correlation coefficients. The test provides outputs ranging from -1 to +1, with those furthest away from zero (i.e., closest to -1 or +1) demonstrating stronger correlations.

Despite the importance of possessing reliable items, questionnaires informed by the theory are rarely scrutinised because for every new behaviour investigated, the development of a new questionnaire is needed (Ajzen, 2006). Consequently, the purpose of this study was to assess the psychometrics of TPB measures concerning participation in university recreational sport. The study specifically examined the internal consistency of direct items and the test-retest reliability of indirect items. Establishing the reliability of such items is important for the distribution of a questionnaire during the main questionnaire study. This will facilitate in the development of a theory-based intervention.

MATERIALS AND METHODOLOGY

Participants

Data was collected in a higher education institution in the North of England, UK. A convenience sample of 28 participants (age $M = 18.89$, $SD = 0.62$, female $n = 18$, male $n = 10$) undertaking different degree programmes (English $n = 7$, Exercise, Health and Fitness $n = 3$, Exercise, Health and Nutrition $n = 4$, Secondary Physical Education and Sports Coaching $n = 7$, Child and Family Welfare Studies $n = 7$). Full demographics are shown in Table 1. Participants were eligible to participate if they attended the university of interest, were enrolled on a full-time degree programme, and were in their first year of undergraduate study. Ethical approval was gained from the university committee (SSHS/2016/015).

Table 1. Participant descriptive statistics.

Demographic		N (28)	M	SD
Age (years)			18.89	0.62
			(age range 18-24)	
Sex				
	Male	10		
	Female	18		
Degree programme				
	English	7		
	Exercise, Health and Fitness	3		
	Exercise, Health and Nutrition	4		
	Secondary Physical Education and Sports Coaching	7		
	Child and Family Welfare Studies	7		

Study Design

A cross-sectional design was used with two waves of data collection (T1 & T2). At T1, participants first read the participant information sheet and, if willing to participate, signed a consent form. The following definition of the behaviour was provided verbally to the participants and was also present in the questionnaire; *participation in university sport for at least 30 minutes, once a week, during the next month*. The researcher also gave a couple of behavioural examples. Questionnaires, which took roughly fifteen minutes to complete, were completed in silence and no communication was made between participants. Once complete, participants were reminded that a follow-up questionnaire would be sent to their stated email address. Participants were then contacted two weeks later to repeat completion of the questionnaire (T2). A questionnaire assessing behaviour was also attached to assess the reliability of behavioural items. All 84 questionnaires were returned successfully; 28 questionnaires at both T1 and T2 assessing test-retest reliability of indirect items and internal consistency of direct items, and 28 questionnaires at T2 assessing internal consistency of items concerning behaviour. Participants were thanked for their involvement.

Measurements

The questionnaire included direct and indirect items informed by the TPB relating to sports participation. Direct items were carefully developed using the recommendations of prior studies (e.g., Armitage, 2005; Prapavessis, Gaston, & DeJesus, 2015). Indirect items were generated using beliefs identified in a previous elicitation study. This resulted in a total of twenty direct items and fifteen indirect items being assessed. A separate questionnaire comprising of three items was also used to measure follow-up behaviour.

Intention

Intention was assessed using three items: 'I intend to participate in sport at university', 'How likely is it that you would participate in sport at university', 'How often do you intend to take part in regular sport at university', scored [1] strongly disagree/very unlikely/never to [7] strongly agree/very likely/frequently.

Attitude

Five items measured participants' attitude (affective and injunctive): 'For me, participating in sport at university would be unpleasant-pleasant; unenjoyable-enjoyable; bad-good; undesirable-desirable; unhealthy-healthy', scored [1] to [7].

Subjective Norm

Subjective norm (descriptive and injunctive) was measured using five items: 'People who are important to me would disapprove/approve of me participating in sport at university', 'People who are important to me think I should participate in sport at university', 'People close to me think I definitely should not/should participate in sport at university', 'How many people similar to you perform sport at university', 'People who are like me will participate in sport at university', scored [1] would disapprove/disagree/definitely should not/virtually none/completely false to [7] would approve, agree, definitely should/almost all/completely true.

PBC

The seven items measuring PBC (self-efficacy and controllability) were: 'For me, participating in sport at university would be', 'How confident are you that you will be able to participate regularly in sport at university', 'Participating in sport at university is beyond my control', 'I believe I have the ability to participate in sport at university', 'Whether I participate in sport at university is totally up to me', 'I would be comfortable participating in sport at university', 'Factors outside my control will influence whether or not I play sport at university', scored [1] very difficult/not very confident/strongly disagree/definitely do not/strongly disagree to [7] very easy/very confident/strongly agree/definitely do/strongly agree.

Behavioural beliefs

Behavioural beliefs were presented as statements and participants rated how strongly they agreed with each statement (e.g., for me, participating in sport would enable me to meet new friends). 7-point scales were used anchored [1] strongly disagree to [7] strongly agree.

Normative beliefs

Normative beliefs comprised of injunctive and descriptive aspects. The social pressure of others was measured from responses assessing the agreement that specific referents would encourage the behaviour (i.e. my friends think that I should participate in sport at university). Items were assessed using 7-point scales anchored [1] strongly disagree to [7] strongly agree. Descriptive norm was measured by asking participants the level of agreement that referents engaged in the behaviour themselves (i.e. most of my friends participate in sport at university). The referent 'family' was omitted due to the unlikelihood of them participating at university. Items were assessed using 7-point scales anchored [1] false to [7] true.

Control beliefs

Participants were asked to identify whether certain factors would influence the likelihood of them carrying out the behaviour (i.e. how much would a lack of time make you more or less likely to participate in sport at university). Responses were measured using 7-point scales, anchored [1] less likely to [7] more likely.

Follow up behaviour

Three items were used to measure behaviour. Two items used 7-point scales, anchored [1] never/false to [7] almost always/true (i.e., 'During the past month, how often did you perform sport at university at least once, for 30 minutes?' and 'I have participated in sport at university for at least 30 minutes, once a week, within the past month'). One item asked 'Please indicate the number of weeks you have performed sport at university for at least 30 minutes, once a week, within the past month', with responses scored; 0, 1, 2, 3, and 4.

Data analysis

Tests were conducted using the SPSS statistical package (Version 21). The average (mean) was taken for all items. Where appropriate, items were recoded with lower scores representing negative responses and higher scores reflecting positive responses. For example, the attitude item 'participating in sport at university would take attention away from my studies' was anchored strongly disagree [1] to [7] strongly agree thus was reverse scored to ensure the disagreement reflected positive perceptions. With regards to the direct items, Cronbach's alpha was used to assess internal consistency. The test gave the following outputs; Cronbach's alpha, alpha-if-deleted indicator and item-total correlation. Items measuring behaviour were first converted into Z scores. Following the recommendation of Francis et al. (2004), an alpha level of > 0.60 was set for all scores. As questionnaires were distributed at two intervals to assess temporal stability, only results from T2 were used to examine direct constructs. Concerning the indirect items, Pearson correlation coefficients were calculated to test associations between T1 and T2 items. An alpha of 0.05 was set as the cutoff for statistically significant correlations.

RESULTS

Cronbach's alpha, item-total correlation and alpha if deleted for all direct items are shown in Table 2. Results showed five attitude items, five subjective norm items, seven PBC items, three intention items and three behaviour items had Cronbach's alphas over 0.8. Pearson's correlation for all indirect items are shown in Table 3. Correlations showed values between 0.51 and 0.91 for behavioural beliefs, 0.73 and 0.93 for normative beliefs, and 0.66 and 0.85 for control beliefs. All p values were below 0.01.

Table 2. Internal consistency of direct items.

Construct and items	Cronbach's Alpha	Item-total correlation	Cronbach's Alpha if deleted
1. Attitude	0.92		
Participating in sport at university would be....			
1.1. bad/good		0.90	0.88
1.2. pleasant/unpleasant		0.93	0.87
1.3. unhealthy/healthy		0.58	0.94
1.4. desirable/undesirable		0.81	0.90
1.5. unenjoyable/enjoyable		0.79	0.90
2. Subjective Norm	0.95		
People who are important to me....			
2.1. would disapprove/approve		0.81	0.95
2.2. think I should		0.87	0.94

2.3. think I definitely should not/should participate in sport at university?		0.91	0.93
2.4. How many people similar to you		0.82	0.94
2.5. People who are like me will		0.88	0.93
3. PBC	0.86		
3.1. I would be comfortable		0.82	0.80
3.2. How confident are you		0.79	0.81
3.3. I have the ability		0.61	0.84
3.4. Factors outside my control		0.14	0.90
Participating in sport would be....			
3.5. very difficult/very easy		0.77	0.81
3.6. beyond my control		0.42	0.86
3.7. totally up to me		0.89	0.79
4. Intention	0.96		
..... participate in sport at university			
4.1. I intend to		0.95	0.90
4.2. How likely is it that you will		0.87	0.96
4.3. How often do you intend to		0.90	0.93
5. Behaviour in the last month	0.97		
..... participate(d) in sport at university			
5.1. How often did you		0.97	0.94
5.2. I have		0.95	0.95
5.3. Indicate the number of weeks you*		0.90	0.99

Notes. All responses were on a 1-7 rating scale

* possible responses were 0, 1, 2, 3 & 4

Table 3. Test-retest reliability of indirect items.

Items	Level of significance (Pearson, r)
1. Behavioural beliefs	
Participating in sport would....	
1.1. improve my health and fitness	0.84**
1.2. be enjoyable	0.91**
1.3. enable me to meet new friends	0.87**
1.4. improve my mental well-being	0.88**
1.5. be time consuming	0.51**
1.6. take attention away from my studies	0.88**

2. Normative beliefs	
.... think that I should participate in sport at university	
2.1. My friends	0.89**
2.2. My family	0.85**
2.3. Academic staff	0.81**
Most of participate in sport at university	
2.4. my friends	0.93**
2.5. academic staff	0.73**
3. Control beliefs	
How much would make you more or less likely to participate in sport at university	
3.1. a lack of time	0.66**
3.2. a lack of knowledge about the sports on offer	0.76**
3.3. a lack of motivation or energy	0.85**
3.4. studying	0.83**

Notes. All responses were on a 1-7 rating scale

** $p < 0.01$

DISCUSSION

The purpose of the study was to determine the reliability of a questionnaire developed using TPB guidelines. More specifically, the study aimed to establish the reliability of direct and indirect items assessing student perceptions towards participation in university sport. Internal consistency was used on direct items and Pearson correlation coefficients on indirect items.

Internal consistency was found on all direct items. In line with the suggestion of Francis et al. (2004), all constructs showed a Cronbach's alpha above 0.8. Such findings replicate those of Newham et al. (2016) and Mendez et al. (2010) and thus suggests all items were measuring their respective theorised constructs. As can be seen in Table 2, the removal of any items would have not increased the Cronbach's alpha of any construct significantly. Furthermore, direct determinants have been argued to exert influence either concurrently (Fishbein & Ajzen, 2010) or separately (Rhodes & Blanchard, 2006). For example, regarding the former, Fishbein and Ajzen (2010) suggest first order factors (e.g., affective and injunctive) simultaneously influence their corresponding second order constructs (e.g., attitude). However, Rhodes and Blanchard (2006) suggest these components independently influence the summative constructs. As the present study found concordance between the components, the study presents evidence that these components influence summative constructs simultaneously (Fishbein & Ajzen, 2010).

In addition to direct items, questionnaires should also be developed to assess belief-based items. Although the majority of research using the TPB has focused on confirming the predictive validity of the constructs rather than undergoing formative procedures (Hardeman, Johnston, Johnston, Bonetti, Wareham, & Kinmonth, 2002), it is nevertheless important to ensure the stability of indirect items (Ajzen, 2006). The present study found all indirect items to have significant positive correlations from T1 to T2. The level of significance was below the 0.05 alpha level, with p values for all correlations less than 0.01. Furthermore, aside from the item 'be time consuming', the strength of all correlations was above 0.6. This shows that most items demonstrated good temporal stability. The lower correlation of this behavioural belief could be because

students' time varies from week to week (Kyndt, Berghmans, Dochy, & Bulckens, 2014). In support of this, the control belief 'a lack of time' was the item with the next lowest correlation. Thus, the temporal stability of these responses may have altered in response to the fluctuating workloads within higher education. Nevertheless, all correlations were still significant, and thus should be retained within the main questionnaire.

In summary, the study found reliable items assessing the perceptions of an under-researched population towards university recreational sport using a well-established behaviour change theory. The utilisation of these items within a future main questionnaire will facilitate the identification of specific belief-based intervention targets.

Despite providing evidence of a reliable TPB questionnaire, the study is not without limitations. First, although the study tried to recruit participants undertaking different subjects, an even distribution was not gained. A similar limitation concerns the relatively small sample size. However, as the study utilised a sample size suggested by Ajzen (2006), it was hard to gain a representative sample of different degree subjects. Next, the study examined the expectancy component of beliefs only, rather than the suggested multiplicative approach. However, due to the limited predicted validity of the value arm (Chan et al., 2015), the study followed other recent research adopting this approach (e.g., Booth, Norman, Harris, & Goyder, 2015; Epton, Norman, Harris, Webb, Snowsill, & Sheeran, 2015). Finally, the reliability of behaviour was assessed using self-report. Although reliability was achieved, there are limitations to self-reported behaviour (Chinapaw, Mokkink, van Poppel, van Mechelen, & Terwee, 2010). As such, more objective measures such as registers or swipe cards could be used in future studies.

CONCLUSION

The study assessed the reliability of items to be included within a theory-based questionnaire. Informed by the TPB, all direct items showed good internal consistency and most indirect items demonstrated temporal stability. As such, the study provides evidence of a reliable instrument to be included within a future study identifying specific belief-based targets. Although the TPB has been used extensively, its work concerning sports participation has been limited. This research is important, particularly if participation rates in university recreational sport are to be increased.

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