Predicting exercise after university: an application of the reasoned action approach across a significant life transition

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Predicting exercise after university: an application of the reasoned action approach across a significant life transition

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ABSTRACT

The present study applied an extended version of the reasoned action approach (RAA) to explain students' post-university exercise intentions and behaviour. Students (N = 136) completed measures of RAA variables, past behaviour, habit strength and self-identity before leaving university, and exercise behaviour six months later (n = 84). The RAA explained 67% of the variance in exercise intentions (experiential attitude, instrumental attitude and autonomy were significant predictors), and 20% of the variance in behaviour (experiential attitude and intention were significant predictors). Past behaviour explained additional variance in exercise intentions and behaviour, but its effects were mediated by self-identity. The RAA provides a useful framework for understanding students' exercise intentions and behaviour as they transition out of university. Self-identity may be particularly important for maintaining exercise levels across significant life transitions.

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Physical activity; college; reasoned action approach; self-identity; significant life transition

Introduction

Engaging in regular exercise reduces the risk of developing chronic health conditions, including cardiovascular disease (Hamer & Stamatakis, 2012), stroke (Middleton et al., 2013) and diabetes (Demakakos et al., 2010). It also has positive benefits for mental health, including reduced anxiety (Anderson & Shiveakurnar, 2013) and increased psychological well-being (Gauvin et al., 2000). Despite these health benefits, 27% of the UK adult population are classified as 'inactive' (Health Survey for England [HSE], 2019). Engagement in regular exercise generally declines with age (Gordon-Larsen et al., 2004; Heath and Social Care Information Centre [HSCIC], 2013; Malina, 2001), with a notable decline in PA between adolescence and adulthood. For example, Zick et al. (2007) reported that 37% of adolescents (15–19 year olds) met recommended PA guidelines compared to 20% in early adulthood (20–24 year olds).

The present study applied the reasoned action approach (RAA; Fishbein & Ajzen, 2010) to examine exercise behaviour across a significant life transition in early adulthood; namely, leaving university. The RAA posits intention as the proximal determinant of behaviour, reflecting an individual's motivation to perform a behaviour. Intention is in turn is determined by experiential attitudes (e.g. belief that the

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behaviour would be fun), instrumental attitudes (e.g. belief that the behaviour would be beneficial), injunctive norms (i.e. perceived wishes of significant others), descriptive norms (i.e. perceived behaviour of others), autonomy (i.e. belief that the behaviour is under one's control) and capacity (i.e. confidence in one's ability to perform the behaviour). The effects of other variables should be mediated by RAA variables. The RAA has been used to explain various health behaviours including condom use, smoking, healthy eating and exercise, with a recent meta-analysis (McEachan et al., 2016) reporting that experiential attitudes (r_+ = .55), instrumental attitudes (r_+ = .38), injunctive norms (r_+ = .39), descriptive norms (r_+ = .35), autonomy (r_+ = .27) and capacity (r_+ = .60) all had significant average correlations with intention, which, in turn, was significantly correlated with future behaviour (r_+ = .48). On average, the RAA explained 59% and 31% of the variance in health-related intentions and behaviour. Interestingly, of the 41 RAA studies on exercise included in the meta-analysis, only three had follow-up periods of at least six months.

The limited research on exercise across significant life transitions has found that starting a job (Brown & Trost, 2003; Kirk & Rhodes, 2012), parenthood (Hull et al., 2010), and starting university (Kwan et al., 2012) negatively impact on exercise behaviour. Kwan et al. (2009) used an earlier version of the RAA, the theory of planned behaviour (TPB; Ajzen, 1988), to examine exercise in students entering university. The TPB and past behaviour explained 38.5% of the variance in exercise intentions but was unable to explain exercise behaviour at eight-week follow-up, with past behaviour being the sole significant predictor. When past behaviour has a direct effect on future behaviour, this is usually argued to reflect the influence of habitual responses (Gardner et al., 2011; Ouellette & Wood, 1998). Repeatedly performing a behaviour in a stable context increases the automaticity of behaviour initiation in response to specific environmental cues (Gardner, 2015). Significant life transitions, however, are likely to weaken previous habitual behaviour patterns due to the changing physical and social environment (Wood et al., 2005). Instead, past behaviour may impact future behaviour through the development of one's self-identity, such that individuals may be motivated to act in accordance with their self-identity (Baumeister & Muraven, 1996; Stets & Burke, 2000), even in a changing physical or social context. Self-identity has been found to be a significant predictor of both intention and behaviour after controlling for TPB variables and past behaviour (Hamilton & White, 2008; Jackson et al., 2003; Rise et al., 2010).

The present study builds on previous research through applying the RAA, along with measures of past behaviour, habit strength and self-identity, to explain university students' exercise intentions and behaviour across the transition of leaving university. In particular, it was hypothesized that (i) the RAA will explain significant proportions of variance in exercise intentions and behaviour, (ii) past behaviour will explain additional variance in exercise intentions and behaviour, (iii) the effect of past behaviour on exercise intentions and behaviour will be mediated by habit strength and/or self-identity.

Method

Procedure and participants

Final year UK university students were recruited via email sent to a research volunteers list. Included was a link to an online participant information sheet, consent form and

baseline questionnaire. The baseline questionnaire (time 1) was completed just before the end of the academic year. Participants were followed up six months later, post-university (time 2). Participation was voluntary but was incentivised via a £50 prize draw at each time point. The Department of Psychology Research Ethics Committee approved the study in accordance with the University's Research Ethics Procedures.

The time 1 questionnaire was completed by 136 participants, comprising 55 males and 81 females with a mean age of 23.29 (SD = 4.05). Ninety-eight were final year undergraduates and 38 were final year postgraduates. The sample was primarily from Britain (79%) and described their ethnicity as 'White' (83%). All participants provided an email address to be contacted six months later. The time 2 questionnaire was completed by 84 participants (see Table 1).

Measures

The time 1 questionnaire included measures of the RAA, past behaviour, habit strength and self-identity. Regular exercise was defined at the start of the questionnaire as 'a minimum of 30 minutes of vigorous-intensity physical activity, at least three days a week', in line with evidence for the health benefits of engaging in vigorous exercise (Hu et al., 1999; Morris et al., 1980). The time 2 questionnaire assessed exercise behaviour.

RAA measures were constructed in line with recommendations (Conner & Sparks, 2015) and assessed on 7-point response scales that were coded so that high values indicated high levels on the variable of interest. Cronbach's (1951) alpha was used to assess the internal reliability of the measures. All RAA variables were assessed with two-item scales: *experiential attitude* (e.g. 'Engaging in regular exercise after I leave university would be … unpleasant/pleasant', α = .88), *instrumental attitude* (e.g. 'Engaging in regular exercise after I leave university would be … harmful/beneficial', α = .73), *injunctive norm* (e.g. 'People who are important to me think I should/should not engage in regular exercise after I leave university', α = .71), *descriptive norm* (e.g.

Table 1. Sample characteristics.

Characteristic	Time 1 (N = 136)	Time 2 (N = 84)
Age, M (SD)	23.29 (4.05)	23.08 (3.94)
Gender, n (%)	55 (40%)	32 (38%)
Male	81 (60%)	52 (62%)
Female		
Nationality, n (%)	107 (79%)	71 (84%)
British	14 (10%)	5 (6%)
Asian	5 (4%)	3 (4%)
North & South American	8 (6%)	5 (6%)
European	1 (1%)	0 (0%)
Indian	1 (1%)	0 (0%)
Missing		
Ethnicity, n (%)	113 (83%)	74 (88%)
White	15 (11%)	5 (6%)
Asian/Asian British	6 (4%)	3 (4%)
Other	2 (2%)	2 (2%)
Missing		
Study level, n (%)	98 (72%)	61 (73%)
Undergraduate	38 (28%)	23 (27%)
Postgraduate		

'Most people I know at university will engage in regular exercise after leaving university', α = .84), *autonomy* (e.g. 'I feel in complete control over whether or not I engage in regular exercise after I leave university', α = .79), *capacity* (e.g. 'If I wanted to, I could easily engage in regular exercise after I leave university', α = .82), and *intention* (e.g. 'Do you intend to engage in regular exercise after you leave university?', α = .93).

Habit strength was assessed using the Self-Report Behavioural Automaticity Index which has good internal reliability and convergent and predictive validity (SRBAI; Gardner et al., 2012). The SRBAI comprises four items rated on 7-point response scales that focus on the central component of habit, i.e. automaticity (e.g. 'Regular exercise is something I do automatically', α = .93).

Self-identity was assessed with three items rated on 7-point response scales in line with De Bruijn et al. (2012) (e.g. 'To engage in regular exercise is an important part of who I am', α = .93).

Time 1 and 2 *exercise behaviour* was assessed using the Godin-Sheppard Leisure-Time Exercise Questionnaire (GLTEQ; Godin, 2011). Participants reported on how many occasions they engaged in mild, moderate and strenuous exercise (for at least 15 minutes) in a typical week. The reported number of bouts of strenuous exercise was used as the measure of exercise behaviour to be consistent with the focus of the RAA measures. The GLTEQ correlates with percentile VO_2max, with strenuous exercise having the greatest discriminant validity.

Results

Attrition analyses

Fewer British participants were lost to follow-up than other nationalities (34% vs. 55%), χ^2 (1, N = 136) = 4.98, p= .03, as were participants who described their ethnicity as 'White' versus other ethnicities (35% vs. 57%), χ^2 (1, N = 136) = 3.92, p= .048. There were no significant differences between those who completed both questionnaires and those lost to follow-up in terms of age (M = 23.08, SD = 3.94 vs. M = 23.63, SD = 4.24), t(134) = 0.77, p = .44, gender (male 42% vs. female 36%), χ^2 (1, N = 136) = 0.50, p= .48, or study level (undergraduate 38% vs. postgraduate 39%%), χ^2 (1, N = 136) = 0.03, p= .85.[1]

Descriptive findings and correlations

The means, standard deviations and intercorrelations for main measures are presented in Table 2. RAA measure mean scores were above scale midpoints, except for descriptive norm. Habit strength and self-identity both scored around the scale midpoint. A non-significant decline in strenuous exercise was observed between time 1 (M = 1.91, SD = 1.74) and time 2 (M = 1.76, SD = 1.87), t(83) = 1.40, p = .16.

All RAA variables (except descriptive norm), past behaviour, habit strength and self-identity, had significant positive correlations with intention. Intention, experiential attitude, past behaviour, habit strength and self-identity had significant positive correlations with exercise behaviour at six-month follow-up. Associations between age, gender,

Table 2. Means, standard deviations and correlations between the study variables (N = 136).

Variable	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	*Mean*	*SD*
1. Experiential Attitude	.67***	.43***	-.07	.18*	.41***	.32***	.37***	.62***	.67***	.25*	5.80	1.33
2. Instrumental Attitude		.46***	.01	.25**	.30***	.24**	.14	.36***	.67***	.10	6.52	0.79
3. Injunctive Norm			.16	.28**	.20*	.05	.04	.21*	.39***	-.06	5.62	1.48
4. Descriptive Norm				.21*	.20*	-.08	-.05	-.11	.04	-.07	4.00	1.17
5. Autonomy					.68***	.05	.11	.17	.51***	-.02	5.16	1.43
6. Capacity						.12	15	.25**	.50***	-.01	5.17	1.32
7. Past Exercise Behaviour							.35***	.63***	.37***	.47***	1.93	1.74
8. Habit Strength								.68***	.30***	.51***	3.46	1.79
9. Self-Identity									.59***	.57***	4.40	1.94
10. Intention										.27*	5.85	1.26
11. Time 2 Exercise Behaviour [a]											1.76	1.87

Note. * $p < .05$. ** $p < .01$. *** $p < .001$. [a] $n = 84$

nationality, ethnicity and study level and exercise intentions and behaviour were non-significant.

Predicting post-university exercise intentions

Hierarchical regression analysis examined the predictors of post-university exercise intentions (Table 3). Variables were entered in three blocks: (i) RAA variables, (ii) past behaviour and (iii) habit strength and self-identity. The RAA variables explained 67% of the variance in post-university exercise intentions, $R^2 = .67$, $F(6, 127) = 42.41$, $p < .001$, with experiential attitude, instrumental attitude and autonomy as significant independent predictors. Past behaviour explained an additional 2% of the variance, $\Delta R^2 = .02$, $\Delta F(1, 126) = 10.24$, $p = .002$, and was a significant predictor along with experiential attitude, instrumental attitude and autonomy. Habit strength and self-identity explained a further 3% of the variance, $\Delta R^2 = .03$, $\Delta F(2, 124) = 6.45$, $p = .002$. The effect of past behaviour became non-significant. Self-identity emerged as a significant predictor, suggesting mediation. Experiential attitude, instrumental attitude and autonomy remained as significant predictors. The final regression model explained 72% of the variance in post-university exercise intentions, $R^2 = .72$, $F(9, 124) = 35.62$, $p < .001$.

Mediation analyses (Preacher & Hayes, 2008) examined whether self-identity mediated the relationship between past behaviour and exercise intentions. Past behaviour was entered as an independent variable along with self-identity as a potential mediator and the RAA variables and habit strength as covariates. The path between past behaviour and exercise intention, $B = 0.12$, $SE = 0.04$, $p = .004$, was reduced to non-significance, $B = 0.02$, $SE = 0.05$, $p = .62$, when self-identity was controlled for. The indirect effect of past behaviour on intention through self-identity was found to be significant, $B = 0.09$, $SE = 0.03$, $CI = 0.04$ to 0.16, confirming mediation.

Predicting post-university exercise behaviour

Hierarchical regression analysis examined the predictors of post-university exercise behaviour (Table 4). Variables were entered in four blocks: (i) intention, (ii) other RAA

Table 3. Summary of hierarchical regression analysis for variables predicting intention (N = 136).

Step	Variable	*B*	*SE*	*ß*
1.	Experiential Attitude	0.43	0.08	.44***
	Instrumental Attitude	0.46	0.12	.30***
	Injunctive Norm	-0.02	0.05	-.03
	Descriptive Norm	-0.01	0.06	-.01
	Autonomy	0.36	0.07	.41***
	Capacity	-0.05	0.08	-.05
2.	Experiential Attitude	0.37	0.08	.39***
	Instrumental Attitude	0.44	0.12	.28***
	Injunctive Norm	-0.01	0.05	-.01
	Descriptive Norm	0.00	0.06	.00
	Autonomy	0.35	0.07	.40***
	Capacity	-0.04	0.08	-.04
	Past Exercise Behaviour	0.12	0.04	.17**
3.	Experiential Attitude	0.23	0.09	.24**
	Instrumental Attitude	0.50	0.11	.32***
	Injunctive Norm	-0.01	0.05	-.02
	Descriptive Norm	0.01	0.06	-.01
	Autonomy	0.32	0.06	.36***
	Capacity	-0.02	0.07	-.02
	Past Exercise Behaviour	0.02	0.05	.03
	Habit Strength	-0.07	0.05	-.10
	Self-Identity	0.22	0.06	.33***

Note. $R^2 = .67$ for Step 1, $p < .001$; $\Delta R^2 = .02$ for Step 2, $p = .002$; $\Delta R^2 = .03$ for Step 3, $p = .002$. * $p < .05$. ** $p < .01$. *** $p < .001$.

variables, (iii) past behaviour and (iv) habit strength and self-identity. Intention explained 7% of the variance in post-university exercise behaviour, $R^2 = .07$, $F(1, 82) = 6.33$, $p = .01$. The addition of the RAA variables explained a further 13% of the variance, $\Delta R^2 = .13$, $\Delta F(6, 76) = 2.00$, $p = .08$. Intention and experiential attitude were the only significant predictors. Past behaviour explained an additional 10% of the variance, $\Delta R^2 = .10$, $\Delta F(1, 75) = 10.60$, $p = .002$, becoming the sole significant predictor. The addition of habit strength and self-identity explained a further 13% of the variance, $\Delta R^2 = .13$, $\Delta F(2, 73) = 8.27$, $p = .001$. Self-identity replaced past behaviour as the sole significant predictor, suggesting mediation. The final regression model explained 43% of the variance in post-university exercise behaviour, $R^2 = .43$, $F(10, 73) = 5.50$, $p < .001$.

Mediation analyses were conducted to examine whether self-identity mediated the relationship between past behaviour and post-university exercise behaviour. Past behaviour was entered as an independent variable along with self-identity as a potential mediator and the RAA variables and habit strength as covariates. The path between past behaviour and post-university exercise behaviour, $B = 0.26$, $SE = 0.12$, $p = .03$, was reduced to non-significance, $B = 0.12$, $SE = 0.13$, $p = .40$, when self-identity was controlled for. The indirect effect of past behaviour on post-university exercise behaviour through self-identity was found to be significant, $B = 0.14$, $SE = 0.07$, $CI = 0.0005$ to 0.27, confirming mediation.

Table 4. Summary of hierarchical regression analysis for variables predicting post-university exercise behaviour.

Step	Variable	*B*	*SE*	*ß*
1.	Intention	0.39	0.15	.27*
2.	Intention	0.61	0.27	.42*
	Experiential Attitude	0.53	0.26	.38*
	Instrumental Attitude	-0.46	0.38	-.20
	Injunctive Norm	-0.30	0.17	-.24
	Descriptive Norm	0.15	0.20	.09
	Autonomy	-0.12	0.23	-.09
	Capacity	-0.35	0.25	-.24
3.	Intention	0.35	0.26	.24
	Experiential Attitude	0.39	0.25	.29
	Instrumental Attitude	-0.34	0.36	-.15
	Injunctive Norm	-0.20	0.16	-.15
	Descriptive Norm	0.21	0.19	.12
	Autonomy	-0.10	0.22	-.08
	Capacity	-0.31	0.23	-.22
	Past Exercise Behaviour	0.39	0.12	.37**
4.	Intention	0.18	0.25	.13
	Experiential Attitude	0.05	0.24	.03
	Instrumental Attitude	-0.01	0.34	-.01
	Injunctive Norm	-0.14	0.15	-.11
	Descriptive Norm	0.22	0.17	.12
	Autonomy	-0.13	0.20	-.09
	Capacity	-0.32	0.21	-.23
	Past Exercise Behaviour	0.12	0.13	.11
	Habit Strength	0.23	0.13	.23
	Self-Identity	0.36	0.17	.38*

Note. $R^2 = .07$ for Step 1, $p = .01$; $\Delta R^2 = .13$ for Step 2, $p = .08$; $\Delta R^2 = .10$ for Step 3, $p = .002$; $\Delta R^2 = .13$ for Step 4, $p = .001$. * $p < .05$. ** $p < .01$

Discussion

The present study applied the RAA to explain students' post-university exercise intentions and behaviour and test different routes through which past behaviour may impact on exercise intentions and behaviour. The results support the use of the RAA to explain exercise intentions and, to a lesser extent, behaviour across a significant life transition. The RAA explained 67% of the variance in intention with experiential attitude, instrumental attitude and perceived autonomy emerging as significant predictors, and 20% of the variance in post-university exercise behaviour, with experiential attitude and intention being significant predictors. These findings are broadly consistent with a recent meta-analysis of the RAA (McEachan et al., 2016). The present findings are important as the RAA and the earlier TPB are typically applied in behaviourally stable contexts over relatively short time periods. Of particular interest were the significant independent effects of experiential attitude on post-university exercise intentions and behaviour, which have also been found in other applications of the RAA to exercise (Hagger & Chatzisarantis, 2005; McEachan et al., 2010) and other health-related intentions and behaviour (Conner et al., 2015).

Past behaviour explained an additional 2% and 10% of the variance in post-university exercise intentions and behaviour, respectively. This is broadly in line with previous findings that past behaviour explains additional variance in exercise intentions and future behaviour over and above that explained by TPB variables (McEachan et al., 2011). The

link between past behaviour and future behaviour is often explained by habitual responses to environmental cues (Gardner, 2015). However, cues that engender exercise behaviour are likely to change across a significant life transition due to modifications in social and physical environments (e.g. starting a job). Thus, behaviour is unlikely to be guided by habitual responses in changing contexts (Wood et al., 2005). The present findings support this proposition, as no evidence was found to suggest that habit strength mediated the relationship between past behaviour and future behaviour.

Instead, self-identity (as an exerciser) mediated the relationships between past behaviour and both exercise intentions and subsequent behaviour. In the regression analyses, self-identity had a direct effect on intention, along with experiential attitude, instrumental attitude and autonomy, and was the sole significant predictor of post-university exercise behaviour. These findings support previous research where self-identity has been found to be a significant predictor of both exercise intentions and behaviour after controlling for TPB variables and past behaviour (Hamilton & White, 2008; Jackson et al., 2003). This suggests that while self-identity is correlated with past behaviour, it does not simply reflect past behaviour, for example, through a process of self-perception (Bem, 1972). Instead, self-identity has a unique, direct effect that reflects the motivational force of acting in accordance with one's self-identity (Stets & Burke, 2000). Maintaining one's self-identity as an exerciser may be particularly important for guiding behaviour in a changing context.

A number of implications for interventions to maintain exercise across significant life transitions such as leaving university are proposed. First, given the significant effect of experiential attitude on intention and future behaviour, interventions should seek to highlight the positive affective consequences of engaging in regular exercise. Previous research has shown that such affective messages can produce changes in exercise behaviour (Conner et al., 2011). Second, as self-identity had a direct impact on intention and future behaviour, interventions should seek to promote individuals' views of themselves as an exerciser. Little is known on how to promote new self-identities (O'Keefe, 2002), which may prove difficult for individuals without a past history of exercising. Instead, it may be more advantageous to support the positive self-identities of current exercisers to prevent exercise behaviour declining across a significant life transition. For example, self-determination theory (Deci & Ryan, 2000) posits that motivation to comply with one's values is a powerful determinant of autonomous motivation.

Some limitations of the present study need to be considered when interpreting the results. First, the GLTEQ is a self-report measure of exercise behaviour and although it has been validated against VO_2max (Godin, 2011), it is not immune to reporting self-protection biases (Schwarz, 1999). McEachan et al. (2011) reported that the TPB explains more of the variance in self-report versus objective measures of behaviour, suggesting that some of the variance accounted for by the RAA in the present study may be due to shared measurement error. Second, although the six-month follow-up response rate was good (62%) given the changing context and follow-up period, the reduced sample size reduced the statistical power of the analyses predicting post-university exercise behaviour. Nonetheless, the sample was sufficient to detect typical effects sizes reported for applications of the RAA (R. McEachan et al., 2016).[2] Third, there was some evidence of attrition bias, with those remaining in the study being more likely to be British and to describe their ethnicity as 'White'. The generalizability of the current findings may

therefore be limited to 'White' British students, who also comprised the majority of the sample.

In conclusion, the present study has a number of theoretical implications. First, the study provides support for the RAA, with specific support for the impact of experiential attitudes on exercise intentions and behaviour. Second, the study provides an important test of the RAA across a significant life transition. Third, self-identity had a direct effect on both exercise intentions and post-university behaviour, consistent with the idea that individuals regulate their behaviour in accordance with their self-identity, which may be particularly important for guiding behaviour during a significant life transition.

Notes

1. Participants who completed both questionnaires and those who were lost to follow-up were also compared on the RAA measures and past behaviour. Those who completed both questionnaires reported higher descriptive norm scores (M = 4.21, SD = 1.07) than those lost to follow-up (M = 3.65, SD = 1.24), $t(134) = 2.76$, $p = .01$, and higher autonomy scores (M = 5.39, SD = 1.36) than those lost to follow-up (M = 4.78, SD = 1.46), $t(134) = 2.48$, $p = .01$. All other comparisons were non-significant.
2. Power analyses indicated that the time 2 sample of 84 would be sufficient to detect an effect size of at least $f^2 = 0.22$ (which equates to $R^2 = .18$) in the regression analysis with 10 predictor variables (at 80% power and alpha set at 0.05). R. McEachan et al. (2016) reported that the RAA typically explains 31% of the variance in behaviour (across all behaviours).

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No potential conflict of interest was reported by the authors.

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