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ORIGINAL ARTICLE

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The mediating role of behavioural automaticity and intention on past to future bootcamp attendance

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ABSTRACT

Objective: The aim of the current study was to test whether behavioural automaticity and intention mediated the effects of past behaviour on a particular type of vigorous physical exercise: bootcamp attendance.

Methods: A community sample ($N = 69$) who had previously attended a bootcamp class was recruited from Queensland, Australia. Participants were asked to complete measures of their previous bootcamp attendance, behavioural automaticity, and intention to attend bootcamps (Time 1). One month later (Time 2), participants were asked to report their bootcamp attendance and behavioural automaticity in the previous month. Data were fitted to a Partial Least Squares-SEM model.

Results: Past behaviour predicted both intention and behavioural automaticity. However, while behavioural automaticity significantly predicted prospectively measured behaviour and mediated the past-future behaviour relationship, there was no significant relationship between intention and bootcamp attendance. Past behaviour still predicted future behaviour beyond both behavioural automaticity and intention.

Conclusions: Current results support dual process and habit theory in that behavioural automaticity accounts for a portion of the residual effect of past behaviour on future behaviour which is not accounted for by intentional processes. The lack of significant effect by intention may also support these theories, as bootcamp classes likely occur in a stable context (e.g., at a prescribed time and in a regular location), encouraging habitual responding over considered decision-making.

KEY POINTS

What is already known about this topic:

(1) Engaging in regular physical activity, especially vigorous intensity exercise, provides benefits to health and wellbeing.
(2) Extending social cognition theories, dual-process models posit that behaviour is enacted predominately through deliberative or automatic pathways, depending on contextual and situational factors.
(3) A common hypothesis in dual process and habit theory is that automaticity is likely to exhibit strong effects when the behaviour occurs in stable contexts.

What this topic adds:

(1) This research tests the effects of behavioural automaticity and intention on physical activity in a seldom examined yet common type of exercise, bootcamp attendance.
(2) Behavioural automaticity mediated the relationship between past behaviour and future bootcamp attendance, but the intention did not predict bootcamp attendance.
(3) Given the stable context of bootcamp classes (i.e., at a prescribed time and place), current findings support dual process and habit theory that behaviours more likely to be stable are more likely to be enacted automatically rather than deliberatively.

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Habit; dual process theory; social-cognition; physical activity

The beneficial effects of engaging in regular physical activity are well established, including enhanced psychological well-being, prevention of heart disease, and improved cognitive functioning (Haskell et al., 2009). Participation in vigorous intensity exercise, compared to moderate physical activity, provides additional benefits including improvements in body composition, decreased resting blood pressure, and enhanced glucose control (Burgomaster et al., 2008; Swain, 2006). Despite the well-known benefits, a large proportion of

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the Australian population fail to meet the recommended guideline of 150 min of moderate intensity or 75 min of vigorous intensity physical activity per week (Australian Government Department of Health Population Health Division, 2019). One popular method of engaging in vigorous physical activity is the attendance of bootcamp style workout classes. Bootcamp-style workouts are vigorous-intensity, highly structured group exercise programs following a military training approach (Thompson, 2007). In addition to health benefits, group exercise programs involve exposure and contact with like-minded individuals, where frequent association with health-focused individuals leads to more engagement in health behaviours, such as exercise (Swain, 2006).

To date, a plethora of research has employed social cognition theories to investigate the mechanisms and determinants of health-related behaviours (McEachan et al., 2011), including physical activity behaviours (Hagger et al., 2002). A key hypothesis of such theories is that behaviour is the result of reasoned, conscious intentions, which themselves are formed on the basis of beliefs stemming from previous experiences (Ajzen, 1991; Brown et al., 2020). Such a proposition has support in the literature, as intention is consistently shown to predict a modest portion of variance in health behaviours including physical activity (Hagger et al., 2002; Hamilton et al., 2021, 2022; McEachan et al., 2011; Phipps, Hannan, et al., 2021; Phipps et al., 2022). However, meta-analytic studies have also found past behaviour to have a significant residual effect on future behaviour beyond that of intention (Ouellette & Wood, 1998; Zhang et al., 2019), implying that the effect of past behaviour on future behaviour is not totally modelled through changes in beliefs, and subsequently, intentions. Instead, the persistent residual effects of past behaviour may indicate the presence of additional pathways to behaviour which are not accounted for by conscious, reasoned decision-making. Such findings have contributed to the rise of dual-process models which implicate both deliberate and automatic processes in explaining behaviour (Strack & Deutsch, 2004).

A key construct that attempts to measure such processes is behavioural automaticity, a core element of the wider habit construct conceptualised as the extent to which individuals enact their behaviour automatically, i.e., without conscious input (Gardner, 2012; Verplanken & Orbell, 2003). To date, the behavioural automaticity construct has shown notable success in predicting physical activity with modest-sized effects (Gardner et al., 2011) and has been shown to mediate the past behaviour-future behaviour relationship alongside intention on a variety of health behaviours (Brown et al., 2020; Hamilton et al., 2020; Phipps et al., 2020). However, as posited by dual process and habit theory, it is likely that while both behavioural automaticity and intention appear as significant determinants of behaviour in group-level correlational data, only one process likely "wins-out" in determining behaviour in any given situation. Thus, theorists have attempted to investigate the situations and contexts in which behaviour is likely to be elicited by either habitual, automatic responding, or intentional, reasoned decisions.

A key factor which may encourage automatic responding over considered decision-making is the stability of the context in which behaviour is enacted. Specifically, theorists have hypothesised behavioural automaticity to likely exhibit strong effects when the behaviour occurs frequently or in stable contexts (Ouellette & Wood, 1998). For example, at the same time of the day or week, in the same place, or with the same people. This is likely explained as, while intention may be useful in eliciting initial occurrences of a behaviour, frequent co-exposure to stable cues and the target behaviour likely encourages both the formation and activation of cue-behaviour scripts. This is supported by evidence, as scholars have observed weaker effects of intention and stronger effects of automatic processes when behaviours were performed frequently or in a stable context (Danner et al., 2008; Norman & Cooper, 2011; Ouellette & Wood, 1998). Regarding physical activity, such a pattern of effects may suggest that while previous findings have shown modest effects of both behavioural automaticity and intention on behaviour (Gardner et al., 2011; Hagger, 2018), certain forms of physical activity may be more likely to fall under the control of behavioural automaticity than others. Specifically, in the current study, we aim to investigate the effects of behavioural automaticity and intention on a physical activity behaviour that is likely considered stable: bootcamp attendance. That is, bootcamp classes often occur at a set time and in a regular place over the period of the course, rather than at a flexible time or in a varied place of the individuals choosing. Based on this reasoning, therefore, bootcamp attendance may theoretically be determined by automatic processes rather than considered decision-making.

The aim of the current study is to test whether behavioural automaticity and intention mediate the effects of past behaviour on future behaviour in a particular type of physical activity behaviour: the attendance of bootcamp classes. Based upon the theories of social cognition, dual-process models and habit theory (Ajzen, 1991; Verplanken & Orbell, 2003), we expect that both intention and behavioural

automaticity will significantly mediate the effects of past behaviour on future bootcamp attendance.

Method

Participants

Participants ($N = 69$, 76.8% female, mean age = 35.84, SD = 11.47) were bootcamp attendees from various locations across Queensland, Australia. Participants were recruited if they had attended bootcamp sessions in the 4-weeks prior to the study, and if they were 18 years of age or older.

Measures

The survey included items measuring demographics, intention, behavioural automaticity, and past behaviour (Time 1), and 1 month later (Time 2), behavioural automaticity and bootcamp attendance were measured. Measures were adapted from validated scales and have been demonstrated to represent reliable measures of the intended constructs (Ajzen, 2006).

Intention

Intention was measured at Time 1 using three items on a 7-point likert scale (1 = *Strongly disagree*, to 7 = *Strongly agree*). These questions measured participant's self-reported intention to attend bootcamp for the subsequent 4 weeks. The three items include (1) it is likely that I will attend bootcamp in the next 4 weeks, (2) I intend to attend bootcamp in the next 4 weeks, (3) I plan to attend bootcamp in the next 4 weeks.

Behavioural automaticity

Behavioural automaticity was measured at Time 1 and Time 2 using the 4-item self-report behaviour automaticity index (Gardner et al., 2012; Verplanken & Orbell, 2003) on a 7-point likert scale (1 = *Strongly disagree*, to 7 = *Strongly agree*). The four items include (1) attending bootcamp is something I do automatically, (2) attending bootcamp is something I do without having to consciously remember, (3) attending bootcamp is something I do without thinking, and (4) attending bootcamp is something I start doing before I realise I am doing it.

Bootcamp attendance

Participant attendance at bootcamp was measured at Time 1 and Time 2 with three items. Items one and two were measured on a 7-point likert scale (1 = *Never*, to 7 = *Always*). Items included (1) "Think about the past 4 weeks. In general, how often did you attend bootcamp?", and (2) "Think about the past 4 weeks. In general, to what extent did you attend bootcamp?". Item three, "Think about the entire past 4 weeks and count, how many times did you attend bootcamp?", required a numerical response

Procedure

This study was granted ethical clearance by the Griffith University Human Research Ethics Board (GU ref no: 2015/55). A prospective-correlational design was used with two data collection time points separated by 4 weeks. Participants were recruited via posts on social media sites, emails to first-year psychology students, through the researchers attending bootcamp locations and providing paper-based surveys, and distributing flyers at various bootcamp locations. At bootcamp locations, consent forms were signed by bootcamp leaders to indicate permission to attend sessions for data collection. After providing informed consent, participants completed an online or paper-based survey measuring intention, behavioural automaticity, past behaviour, and bootcamp attendance items (Time 1). Four weeks later, consenting participants completed the Time 2 survey. This survey was provided in-field, online, or over the phone. A unique code identifier was used to match participant responses on the two surveys. Estimated completion for survey 1 and 2 was 16 and 6 min, respectively. Upon completion of both time points, participants were given the opportunity to enter a prize draw to win one of the four $25 Coles/Myer gift card vouchers.

Data analysis

The data were analysed as a linear partial least squares structural equation model using WarpPLS 8.0. Standard errors were created using the stable method (Kock, 2014). Only cases with complete data were used in the analysis. The Tenenhaus' GoF index (GoF), the R-squared contribution ratio (RSCR), and the average block variance inflation factor (AVIF) were used to assess model fit. Values exceeding 0.36 for the GoF indicate good quality for studies with large effect sizes. Values greater than 0.90 for RSCR and less than 3.3 for the AVCIF also indicate good fit and model quality. Analysis using Gpower 3.1. indicated a minimum required sample of 55 to achieve a power of .80, assuming modest effect sizes for the regression coefficients (f^2=.15; Cohen, 1988).

Results

While the final sample consisted of 69 participants, data were collected for 159 participants at baseline,

Table 1. Means, standard deviations, reliability, and zero-order intercorrelations for all variables addressing bootcamp attendance.

		1.	2.	3.	4.	5.	6.	7.
1.	Age	-						
2.	Gender	−.188	-					
3.	Past behaviour (Time 1)	.124	.016	-				
4.	Behavioural automaticity (Time 1)	.241*	.021	.638**	-			
5.	Behavioural automaticity (Time 2)	.243*	−.038	.477**	.609**	-		
6.	Intention (Time 1)	.108	.021	.556**	.541**	.274*	-	
7.	Bootcamp attendance (Time 2)	.151	−.032	.559**	.429**	.698**	.288*	-
	Mean	35.84	-	5.61	5.49	5.11	6.46	4.83
	Standard deviation	11.47	-	1.61	1.69	2.05	1.26	1.95
	Reliability	-	-	.94	.94	.98	.93	.94

*$p < .050$; **$p < .010$.

with 90 failing to complete the Time 2 survey, 1 month later. Participants who successfully completed the Time 2 survey did not significantly differ from those who did not with regard to age ($t(156) = 1.37$, $p = .173$), gender (χ^2 (1) = 2.38, $p = .123$), marital status (χ^2 (4) = 4.55, $p = .235$), employment status (χ^2 (1)= .266, $p = .966$), income (χ^2 (1) = 2.46, $p = .652$), or ethnicity (χ^2 (1)= .195, $p = .659$). However, there was a modest difference between those who completed the Time 2 survey and those who did not on the Time 1 study variables (Wilks' Lambda =.916, $F(3,153) = 4.68$, $p = .004$, η_p^2= .084; Past Behaviour $F(1,155) = 12.26$, $p = .001$, η_p^2= .073; T1 Behavioural Automaticity $F(1,155) = 4.64$, $p = .033$, η_p^2= .029; Intention $F(1,155) = 8.93$, $p = .003$, η_p^2= .054). Correlations, internal consistency, and descriptive statistics for all variables are presented in Table 1.

Regarding the model, analysis revealed good fit to data (GoF = .613, RSCR =.993, AFVIF = 2.29, see Figure 1). All items are loaded significantly onto their respective latent variables (all β's > .628, all p's <.001). Past behaviour predicted intention (β = .526, $p < .001$, f^2= .277), Time 1 behavioural automaticity (β=.626, $p < .001$, f^2= .392), and Time 2 bootcamp attendance (β = .403, $p < .001$, f^2= .246). In contrast to expectations, intention did not predict Time 2 bootcamp attendance (β=-.101, $p = .124$, f^2= .025) and thus did not mediate the relationship between past behaviour and bootcamp attendance (β=-.053, $p = .194$, f^2 = .033). Behavioural automaticity significantly mediated the effect of past behaviour on prospectively measured bootcamp attendance at Time 2 (β = .198, $p < .001$, f^2 = .121), as Time 1 behavioural automaticity significantly predicted Time 2 behavioural automaticity (β = .609, $p < .001$, f^2 = .371), and Time 2 behavioural automaticity in turn predicted prospectively measured bootcamp attendance at Time 2 (β = .520, $p < .001$, f^2= .361).

Discussion

In the current study, we aimed to investigate the mediating role of intention and behavioural automaticity on the relationship between past and future behaviour in a community sample of bootcamp fitness class attendees. Automaticity mediated the relationship between past behaviour and future bootcamp attendance. However, while past behaviour predicted bootcamp attendance, intention did not have a significant effect on future bootcamp attendance.

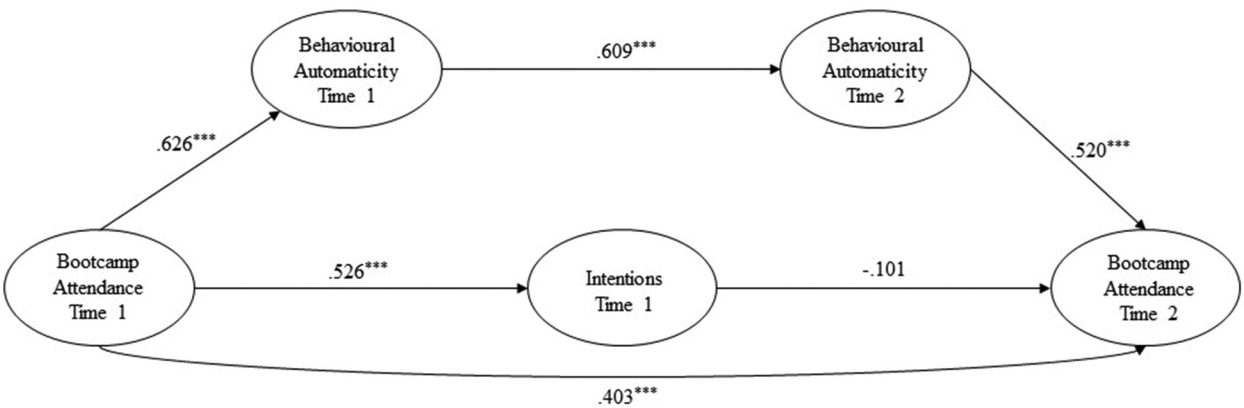

Figure 1. The tested model predicting bootcamp attendance from behavioural automaticity and intention.
Note. Paths are presented with standardised parameter estimates. *$p < .05$, **$p < .01$, ***$p < .001$.

The significant effect of past behaviour on behavioural automaticity and of behavioural automaticity on subsequent behaviour is in line with previous theory that constructs that measure automatic, habitual processes, like behavioural automaticity, account, at least partially, for the residual effects of past behaviour on future behaviour that are not accounted for by intention (Ouellette & Wood, 1998). Repeated occurrences of past behaviour are a key determinant of more automatic responding, leading to habit development (Gardner & Lally, 2018), especially in cases where the behaviour occurs frequently and in a stable context. Further, once developed, habit encourages future behavioural occurrences upon encountering relevant stimuli or cues, triggering behaviour rapidly and automatically by activating behavioural scripts or encouraging habitual decisions in favour of undertaking the behaviour (Gardner, Rebar, et al., 2020; Hagger, 2020). This effect is again likely to be particularly strong in stable contexts such as bootcamp attendance, as cues such as the consistent timing or location of bootcamp classes may become triggers for scripts promoting actual bootcamp attendance.

In contrast to our hypotheses and reasoned action theories (Ajzen, 1991), intention did not mediate the relationship between past and future behaviour. We observed a significant effect of past behaviour on intention in line with current theories of social cognition and reasoned action. That is, past occurrences of a behaviour likely affect the social-cognitive beliefs which underlie intentions, for example, by allowing for evaluations of the behaviour and increasing the likelihood that behaviour is viewed as under one's control. However, intention did not significantly predict future behaviour, despite the constructs theoretical prominence as the most proximal predictor of behaviour (Ajzen, 1991). While this finding may be unexpected from social cognition theories and previous evidence in broader physical activity research (Hagger et al., 2002), a plausible explanation for this lack of significant effect may lie in dual process and habit theories. Specifically, there are findings of weaker effects of intention as compared to habit in highly stable contexts (Norman & Cooper, 2011; Ouellette & Wood, 1998) and that when a behaviour becomes sufficiently habitual, intention is no longer an important factor in eliciting a behavioural response (Chatzisarantis & Hagger, 2007; Gardner et al., 2011). Thus, as the current study recruited only those who had recently attended a bootcamp class, it is likely intention played an important role in the initial decision to engage in these classes, but once attendance began, the stable context (e.g., in the same gym or park each time) and timing (e.g., at the same time each week) of bootcamp classes likely encouraged more automatic responding and habit development.

Past behaviour also predicted bootcamp attendance directly and importantly beyond the effects of behavioural automaticity and intention. While some residual effect of past behaviour would be expected, for example, due to shared method bias in the behaviour measure, the moderate strength of this effect raises potentially important questions for the tested model. Specifically, seminal papers in the habit field theorised that the majority of the variance which past behaviour accounted for in the future behaviour beyond intention was due to habitual responding (Ouellette & Wood, 1998). Yet, the strength of the observed residual effect of past behaviour in the current study suggests this is not the case. Alternatively, this residual effect of past behaviour on bootcamp attendance may reflect the effect of alternative constructs on bootcamp attendance that were not measured in the current study. For example, it is possible factors such as implicit beliefs, self-regulation, or individual difference factors may affect behaviour beyond the effect of behavioural automaticity and intention (Adriaanse et al., 2014; Hagger & Hamilton, 2021; Hamilton et al., 2018; Phipps et al., 2020) or even moderate whether an individual responds automatically or as a result of a considered decision-making (Gardner, Lally, et al., 2020; Phipps, Hagger, et al., 2021; Sas et al., 2022).

The current study has numerous strengths including the investigation of a novel population group in bootcamp attendees, use of a prospective design, and adoption of theory to base hypotheses. Despite these strengths, several limitations should be highlighted. First, the current study used self-reported measures of bootcamp attendance, and thus measurements may be subject to recall and social desirability bias. Future research may consider requiring bootcamp leaders to complete class attendance lists and comparing this with self-reported attendance to provide more accurate data. As an additional benefit, such observation-based behavioural measures would also serve to minimise any potential biases caused by participants declining to complete follow-up surveys. This was an issue in the current research, where higher than desirable attrition between the Time 1 and Time 2 measurement points presented a notable limitation and resulted in a modest sample size for the final analysis. This is partially addressed through the use of PLS-SEM, which is generally accepted to provide accurate results even in smaller sample sizes (Willaby et al., 2015). However, it is none-the-less a concern which should be addressed in the future

research, for example, through the use of a larger sample and objective or observational measures. Lastly, due to the correlational nature of this study, the interpretation of the effects reported is based solely upon theory. While this is an inherent limitation of correlational research, it may be of particular importance in researching constructs that are likely developed through stable contexts, like behavioural automaticity, where the direction of effect is difficult to establish. Additional research including longitudinal and cross-lagged panel designs is needed in order to confirm the hypothesised directions of effects.

Taking limitations into account, the current study has notable theoretical and practical implications. Practically, current findings provide further support for the proposition that constructs which measure automatic, habitual processes, like behavioural automaticity, may be valuable targets for behaviour change interventions aiming to encourage physical activity (Kaushal et al., 2018). This may be especially important in the context of structured exercise programs like bootcamp classes, where habits may form rapidly and have particularly strong effects, thus potentially helping to promote long-term adherence to exercise guidelines. Further, the finding that behavioural automaticity significantly mediated the relationship between past behaviour and future bootcamp attendance provides additional empirical evidence for habit theory (Ouellette & Wood, 1998). Also, although past behaviour predicted intention, but intention did not predict bootcamp attendance, this finding may contribute to the theory proposing dual processes to behaviour, as it is possible intention does not predict bootcamp attendance due to the nature of bootcamp classes encouraging more automatic, habitual responding. Future research may seek to replicate the current findings in order to further inform habit-based interventions and elucidate the mechanisms by which behavioural automaticity and intention affect future behaviour.

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No potential conflict of interest was reported by the author(s).

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Data availability statement

Data, outputs and supplementary materials are available at https://osf.io/uqjxk/

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