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**Title: The impact of past behaviour on social cognitive factors and sports participation
in university students**

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The impact of past behaviour on social cognitive factors and sports participation in university students

Abstract

Sport can provide many health benefits to university students, yet participation rates in transitioning students tend to decline. The Theory of Planned Behaviour can be used to understand participation in health behaviours. The inclusion of past behaviour has been shown to have significant effects on social cognitive constructs and future behaviour. The purpose of the study was to understand the relationship between social cognition constructs and past behaviour relating to sports participation. A prospective correlation design was used with two waves of data collection. First-year university students ($N = 286$) completed assessments of social cognition constructs and past behaviour. Four-weeks later participants completed follow-up measures of their participation in sport. Two structural equation models were conducted; Model 1 tested the influence of TPB constructs on behaviour and Model 2 included past behaviour. Model 1 accounted for 59% of the variance in intention and 42% in behaviour, which increased to 68% and 43%, respectively, in Model 2. Model 1 showed all three antecedents of intention to be significant and intention to predict behaviour. Intention also mediated the effects of attitude, subjective norm, and perceived behavioural control on behaviour. Model 2 demonstrated similar direct and indirect effects. Additionally, past behaviour had a total effect on behaviour and a direct effect on all TPB constructs. The effects of past behaviour on intention and behaviour were mediated by TPB constructs and there was no direct effect from past behaviour to behaviour. The study found the TPB to explain university students' participation in sport and the effects of past behaviour to be mediated through social cognition constructs. This suggests interventions should focus on the conscious, deliberative factors underlying sports participation rather than habitual, automatic factors. This could be due to the unstable environments first-year students navigate when transitioning into university.

Keywords: past behaviour; sports participation; social cognition; theory of planned behaviour; health behaviour

Main text

Introduction

Sports participation has many health benefits (Buckworth et al., 2013), yet participation rates in transitioning university students is poor (Webber & Mearman, 2009). To understand and change health behaviour, theories of social cognition can be adopted, such as the Theory of Planned Behaviour (TPB; Ajzen, 1991). Despite TPB constructs demonstrating impressive variance in behaviour, research has found past behaviour to play a substantial role in future behaviour (Conner & Armitage, 1998; Norman et al., 2000). According to the TPB, model constructs should mediate past behaviour effects. However, recent research has found a residual effect which has been suggested to represent automatic, habitual processes (Brown et al., 2018; Hagger, 2019). Not considering the role of past behaviour can have consequences both theoretically and practically. It is therefore important to establish the role of past behaviour on key social cognitive constructs and sports participation in transitioning university students.

Background

Students transitioning into university tend to engage in less health enhancing behaviours and more in unhealthy behaviours (Cameron et al., 2015; Crombie et al., 2009; Goldstein et al., 2015). This is also applicable to sport whereby despite its many health benefits (Buckworth et al., 2013), university students choose not to participate (Webber & Mearman, 2009). The transition from familiar and controlled environments to those that are more unstable means first-year students face considerable challenges to participate in health-related behaviours and adopt healthy lifestyles (Crozier et al., 2015; Steptoe et al., 2002). However, this period of instability provides an opportunity to influence the behaviours undertaken.

Theories of social cognition can be applied to understand and change health behaviours (Conner & Norman, 2015). The TPB asserts intention as the proximal determinant of behaviour. Intentions are influenced by attitude (i.e. the evaluation of a behaviour), subjective norm (SN) (i.e. the normative influences of other people), and perceived behavioural control (PBC) (i.e. the amount of control over a behaviour). Primary and meta-analytic studies have attested to the predictive utility of the TPB, with theory constructs explaining between 40%-45% of the variance in intentions and 19%-36% of the variance in behaviour (Armitage & Conner, 2001; Hagger et al., 2002; McEachan et al., 2011).

Despite its utility, research has found behaviour to be influenced by past behaviour (Conner & Armitage, 1998; Norman et al., 2000). According to the TPB, past behaviour can indirectly affect future behaviour through model constructs (Ajzen, 1991). However, research has found a residual effect of past behaviour when accounting for social cognitive constructs (Brown et al., 2018; Conner et al., 1999; Hagger et al., 2016). This direct pathway has been suggested to represent automatic processes that act beyond a person's awareness (Gardner, 2015; Hagger, 2019). Habits, for example, are automatically triggered actions in response to contextual cues (Gardner et al., 2016). Past behaviour may also lead to attenuation effects between social cognitive constructs and behaviour (Hagger et al., 2018).

Ouellette and Wood (1998) posit novel, unstable behaviours to be influenced by deliberative processes and habitual behaviours to be influenced by past behaviour. Greater effects of social cognitive constructs relative to past behaviour would provide support for the former whereas larger effects of past behaviour relative to social cognitive constructs would lend more to the latter. It could be that sports participation in transitioning university students is a consequence of deliberative processes, past behaviour independent of social cognitive constructs (i.e. habit), or a hybrid of the two.

By not considering the role of past behaviour, studies may overestimate the importance of TPB constructs. For example, significant additional variance captured by past behaviour but attributed to social cognitive predictors would infer greater responsibility of conscious processes. This would apply also to the indirect effects; attenuation effects on behaviour could reduce the impact of TPB constructs whilst highlighting the importance of past behaviour. Finally, beyond explanatory purposes, failure to account for past behaviour could miss identifying important modifiable intervention targets (Hagger et al., 2018). Related to sports participation in transitioning university students, it is therefore important to understand the influence of past behaviour and social cognitive factors.

Purpose

The study examined the influence of past behaviour on TPB constructs and sports participation. Model 1 examined the direct relationship between attitude, SN and PBC on intention, and the direct effects of PBC and intention on behaviour (see Figure 1). Model 1 also tested the indirect effects of attitude, SN, and PBC on behaviour mediated by intention. Model 2 examined the influence of past behaviour on TPB constructs and behaviour (see Figure 2). The model also tested the indirect effects of past behaviour on intention through TPB constructs, and the indirect effects of past behaviour to behaviour through intention.

Consistent with the TPB, the antecedents of intention were expected to demonstrate direct effects on intention, and PBC and intention were expected to directly affect behaviour. It was hypothesised that intention would mediate the effects of attitude, SN, and PBC on behaviour. With the inclusion of past behaviour, a total effect of past behaviour on intention and behaviour was expected. Two alternative predictions were made relating to the specific influence of past behaviour; 1) in accordance with the TPB, social cognitive constructs would fully mediate the impact of past behaviour on intention and behaviour, and there would be no direct effect of past behaviour on future behaviour when controlling for social cognitive

factors, or 2) past behaviour would have a direct effect on future behaviour when controlling for TPB constructs.

Materials and methods

Participants

Participants recruited to the study were first-year undergraduate students attending a small-sized higher education institution in the UK. A purposive sampling strategy was adopted to recruit participants using university announcements, advertisements, and word-of-mouth. Recruitment was undertaken within a four-week period midway through the first semester of the academic year. Interested participants were provided an information sheet and gave informed consent. Participants enrolled in the study voluntarily, without any incentives, and were assured of data confidentiality. The study received full ethical approval from the school ethics board.

Design and procedure

A prospective correlation design was used with two waves of data collection. Participants were required to complete a questionnaire at T1 and four weeks later at T2. Participants were asked to adhere to the specific definition of sport; participation in university sport for at least 30 minutes, once a week, during the next month (note this changed to 'past month' for T2 behaviour assessments). Once T2 questionnaires had been completed, participants were thanked for their participation and provided debrief information. Pseudo codes were used to match T1 and T2 data.

Measures

Measures were taken at T1 and four weeks later at T2.

T1: TPB constructs were assessed in accordance with standard procedures (Ajzen, 1991, 2002). Five items measured attitude (e.g. For me, participating in university sport would be, Bad-Good, Cronbach's $\alpha = .85$), five items measured SN (e.g. People who are important to

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me think I should participate in sport at university, Disagree-Agree, Cronbach's $\alpha = .74$), seven items measured PBC (e.g. For me, participating in sport at university would be, Very difficult-Very easy, Cronbach's $\alpha = .86$), and three items measured intention (e.g. I intend to participate in sport at university, Strongly agree-Strongly disagree, Cronbach's $\alpha = .94$). Past behaviour was measured using three items (e.g. I have participated in sport on all four weeks during the past month, True-False, Cronbach's $\alpha = .93$). All items used 7-point Likert scales varying in direction. Measures of age and sex were also taken at T1.

T2: Three items measured behaviour at T2. Two items used 7-point Likert scales (e.g. During the past month, I participated in sport on all four weeks, True-False) and one item asked participants to report the number of weeks they had participated in sport (e.g. How often have you participated in sport in the last four weeks, Never-On all four weeks, Cronbach's $\alpha = .91$).

Data analysis

Negatively worded items were reversed when required, meaning lower responses represented negative perceptions and higher scores reflected positive perceptions. The mean of each item representing the same construct were summed and averaged to provide an overall score for each construct. The three items assessing T2 behaviour were standardized and summed and averaged into a single z-score.

Variance-based structural equation modelling (VB-SEM) was used to test the hypothesized models (see Figure 1 and Figure 2). Models were tested using the Warp PLS v7.0 software (Kock, 2020). The first model examined the relationships between TPB constructs and behaviour. Specifically, this tested the direct effects of attitude, SN, and PBC on intention, and the direct effects of intention and PBC on behaviour. Model one also tested the indirect effects of attitude, SN, and PBC on behaviour through intention. The second model included past behaviour and tested multiple direct and indirect effects. In addition to

the direct effects tested in the first model, Model 2 examined the direct effects of past behaviour on attitude, SN, PBC, intention, and behaviour. Model 2 also tested the indirect effects of past behaviour on intention and behaviour through TPB constructs.

The validity of the measures was examined to ensure the validity of the measurement model. The factor of each indicator on the corresponding latent factor was expected to be greater than .700, and the average variance extracted (AVE), which examines whether the items account for sufficient variance in the factor, to be greater than .500. Multiple criteria was used to examine the overall model fit: the goodness-of-fit (GoF) index with values of .100, .250, and .360 equate to small, medium, and large effect sizes, respectively; the average path coefficient (APC) and the average R² (ARS) should be different from zero for an adequately-fitting model; and for a well-fitting model, the values of the average variance inflation factor for model parameters (AVIF) should be less than 5.000 (Kock, 2020).

[Insert Figure 1 and Figure 2 near here]

Results

Participants

Data was completed by 286 participants at T1 ($n = 118$ males, 168 females; $M = 19.09$ years, $SD = 2.62$, range = 18-40) and 231 participants at T2 ($n = 99$ males, 132 females; $M = 19.02$ years, $SD = 2.27$, range = 18-40) (19.2% attrition). To check whether there were differences between those completing and not completing T2 questionnaires, a MANOVA was conducted with T1 age, past behaviour, attitude, SN, PBC, and intention as the dependent variables and status of participation (completers and non-completers) as the independent variable. There were no significant differences between study participants, $F(6, 279) = 1.28$; Wilks' $\Lambda = .97$, $p = .26$; $\eta^2 = .02$. A chi square test also revealed no significant differences in attrition between sex ($\chi^2(1, N = 286) = 1.26$, $p = .26$). Due to these lack of

differences, hierarchical regression was used to impute missing data. All data were normally distributed.

Model checks

VB-SEM was used to confirm the validity of the measurement model. Factor loadings for the latent factors exceeded the .700 criterion and all AVE values were above .500.

Indicators of overall model fit were found to be acceptable for both Model 1 (GoF Index = .642; APC = .355, $p < .001$; ARS = .577, $p < .001$; AVIF = 2.196) and Model 2 (GoF Index = .515 ; APC = .315, $p < .001$; ARS = .351, $p < .001$; AVIF = 1.700).

Model tests

The results from the path analysis can be seen in Table 1 which includes the standardized path coefficients, confidence intervals, and test statistics for the direct, indirect, and total effects for Models 1 and 2. Statistically significant effects are shown in Figures 3 (Model 1) and 4 (Model 2).

Model 1. Model 1 examined the effects of TPB constructs on behaviour (Figure 3). The data showed statistically significant direct effects of attitude, SN, and PBC on intention, and significant direct effects of PBC and intention on behaviour. Moreover, the data showed the impact of all social cognitive constructs on behaviour to be mediated through intention. Overall, the model accounted for 59% of the variance in intention and 42% of the variance in behaviour.

Model 2. Model 2 examined the effects of past behaviour on TPB constructs and behaviour. When past behaviour was included in the model, similar direct and indirect effects were found for TPB constructs on intention and behaviour as was demonstrated in Model 1, although the inclusion of past behaviour attenuated all effects. Past behaviour had a significant direct effect on TPB constructs and intention, but the path to behaviour was not significant. All indirect effects between past behaviour and intention through TPB constructs

and past behaviour and behaviour through intention were significant. The variance explained in intention and behaviour increased to 68% and 43%, respectively.

[Insert Table 1 near here]

[Insert Figure 3 and Figure 4 near here]

Discussion

The study examined the influence of past behaviour on key social cognitive constructs and sports participation in transitioning university students. Model 1 showed all constructs significantly predicted intention, with SN demonstrating the largest beta weight. Previous studies have found attitude to influence intentions towards sport and physical activity (Gucciardi & Jackson, 2015; Hagger et al., 2002). However, students in the first year of study are still forming new social bonds and may be significantly influenced by the perceptions of others. The variance accounted for in behaviour was also high and the key predictors of behaviour were significant. This suggests both intentions and perceptions of control have significant influence on sports participation, and that targeting key social cognition constructs could have utility in changing behaviour. Additionally, the mediation of attitude, SN, and PBC to behaviour through intention supports key TPB propositions (Ajzen, 1991).

The inclusion of past behaviour in Model 2 explained an additional 9% of the variance in intention. Past behaviour had significant direct effects on all TPB constructs and significant indirect effects on intention through model antecedents. Moreover, the direct effects of these constructs on intention found in Model 1 were attenuated, although these paths remained significant. Taken together, these findings suggest past behaviour has a direct effect on intention which is mediated by TPB mechanisms. The indirect effect of past behaviour to behaviour through social cognition constructs likely represents the extent to which past behaviour reflects previous reasoned, deliberation over performing sport in the

future. The inclusion of past behaviour had a modest increase in the variance explained in behaviour (1%) and no direct effect for past behaviour on behaviour in Model 2 was found. A significant total effect without a significant direct effect for past behaviour on behaviour suggests full mediation of TPB constructs. The results therefore support TPB assertions that the influence of past behaviour is mediated through theory constructs (Ajzen, 1991). Ouellette and Wood (1998) posit novel behaviours undertaken in unstable contexts and not learned are influenced by social cognitive constructs. The present study examined the behaviours of transitioning students who are entering unfamiliar environments and forming new behaviours. Findings could therefore reflect this period of transition. It would be interesting for research to examine whether other health behaviours undertaken during the transitional year are also influenced more by conscious processes.

Alternatively, the results could reflect the behaviour examined. Previous studies have found a residual effect of past behaviour in more habitual behaviours such as fruit and vegetable consumption (e.g. Brown et al., 2018) and alcohol intake (Conner et al., 1999). It could be contended that sport participation requires more conscious deliberation, such as planning the actions involved in the activities (e.g. arranging teams and equipment) and is therefore less automatic than these behaviours. Future research should establish which specific health behaviours are directly affected by past behaviour.

The findings have important implications for promotion efforts geared towards sports participation in university students. Results suggest interventions should specifically target the approval of significant others whilst ensuring perceptions of control are high. Intervention designers could adopt relevant behaviour change methods and techniques when targeting these mechanisms ((Kok et al., 2016; Michie et al., 2013). For example, the techniques ‘information about others’ approval’ and ‘social comparison’ could be used to manipulate the perceptions of others. Moreover, given there are many factors that could make

it difficult for transitioning students to participate in sport, perceptions of control could be targeted by engaging in ‘action planning’ or through ‘behavioural practice/rehearsal’.

Strengths and limitations

There are a number of strengths attached to the study. First, the study examined the mediating effects of TPB variables using path analysis and therefore tested theoretical model assumptions. Second, the study specifically examined the role of past behaviour relating to key social cognitive constructs and sports participation. This type of research has been lacking but is necessary for understanding the mechanisms underlying behaviour. Finally, the study investigated a behaviour that has important health benefits, especially for students entering university.

Despite these strengths, the study is not without limitations. First, the adopted prospective correlational design means causality cannot be inferred from the data. Experimental evidence is needed to confirm the findings. Second, although mentioned as a strength, the focus on first-year students limits generalizability of study findings. It would be fruitful to examine the mechanisms underlying sports participation in different university years to understand whether reasoned, deliberative processes give way to automatic and habitual mechanisms once sports participation becomes dependent on situational cues over time. Finally, the study used self-report to assess the variants of behaviour which may have led to bias (Althubaiti, 2016). Studies may seek to gain objective measures of sports participation using registers or swipe cards, if appropriate.

Conclusion

The study examined the relationship between past behaviour, TPB constructs, and sports participation in transitioning university students. The TPB was found to provide a good account of sports participation and its key tenets were supported. When past behaviour was included, the influence of TPB constructs remained and the path from past behaviour to

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behaviour was fully mediated by TPB mechanisms. Targeting social cognitive factors may be more beneficial to promoting participation in sport within transitioning university students than features of automaticity and habit.

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Tables

Table 1.

Standardized Path Coefficients and 95% Confidence Intervals from Structural Equation Models excluding (model 1) and including (model 2) past behaviour.

Effect	Model excluding past behaviour				Model including past behaviour			
	β	95%CI		p	β	95%CI		p
		LL	UL			LL	UL	
Direct effects								
Attitude → Intention	.331***	0.221	0.441	<.001	.284***	0.196	.0372	<.001
SN → Intention	.353***	0.243	0.462	<.001	.242***	0.141	0.343	<.001
PBC → Intention	.244***	0.132	0.355	<.001	.170***	0.076	0.263	<.001
Intention → Behaviour	.339***	0.230	0.449	<.001	.293***	0.172	0.415	<.001
PBC → Behaviour	.508***	0.401	0.615	<.001	.507***	0.399	0.614	<.001
PB → Attitude	----	----	----	----	.392***	0.309	0.475	<.001
PB → SN	----	----	----	----	.468***	0.373	0.564	<.001
PB → PBC	----	----	----	----	.366***	0.270	0.463	<.001
PB → Intention	----	----	----	----	.360***	0.270	0.450	<.001
PB → Behaviour	----	----	----	----	.070	-0.030	0.170	.085
Indirect effects								
Attitude → Intention → Behaviour	.112**	0.032	0.192	.003	.083***	0.040	0.126	<.001
SN → Intention → Behaviour	.120**	0.039	0.200	.002	.071***	0.032	0.110	<.001
PBC → Intention → Behaviour	.083*	0.007	0.163	.023	.050**	0.017	0.083	.002
PB → attitude → Intention	----	----	----	----	.111***	0.069	0.152	<.001
PB → SN → Intention	----	----	----	----	.113***	0.021	0.203	<.001
PB → PBC → Intention	----	----	----	----	.062***	0.016	0.108	<.001
PB → attitude → Intention → Behaviour	----	----	----	----	.032***	0.013	0.052	<.001
PB → SN → Intention → Behaviour	----	----	----	----	.033***	0.011	0.054	<.001
PB → PBC → Intention → Behaviour	----	----	----	----	.018**	0.004	0.031	.004
PB → PBC → Behaviour	----	----	----	----	.186***	0.125	0.247	<.001

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	PB → Intention → Behaviour ^a	----	----	----	----	.105***	0.052	0.158	<.001
Total indirect effects									
	PB → Intention	----	----	----	----	.287***	0.218	0.356	<.001
	PB → Behaviour	----	----	----	----	.375***	0.293	0.457	<.001
Total effects									
	PB → Intention ^b	----	----	----	----	.647***	0.580	0.714	<.001
	PB → Behaviour ^b	----	----	----	----	.445***	0.349	0.541	<.001
R ²									
	Intention	.59	----	----	----	.68	----	----	----
	Behaviour	.42				.43	----	----	----

Note. β = Standardized path coefficient; 95%CI = 95% confidence interval; p = Probability value of standardized path coefficient; * $p < .05$ ** $p < .01$ *** $p < .001$; LL = Lower limit of 95%CI; UL = Upper limit of 95%CI; SN = Subjective norm; PBC = Perceived behavioural control; PB = Past behaviour; ^aIndirect effect of past behaviour on behaviour through intention only; ^bTotal effect including direct and indirect effects

Figures

Figure 1. The TPB excluding past behaviour (Model 1).

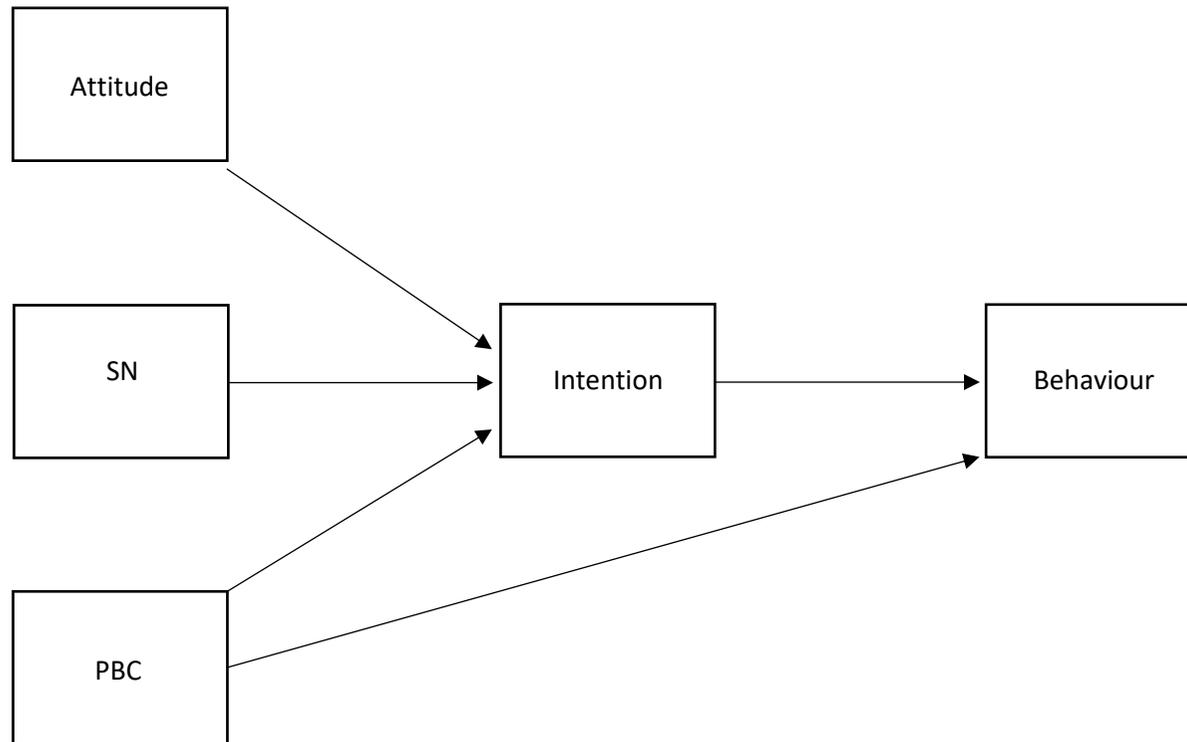


Figure 2. Proposed model including the TPB and past behaviour (Model 2).

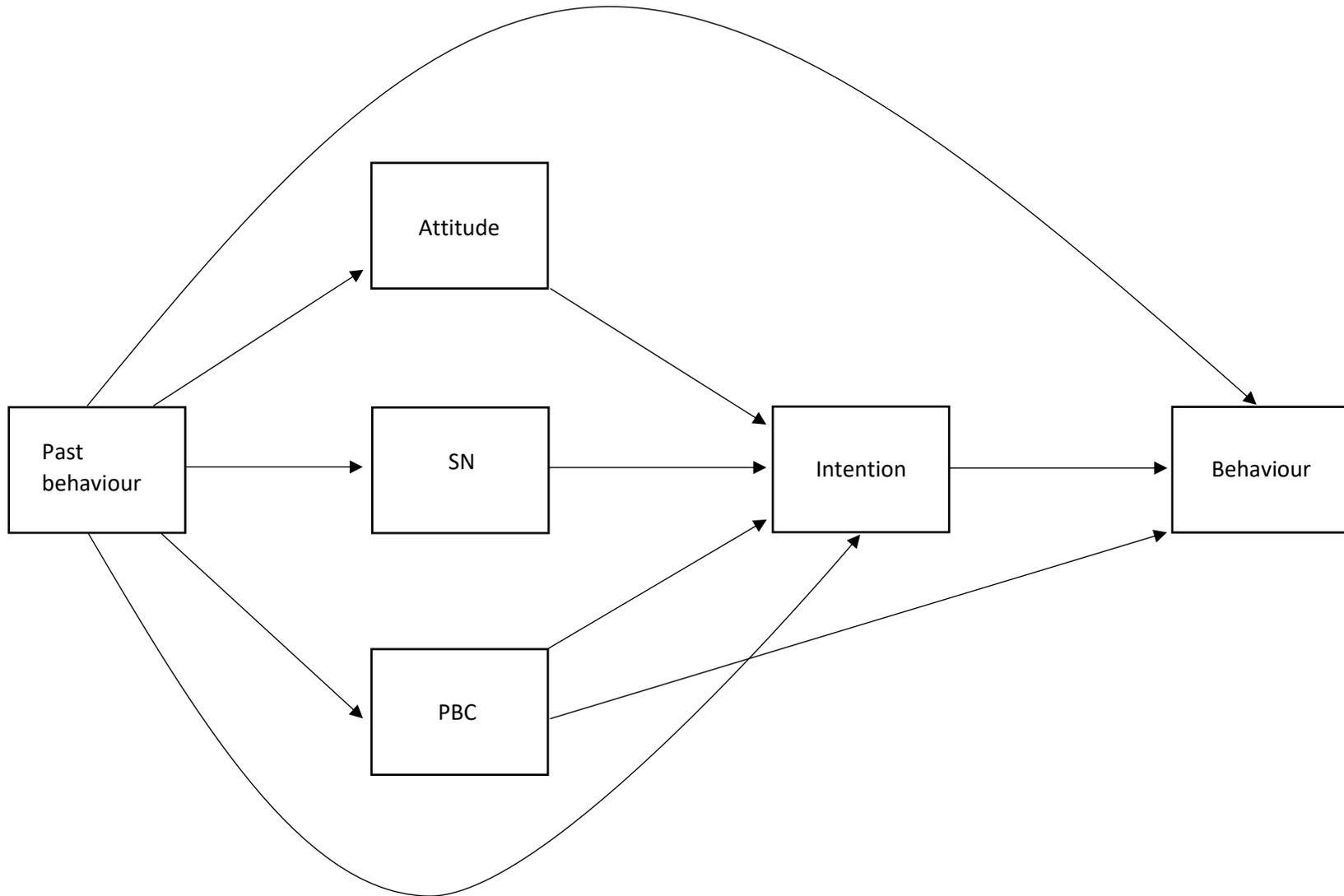


Figure 3. Path coefficients for the TPB excluding past behaviour (Model 1).

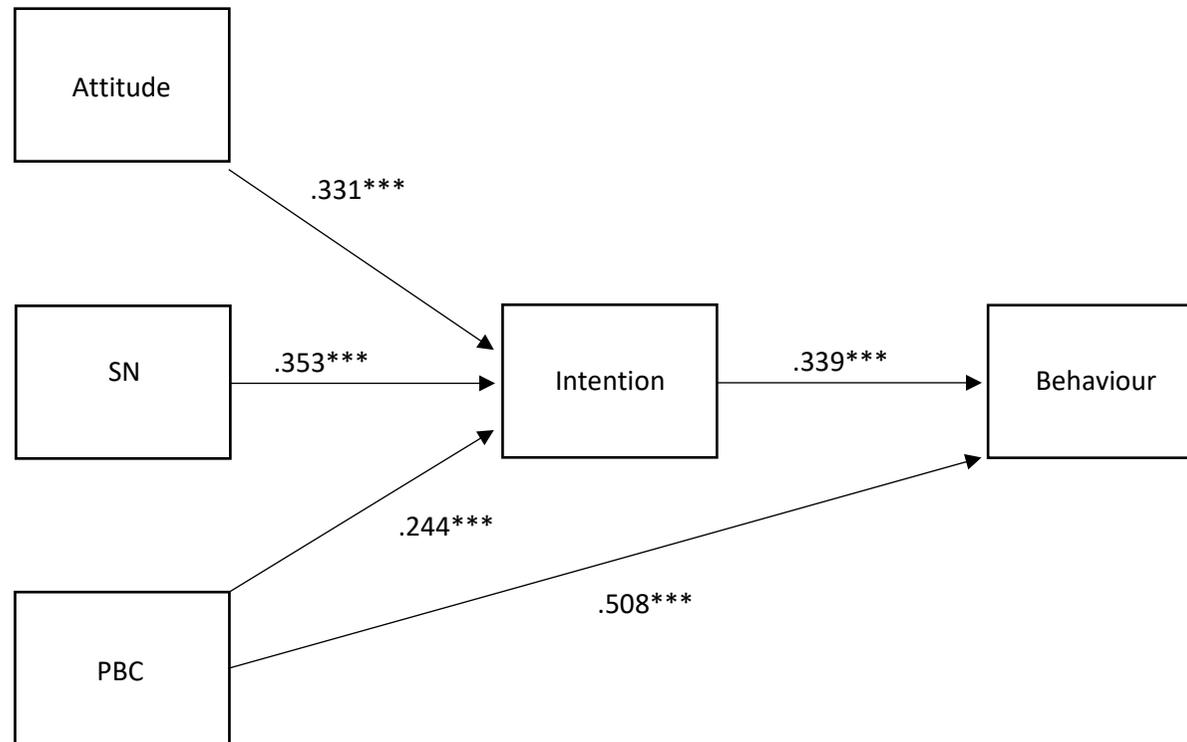


Figure 4. Path coefficients for the TPB including past behaviour (Model 2).

