

The Theory of Planned Behavior and Exercise: Evidence for the Mediating and Moderating Roles of Planning on Intention-Behavior Relationships

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Two studies on the Theory of Planned Behavior (TPB) and exercise behavior are reported that consider the mediating and moderating effects of planning on intention-behavior relationships. Undergraduate students ($N = 125$ and $N = 102$) completed questionnaires assessing TPB constructs, planning, and past exercise behavior. The TPB was highly predictive of exercise intentions ($R^2 = .37$ and $.62$) and future behavior ($R^2 = .43$ and $.49$) assessed at 2 weeks (Study 1) and 1 week (Study 2) follow-up. Planning was found to mediate the impact of intention on future behavior (Study 2) and to moderate the intention/behavior relationship (both studies). The results are discussed in relation to recent models of health behavior that focus on the volitional (i.e., postdecisional) phase of health behavior.

Key Words: health behavior, social cognition model, motivational phase

Regular exercise has been advocated as a key component of a healthy lifestyle (Dept. of Health, 1992; U.S. Dept. of Health and Human Services, 2000). However, despite the various health benefits of engaging in exercise, many individuals continue to lead a sedentary lifestyle. For example, 75% of American adults are either inactive or not active enough to accrue any health benefits (Centers for Disease Control and Prevention, 2001). Similarly, in the U.K. only one in three men and only one in five women participate in any sport or recreational activity (Office of Population Censuses and Surveys, 1989). Against this backdrop it is imperative to identify the key proximal predictors of exercise behavior in order to design effective interventions. One model that has attracted considerable attention in the exercise domain is the Theory of Planned Behavior (Ajzen, 1988).

According to the Theory of Planned Behavior (TPB), the proximal determinant of behavior is the person's intention to perform the behavior. Intention, in turn, is determined by three constructs. First is the person's attitude (i.e., positive or negative evaluation) toward performing the behavior. Second is the person's perception of the wishes of important others (i.e., subjective norm). Third is the person's perception of the amount of control he or she has over performing the behavior (i.e., perceived behavioral control). Perceived behavioral control is also

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believed to have a direct effect on behavior when people are accurate in their assessment of actual control.

The TPB has been applied to the prediction of a wide range of social and health behaviors (for reviews, see Armitage & Conner, 2001; Conner & Sparks, 2005), including exercise (see Hagger, Chatzisarantis, & Biddle, 2002; Hausenblas, Carron, & Mack, 1997). In their meta analysis of 72 TPB-exercise studies, Hagger et al. (2002) reported significant average correlations between the attitude ($r_+ = .48$), subjective norm ($r_+ = .25$), and perceived behavioral control ($r_+ = .44$) constructs and exercise intentions. Together these variables explained 45% of the variance in exercise intentions. Both intention ($r_+ = .42$) and perceived behavioral control ($r_+ = .31$) were found to have significant average correlations with exercise behavior, explaining 27% of the variance in exercise behavior.

Despite these encouraging findings, two issues are worthy of comment. First, it is clear that the TPB is better able to explain exercise intentions than behavior. This suggests the model is open to the inclusion of further variables that may capture additional variance in behavior. As Ajzen (1991) concedes, "the TPB is, in principle, open to the inclusion of additional predictors if it can be shown that they capture a significant proportion of the variance in intentions or behavior after the theory's current variables have been taken into account" (p. 199). Second, despite the reporting of significant average correlations between intention and behavior in recent meta-analyses (Armitage & Conner, 2001; Hagger et al., 2002), it is clear that there is considerable heterogeneity in the strength of this relationship. Such findings suggest a need to identify the conditions under which intentions are more or less likely to lead to behavior, and a number of moderator variables of the intention-behavior relationship have been suggested in the literature including direct experience, temporal stability, certainty, and accessibility (see Cooke & Sheeran, 2004).

Sheeran (2002) has conducted a detailed analysis of the nature of intention-behavior inconsistencies and has demonstrated that the "intention-behavior gap" is predominantly due to intenders who fail to act on their intentions rather than nonintenders who do act. Across six studies (a median of) only 53% of intenders performed the focal behavior whereas, in contrast, 93% of nonintenders did not perform the focal behavior. This suggests a need to identify the variables that distinguish between intenders who subsequently act versus those who do not act upon their intentions as one way of bridging the intention-behavior gap. Thus there is a need for further work to outline the volitional processes through which people can successfully translate their intentions into action.

Most social cognition models of health behavior, such as the TPB, fail to provide an adequate account of the postintentional processes that are important in translating intentions into behavior. As a result, a number of theorists have made a distinction between a motivational (i.e., predecisional) phase which culminates in the formation of an intention, and a volitional (i.e., postdecisional) phase which involves a range of self-regulatory activities to ensure that intentions are successfully enacted (Bagozzi, 1992; Gollwitzer, 1999; Heckhausen, 1991; Schwarzer, 1992). Intention is therefore seen to be a necessary, but not sufficient, determinant of behavior. For example, Gollwitzer (1999) distinguishes between *goal intentions* (e.g., "I intend to exercise") and *implementation intentions* that specify when, where, and how a behavior, in support of the goal intention, is to be performed (e.g., "I will jog home from work after the staff meeting on Monday afternoon").

Accumulated evidence indicates that instructing people to make such “if-then” plans increases the likelihood of behavioral performance. In a meta-analysis of 15 implementation intention studies, Sheeran (2002) reported a medium to strong effect size ($d_+ = .70$) of forming an implementation intention on behavioral performance. In relation to exercise behavior, for example, Milne, Orbell, and Sheeran (2002) reported that a combined implementation intention and protection motivation theory (PMT; Rogers, 1983) intervention resulted in 91% of participants having engaged in exercise at least once as reported at 1-week follow-up, compared to 38% in the no-intervention control condition and 35% in the PMT-only intervention group.

Schwarzer's (1992) health action process approach (HAPA) makes a similar distinction between the motivational and volitional phases of health behavior. In the motivational phase, intention is determined by perceived risk, outcome expectancies, and self-efficacy. This phase culminates in the formation of a behavior intention which captures “the motivational factors that have an impact on a behavior” (Ajzen, 1988, p. 113). However, translating an intention into action may require a range of postdecisional processes. Thus in the volitional phase Schwarzer (1992) highlights the importance of action plans and action control in ensuring the successful enactment of intentions. Individuals must plan, initiate, and maintain the behavior by deploying a range of self-regulatory skills and strategies. In particular, planning is seen as a key variable in the volitional phase that impacts on the intention-behavior relationship. In line with Gollwitzer's (1999) definition of implementation intentions, Sniehotta, Scholz, and Schwarzer (2005, p. 146) propose that when people form plans, they develop “a mental representation of a suitable future situation (“where” and “when”) and a behavioural action (“how”), which is expected to be effective for the goal pursuit.”

In the HAPA, planning is seen as a mediating variable between intention and behavior, such that intention is believed to have its impact on behavior through planning. However, it may be more appropriate to argue that planning should act as a moderator of the intention-behavior relationship such that intenders who engage in planning should be more likely to translate their intentions into behavior (Sutton, 2005). Both the mediating and moderating roles of planning have been examined in a number of studies on condom use (Abraham, Sheeran, Norman, et al., 1999; White, Terry, & Hogg, 1994), sunscreen use (Jones, Abraham, Harris, Schulz, & Crispin, 2001), breast self-examination (Luszczynska & Schwarzer, 2003), and exercise behavior (Sniehotta et al., 2005).

White et al. (1994) assessed the impact of planning in relation to condom use and discussing condom use with new partners. Contrary to expectations, planning failed to explain additional variance in either behavior, over and above the influence of TPB variables, at 1-month follow-up. In addition, planning also failed to moderate intention-behavior relationships. Abraham et al. (1999) used a retrospective design in which participants were asked to indicate their prior intention to use a condom when having sex with a new partner and the extent to which they had engaged in a number of planning activities. Analyses conducted on intenders revealed that those who reported having used a condom were more likely to have made plans regarding the acquisition, suggestion, negotiation, and use of condoms than those intenders who reported not using a condom. However, the retrospective nature of the study (i.e., participants were instructed to think back and report their intentions and plans prior to having sex with a new partner) is an important study limitation.

Jones et al. (2001) also used a retrospective design to study sunscreen use. Planning was found to partially mediate the effect of intention on behavior. In addition, a significant but weak moderation effect was observed such that intention was a stronger predictor of behavior among participants classified as planners versus nonplanners. Luszczynska and Schwarzer (2003) examined the role of planning in a longitudinal study on breast self-examination (BSE). Planning was found to mediate the impact of intention on behavior at 3-month follow-up. However, planning was assessed at the same time as the follow-up measure of BSE. This is likely to have inflated the strength of the relationship between planning and behavior in comparison to the relationship between intention (which was measured at baseline) and behavior. In addition, the study failed to examine the potential moderating effect of planning on the intention-behavior relationship. Finally, Sniehotta et al. (2005) separated the measurement of planning and behavior and found that planning mediated the intention-behavior relationship among patients attending a cardiac rehabilitation program. However, their study also failed to examine the moderating role of planning.

The present research attempted to overcome some of the limitations in previous studies on the mediating and moderating roles of planning. Two studies are reported that applied the TPB to the prediction of exercise intentions and behavior over 1- and 2-week periods. In both studies, participants completed TPB questionnaires at Time 1 that also contained measures of planning. The ability of planning to mediate and moderate the relationship between intention and future exercise behavior was tested using regression analyses. It was therefore hypothesized (a) that the TPB would explain significant proportions of the variance in both exercise intentions and behavior, (b) that the planning measures would explain additional variance in exercise behavior and reduce the predictive power of intention (i.e., mediation hypothesis), and (c) that the interaction between intention and planning would explain additional variance in exercise behavior (i.e., moderation hypothesis).

Study 1. Method

Respondents and Procedure

Respondents were a convenience sample of undergraduates recruited on a university campus who participated by completing questionnaires at two time points separated by 2 weeks. Potential respondents were recruited face to face at various sites across the campus (e.g., students union building) and were asked to participate in a study on attitudes toward exercise. The students received no incentive to participate in the study. The study was approved by the departmental ethics committee and conducted in line with the institution's ethical procedures and British Psychological Society (BPS) guidelines. In all, 125 respondents completed the Time 1 questionnaire. The Time 1 sample included 61 males and 65 females ages 18 to 39 ($M = 21.38$, $SD = 3.39$). Students recruited into the study at Time 1 provided their email address so that they could be contacted 2 weeks later with a short follow-up questionnaire. Fifty-eight respondents completed the Time 2 questionnaire 2 weeks later by email. Attrition bias was assessed by comparing respondents who completed both questionnaires with those who only completed the Time 1 questionnaire. No significant differences were found in scores on variables included in the Time 1 questionnaire, $F(6, 115) = 1.48$, *ns*.

Measures

In the Time 1 questionnaire the TPB components were measured using multi-item scales in relation to taking part in regular physical activity. Regular physical activity was defined at the start of the questionnaire as “physical activity that you purposely engage in for whatever reason at least 2 or 3 times a week for about 20 to 30 minutes at a time. For example, this would include activities such as aerobics, badminton, jogging, walking, etc., but not activities which form part of your everyday life, such as walking to the bus stop.” Unless otherwise indicated, items were scored between -3 and $+3$ and were coded such that higher scores indicated a higher level on the variable of interest. Mean scores were computed for each variable.

Intention to engage in regular physical activity was assessed by 5 items ($\alpha = 0.95$; e.g., “I intend to take regular physical activity in the future,” definitely do not/definitely do). *Attitude* was assessed by a series of semantic differentials (5 items, $\alpha = 0.72$; e.g., “My taking regular physical activity would be...” bad/good). *Subjective norm* was assessed using 3 items ($\alpha = 0.60$, e.g., “People who are important to me think I should take regular physical activity,” unlikely/likely). *Perceived behavioral control* was assessed by 6 items ($\alpha = 0.75$, e.g., “How much personal control do you think you have over taking regular physical activity?” very little control/complete control).

In addition to the TPB measures, *planning* was assessed by 2 items ($\alpha = 0.86$, i.e., “To what extent have you thought about and planned the following in relation to taking regular physical activity? (i) Making free time to take regular physical activity, (ii) Taking account of the number of other commitments that you have,” not thought about this/clear plans). Items were scored between 1 and 7, with higher scores indicating more planning about taking physical activity, and a mean was computed.¹

Past exercise behavior was assessed through the use of a single item (i.e., “How frequently do you take physical activity on average?” never/frequently), scored from 1 to 7. *Future exercise behavior* was assessed at 2-week follow-up. Respondents were asked to indicate the number of times they had exercised in the intervening 2 weeks (i.e., “How often over the last 2 weeks have you engaged in physical activity?”).

Results of Study 1

Descriptive Findings

The intercorrelations between the Study 1 measures, along with the means and standard deviations, are presented in Table 1. Attitude and perceived behavioral control had significant positive correlations with exercise intentions, along with planning and Time 1 exercise. The subjective norm-intention correlation was nonsignificant. Intention was found to correlate with future exercise behavior along with the other TPB variables, with the exception of subjective norm. Planning and past behavior were also found to correlate with future exercise behavior.

Predicting Exercise Intentions

A hierarchical regression analysis was used to predict exercise intentions (see Table 2). The independent variables were entered in two blocks: (a) attitude,

Table 1 Descriptive Statistics and Intercorrelations Between the Variables in Study 1 ($N = 125$)

	INT	ATT	SN	PBC	PLN	PB	Mean	SD
Future behavior (FB) ^a	.60***	.28**	.06	.55***	.51***	.81***	2.60	1.57
Intention (INT)		.44***	.13	.56***	.50***	.66***	1.78	1.23
Attitude (ATT)			.24**	.36***	.25**	.26**	1.97	0.84
Subjective norm (SN)				.15	.17	.02	0.26	1.57
Perceived behavioral control (PBC)					.32**	.52***	1.43	0.96
Planning (PLN)						.49***	3.97	1.57
Past behavior (PB)							6.52	2.75

Note: ^aFor future behavior, $N = 58$. ** $p < .01$, *** $p < .001$

Table 2 Summary of Hierarchical Regression Analyses for Variables Predicting Exercise Intentions in Study 1 ($N = 125$) and Study 2 ($N = 102$)

Step	Variable	Study 1		Study 2	
		β	β	β	β
1.	ATT	.27**	.22**	.42***	.36***
	SN	.01	.03	.06	.02
	PBC	.46***	.20**	.44***	.36***
2.	PB		.50***		.27***
R^2		.38***	.57***	.62***	.67***

** $p < .01$, *** $p < .001$

subjective norm, and perceived behavioral control, and (b) past behavior. The TPB variables were able to explain 37% of the variance in exercise intentions, $F(3, 118) = 23.07$, $p < .001$, with attitude and perceived behavioral control emerging as significant independent predictors. The addition of past behavior led to a significant increment in the amount of variance explained, $\Delta R^2 = .18$, $\Delta F = 46.07$, $p < .001$. Attitude and perceived behavioral control remained as significant predictors along with past behavior. In the final regression equation, the variables under consideration were able to explain 55% of the variance in exercise intentions, $F(4, 117) = 35.43$, $p < .001$.

Table 3 Summary of Hierarchical Regression Analyses for Variables Predicting Time 2 Exercise in Study 1 ($N = 58$) and Study 2 ($N = 76$)

Step	Variable	β	β	β	β
Study 1					
1.	INT	.43**	.32*	.54**	.27
	PBC	.32*	.30*	.22	-.14
2.	PLN		.19	.12	-.02
3.	INT $\times$ PLN			.26*	.27**
4.	PB				.80***
R^2		.43***	.45***	.49***	.71***
Study 2					
1.	INT	.70***	.43**	.45**	.22
	PBC	.00	.02	.04	-.01
2.	PLN		.36**	.39**	.33***
3.	INT $\times$ PLN			.23**	.16*
4.	PB				.48***
R^2		.49***	.55***	.60***	.74***

* $p < .05$, ** $p < .01$, *** $p < .001$

Predicting Exercise Behavior

A hierarchical regression analysis was used to predict exercise behavior (see Table 3). The independent variables were entered in four blocks: (a) intention and perceived behavioral control, (b) planning, (c) the interaction between intention and planning, and (d) past behavior. The variables were mean-centered prior to computing the intention $\times$ planning interaction term in order to minimize any problems of multicollinearity and to aid the interpretation of a significant interaction (Aiken & West, 1991).

Intention and perceived behavioral control were able to explain 43% of the variance in exercise behavior at Time 2, $F(2, 55) = 20.86$, $p < .001$, with both variables making significant contributions to the regression equation. The addition of planning failed to increase the amount of variance explained in exercise behavior, $\Delta R^2 = .02$, $\Delta F = 2.08$, *ns*, although it did lead to a small reduction in the size of the beta weight for intention, which nonetheless remained significant along with perceived behavioral control. The reduction in the size of the beta weight for intention when planning was added to the regression equation was found to be nonsignificant, Sobel test = 1.63, *ns*. The addition of the interaction term between intention and planning at Step 3 produced a significant increment in the amount of variance explained, $\Delta R^2 = .04$, $\Delta F = 4.21$, $p < .05$, indicating that planning moderated the intention-behavior relationship.

The nature of the interaction was explored in more detail using simple slopes analysis (Aiken & West, 1991). Regression lines were computed at three levels of

the hypothesized moderator, i.e., the mean level and one standard deviation above and below the mean. The strength of intention-behavior relationship was found to increase along with levels of planning. Under low levels of planning, intention was a modest predictor of behavior, $\beta = .52, p < .05$, whereas under moderate, $\beta = .84, p < .001$, and high, $\beta = 1.16, p < .001$, levels of planning, intention was a stronger predictor of behavior.² Finally, the addition of past behavior produced a further increment in the amount of variance explained, $\Delta R^2 = .21, \Delta F = 37.77, p < .001$. In the final regression equation, the variables under consideration were able to explain 71% of the variance in Time 2 exercise behavior, $F(5, 52) = 24.99, p < .001$, with the intention $\times$ planning interaction term and past behavior emerging as significant independent predictors.

Discussion, Study 1

Study 1 first sought to assess the ability of the TPB to predict exercise intentions and behavior over a 2-week period. The TPB provided a strong prediction of exercise intentions in line with previous TPB-exercise studies (Hagger et al., 2002). Attitude and perceived behavioral control were predictive of exercise intentions, although the subjective norm-intention relationship was weak and nonsignificant. The TPB was also highly predictive of exercise behavior at Time 2 with both intention and perceived behavioral control emerging as significant predictors. Study 1 also assessed the mediating and moderating impact of planning on the intention-behavior relationship.

Contrary to predictions, the addition of the planning measure failed to increase the amount of variance explained in exercise behavior over and above the TPB. Thus little evidence was found for the proposed mediating role of planning. In contrast, stronger support was found for the moderation hypothesis. A significant intention $\times$ planning interaction was found which indicated that the intention-behavior relationship became stronger with increasing levels of planning. This supports the view that planning is an important activity in the volitional phase of health behavior which aids the translation of intentions into action. Moreover, it is noteworthy that the intention $\times$ planning interaction remained significant even after controlling for the effect of past exercise behavior.

However, there are a number of study limitations which mean that the above conclusions are made with some caution. First there was a relatively low response rate to the Time 2 questionnaire, which may have been a consequence of the nature of the recruitment and follow-up procedures. Nonetheless, subsequent analyses revealed no differences between the Time 1 responses of those who completed versus those who failed to complete the Time 2 questionnaire. However, the resultant reduction in sample size may have reduced the statistical power of the regression analysis predicting Time 2 behavior.

Second, the TPB items referred to physical activity, which is typically taken to refer to the total amount of physical activity individuals engage in, rather than exercise per se. However, the term "regular physical activity" was defined at the start of the questionnaire to refer exclusively to purposeful physical activity (e.g., leisure time exercise) and not to other everyday physical activities.

Third, the TPB measures failed to specify a time frame for performance of regular physical activity, thereby violating the principle of compatibility (Ajzen, 1988) which states that the TPB variables and behavior should be measured at the

same level of specificity with respect to action, target, context, and time. It is possible that this may have reduced the predictive power of the TPB measures, although it should be noted that the TPB was highly predictive of exercise behavior in the present study.

Fourth, the planning measure consisted of two items focusing on the extent to which respondents had thought about and planned how to (a) make free time available and (b) take account of other commitments. However, it is likely that individuals may develop many more plans when trying to act upon their intentions to exercise, such as planning when, where, how, and with whom they will exercise. As a result, it is possible that the planning measure used in the present study may have been too prescriptive to capture the full range of planning activities that individuals engage in. This may help explain the nonsignificant mediation effect observed for planning.

Study 2 therefore sought to replicate the findings of Study 1, but with a number of improvements. Respondents completed TPB questionnaires in relation to engaging in exercise over the next week. In addition, respondents were asked to indicate the extent to which they had made plans regarding when, where, how, and how often to exercise over the next week, in line with the planning measure used by Luszczynska and Schwazer (2003). Future exercise behavior was assessed 1 week later. The same hypotheses were tested as in Study 1, in relation to the ability of the TPB to predict exercise intentions and behavior, and the mediating and moderating roles of planning.

Study 2. Method

Respondents and Procedure

Respondents were a convenience sample of undergraduates who completed questionnaires at two time points separated by 1 week as part of a psychology lab class. The students received no incentive to take part in the study. The study was approved by the departmental research ethics committee and was conducted in line with BPS ethical guidelines. A total of 102 respondents completed the Time 1 questionnaire. The Time 1 sample included 20 males and 82 females ages 19 to 51 ($M = 20.80$, $SD = 3.85$). Completed Time 2 questionnaires were obtained from 76 of the Time 1 sample. Attrition bias was assessed by comparing respondents who completed both questionnaires with those who only completed the Time 1 questionnaire. No significant differences were found in scores on the variables included in the Time 1 questionnaire, $F(6, 95) = 1.73$, *ns*.

Measures

In the Time 1 questionnaire, the TPB components were measured using multi-item scales in relation to exercising at least three times over the next week. Exercise was defined at the start of the questionnaire as “activities such as aerobics, badminton, football, going to the gym, jogging, etc., but not activities that form part of your everyday life such as walking to the bus stop, dancing at clubs, etc.” Unless otherwise indicated, items were scored between -3 and $+3$ and were coded such that higher scores indicated a higher level on the variable of interest. Mean scores were computed for each variable.

Intention to exercise at least three times over the next week was assessed by 3 items ($\alpha = 0.95$; e.g., “Do you intend to exercise at least three times over the next week?” definitely intend not to/definitely intend to). *Attitude* was assessed by a series of semantic differentials (5 items, $\alpha = 0.73$; e.g., “Exercising at least three times over the next week would be...” bad/good). *Subjective norm* was assessed using 2 items ($\alpha = 0.84$, e.g., “People who are important to me think I should/should not exercise at least three times over the next week”, think I should not/think I should). *Perceived behavioral control* was assessed by 6 items ($\alpha = 0.89$, e.g., “I feel in complete control over whether or not I exercise at least three times over the next week”, agree/disagree).

In addition to the TPB measures, *planning* was assessed using 4 items based on the items used by Luszczynska and Schwarzer (2003). Respondents were asked to indicate to what extent they had made a detailed plan regarding (a) when, (b) where, (c) how, and (d) how often to exercise over the next week (i.e., “I have made a detailed plan regarding... *when* to exercise over the next week, *where* to exercise over the next week, *how* to exercise over the next week, *how often* to exercise over the next week”, not at all true/exactly true). Items were scored between 1 and 7, with higher scores indicating more planning over taking exercise, and a mean was computed ($\alpha = 0.94$).³

Past exercise behavior was assessed through the use of a single open-ended item (i.e., “How many times did you exercise in the past week?”). The same item was used to assess *future exercise behavior* at 1-week follow-up.

Results of Study 2

Descriptive Findings

The intercorrelations between the Study 2 measures are presented in Table 4 along with the means and standard deviations. All three TPB constructs were found to have significant positive correlations with exercise intentions. In addition, both planning and Time 1 exercise also had significant positive correlations with inten-

Table 4 Descriptive Statistics and Intercorrelations Between the Variables in Study 2 ($N = 102$)

	INT	ATT	SN	PBC	PLN	PB	Mean	SD
Future behavior (FB) ^a	.70***	.57***	.39***	.54***	.67***	.76***	1.80	1.79
Intention (INT)		.70***	.34**	.77***	.70***	.60***	0.65	1.82
Attitude (ATT)			.36**	.60***	.54**	.45**	1.78	0.83
Subjective norm (SN)				.29**	.42***	.31**	1.67	1.06
Perceived behavioral control (PBC)					.46***	.47***	1.29	1.28
Planning (PLN)						.51***	3.65	1.97
Past behavior (PB)							1.75	1.67

Note: ^aFor future behavior, $N = 76$. ** $p < .01$, *** $p < .001$

tion. In turn, intention was found to correlate with future exercise behavior along with the other TPB variables, planning and past behavior.

Predicting Exercise Intentions

A hierarchical regression analysis was used to predict exercise intentions (see Table 2). The independent variables were entered in two blocks: (a) attitude, subjective norm, and perceived behavioral control, and (b) past behavior. The TPB variables were able to explain 62% of the variance in exercise intentions, $F(3, 98) = 53.43$, $p < .001$, with attitude and perceived behavioral control emerging as significant independent predictors. The addition of past behavior led to a significant increment in the amount of variance explained, $\Delta R^2 = .05$, $\Delta F = 15.23$, $p < .001$, although both attitude and perceived behavioral control remained as significant predictors along with past behavior. In the final regression equation, the variables under consideration were able to explain 67% of the variance in exercise intentions, $F(4, 97) = 56.33$, $p < .001$.

Predicting Exercise Behavior

A hierarchical regression analysis was used to predict exercise behavior (see Table 3). The independent variables were entered in four blocks: (a) intention and perceived behavioral control, (b) planning, (c) the interaction between intention and planning, and (d) past behavior. Intention and perceived behavioral control were able to explain 49% of the variance in exercise behavior at Time 2, $F(2, 73) = 34.71$, $p < .001$, although only intention emerged as a significant predictor. The addition of planning led to a significant increment in the amount of variance explained in exercise behavior, $\Delta R^2 = .06$, $\Delta F = 10.91$, $p < .001$, and reduced the size of the beta weight for intention, from .70 to .43, although it remained significant. The reduction in the size of the beta weight for intention when planning was added to the regression equation was tested and found to be highly significant, Sobel test = 6.13, $p < .001$.

The addition of the interaction term between intention and planning at Step 3 produced a further increment in the amount of variance explained, $\Delta R^2 = .05$, $\Delta F = 8.52$, $p < .01$, indicating that planning moderated the intention-behavior relationship. The nature of the interaction was explored in more detail using simple slopes analysis (Aiken & West, 1991). Under low levels of planning, intention had a nonsignificant relationship with behavior, $\beta = .22$, *ns*. However, the strength of intention-behavior relationship increased along with levels of planning, such that intention was a significant predictor of behavior under moderate, $\beta = .49$, $p < .001$, and high, $\beta = .75$, $p < .001$, levels of planning.⁴ Finally, the addition of past behavior produced a further increment in the amount of variance explained, $\Delta R^2 = .14$, $\Delta F = 35.38$, $p < .001$. In the final regression equation, the variables under consideration were able to explain 74% of the variance in exercise behavior at Time 2, $F(5, 70) = 35.33$, $p < .001$, with planning, the intention $\times$ planning interaction term, and past behavior emerging as significant independent predictors.

Discussion, Study 2

Study 2 sought to replicate the main findings from Study 1, but with a number of study improvements. In particular, the TPB measures focused on exercise

behavior over the next week rather than regular physical activity over an unspecified time frame. As in Study 1, the TPB was highly predictive of exercise intentions, with attitude and perceived behavioral control emerging as significant independent predictors. The TPB was also highly predictive of exercise behavior at 1-week follow-up, with intention emerging as the sole predictor. Study 2 included a general planning measure that focused on the extent to which participants had developed plans in relation to when, where, how, and how often they were going to exercise over the next week. This measure was found to partially mediate the intention-behavior relationship. Thus, planning explained additional variance in exercise behavior and reduced the size of the beta weight for intention, although it remained significant. Planning was also found to moderate the intention-behavior relationship. As in Study 1, the intention-behavior relationship became stronger with increasing levels of planning. Moreover, the interaction between intention and planning again remained significant even after the addition of past exercise behavior.

General Discussion

The two studies presented in this paper addressed three main hypotheses relating to (a) the ability of the TPB to predict exercise intentions and behavior, and the (b) mediating and (c) moderating roles of planning with respect to the intention-behavior relationship.

Strong support was found for the TPB in both studies in relation to prediction of exercise intentions and behavior. The TPB explained 37% and 62% of the variance in exercise intentions, with attitude and perceived behavioral control emerging as significant independent predictors. Intention, in turn, was the strongest predictor of exercise behavior in both studies, and perceived behavioral control also emerged as a significant predictor in Study 1. The TPB was able to explain 49% and 43% of the variance in exercise behavior at 1- and 2-week follow-up. These results are generally in line with recent meta analyses of TPB studies on exercise (Hagger et al., 2002) and social/health behaviors (Armitage & Conner, 2001).

Mixed support was found for the hypothesis that planning would mediate intention-behavior relationships. In Study 1 the planning measure failed to explain additional variance in exercise behavior at 2-week follow-up and led to only a negligible, and nonsignificant, reduction in the size of the beta weight for intention. More evidence in support of the mediation hypothesis was found in Study 2 in which the planning measure explained additional variance in exercise behavior at 1-week follow-up and led to substantial, and significant, reduction in the size of the beta weight for intention. Nonetheless, intention remained as a significant predictor suggesting only partial mediation.

The results of the present studies reflect the mixed results reported in previous tests of the mediating role of intention. For example, White et al. (1994) failed to find any evidence of mediation in a prospective study of condom use and negotiation with new partners. In contrast, mediation effects have been reported in a number of other studies (e.g., Jones et al., 2001; Luszczynska & Schwarzer, 2003; Sniehotta et al., 2005), although some of these findings may be attributable to methodological artifacts. Research to date has therefore provided mixed evidence for the mediation hypothesis, thereby questioning the view, as outlined in the HAPA (Schwarzer, 1992), that intention has its impact on behavior entirely through planning.

Stronger support was found for the hypothesis that planning would moderate the intention-behavior relationship. Thus the strength of the relationship between exercise intentions and behavior at 1-week (Study 2) and 2-week (Study 1) follow-up was found to increase with increasing levels of planning. At low levels of planning, intention was a weak or nonsignificant predictor of behavior, whereas at moderate and high levels of planning the relationship was strong and significant. Evidence in support of the moderation hypothesis has been reported in some (e.g., Abraham et al., 1999; Jones et al., 2001), but not all (e.g., White et al., 1994), previous studies. It is noteworthy that the moderation effects in the present studies were found despite using two different planning measures focusing on relatively specific plans (in Study 1) and more general planning activities (in Study 2).

These results therefore suggest that, with respect to exercise, planning is an important moderator of the intention-behavior relationship and, by implication, a key volitional variable in ensuring that intentions are translated into behavior.⁵ However, more work is needed on the conceptual and operational definition of planning, given the range of different planning measures reported in the literature. The measure used in Study 2 that asked respondents to indicate the extent to which they had made plans regarding when, where, how, and how often to exercise (see also Luszczynska & Schwarzer, 2003) may provide a useful measure for future research, given that it is consistent in structure with experimental work on implementation intentions (Gollwitzer, 1999).

It is also noteworthy that the reported effects for planning (Study 2) and the planning $\times$ intention interactions (Studies 1 and 2) remained significant even after the addition of past behavior, which has been found to be a strong predictor of future behavior in many TPB studies (see Conner & Armitage, 1998). The present results therefore suggest that some of the variance in future behavior typically accounted for by past behavior may be explained by measures of planning. Such a conclusion is consistent with experimental work on implementation intentions which has shown that instructing participants to make "if-then" plans can break the strong relationship between past and future behavior. For example, Orbell, Hodgkins, and Sheeran (1997) reported that the effect of past behavior on future breast self-examination (BSE) was negligible among women who had been instructed to make implementation intentions (i.e., plans) regarding when and where to perform BSE over the next month. In contrast, a strong relationship between past behavior and BSE was found among women in the control group.

Research to date suggests that the planning construct may be usefully added to current social cognition models of health behavior (such as the TPB) as an additional, volitional, predictor of behavior. Three strands of evidence serve to support this conclusion. First, a number of theorists have argued that a distinction can be made between a motivational phase of health behavior which culminates in the formation of an intention, and a volitional phase in which various postintentional strategies are required for the successful translation of intentions into action (Bagozzi, 1992; Gollwitzer, 1999; Heckhausen, 1991; Schwarzer, 1992). Planning has been identified as a key volitional variable in this respect (Gollwitzer, 1999; Schwarzer, 1992). Thus, a clear conceptual distinction can be made between intention as a motivational variable and planning as a volitional variable.

Second, there is a range of empirical evidence to support the inclusion of planning in current social cognition models of health behavior. Even though measures of intention and planning may be expected to be correlated (as it would be

counterintuitive for persons with weak intentions to make detailed plans), it was noteworthy that items designed to measure intention and planning loaded onto different factors in line with expectations in the present studies. Moreover, planning has been found to mediate and moderate the influence of intention on behavior in the present, and previous, studies (e.g., Abraham et al., 1999; Jones et al., 2001; Luszczynska & Schwarzer, 2003; Sniehotta et al., 2005). Third, experimental evidence confirms that the formation of an implementation intention (i.e., specific if-then plans) is a powerful technique for aiding the enactment of goal intentions (Gollwitzer, 1999; Sheeran, 2002).

Nonetheless, it is likely that further volitional variables may be needed to provide a full account of the mechanisms underlying the movement from intention to behavior. For example, Kuhl (1985) in his theory of action control has outlined a number of action control processes that can be deployed to strengthen and protect intentions from alternative action tendencies, and thereby aid the translation of intentions into action. For example, Fuhrmann and Kuhl (1998) found that individuals' use of strategies to control attention (e.g., not attending to tempting stimuli or thoughts), impulses (e.g., suppressing unwanted urges), motivation (e.g., thinking of positive outcomes), and decision making (e.g., making quick and reliable decisions) were related to the enhanced enactment of nutritional intentions in response to opportunities to consume, or refrain from consuming, certain foods. Further work is needed in order to build upon these initial findings and provide a more complete account of the volitional mechanisms through which intentions are translated into action.

There are a number of study limitations that mean the above conclusions are made with some caution. First, it should be noted that the frequency of exercise behavior was assessed rather than levels of physical activity. In addition, the measurement of exercise behavior was self-report, which may have augmented the strength of TPB-behavior relationships. As a result, the present findings need to be replicated using more objective and reliable measures of exercise behavior, and McAuley and Jacobson (1991) have made a number of recommendations for the development of such measures. Second, the mediating and moderating effects of planning were assessed over relatively short time periods in the present studies. There is thus a need for future research to replicate these initial and encouraging findings over longer time intervals.

Notwithstanding these study limitations, the present results have both theoretical and practical importance. The results highlight planning as an important volitional variable that could be added to the TPB in order to increase its predictive validity. Planning was found to (partially) mediate and, more important, moderate intention-behavior relationships. The present results therefore shed light on the nature of the intention-behavior gap and the volitional activities that individuals need to engage in to successfully act upon their intentions. The results also have a number of practical implications. The TPB provides a good basis for developing theory-based interventions to change exercise intentions (cf. Michie & Abraham, 2004). In the present studies, attitude and perceived behavioral control were the key predictors of intention.

Interventions should therefore focus on the positive and negative outcomes associated with exercise and address the internal (e.g., self-efficacy) and external (e.g., access to facilities) control factors that underpin perceptions of control. However, for exercise intentions to be translated into behavior, it is also necessary to

encourage individuals to engage in planning activities to ensure that their intentions are strengthened and protected from competing action tendencies. Forming implementation intentions may be one mechanism for achieving this, although there are likely to be additional volitional strategies that can be used to ensure that intentions are translated into behavior.

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Notes

¹ The intention and planning items were subjected to a principal components analysis with varimax rotation. Inspection of the scree plot revealed two factors with eigenvalues greater than 1 that explained 67.8% and 16.41% of the variance in item scores. The items loaded onto the two factors (i.e., above .40) in line with expectations. The first factor included the 5 intention items (factor loadings .83 to .91), the second factor contained the 2 planning items (factor loadings of .66 and .72).

² The intention $\times$ planning interaction was also decomposed by assessing intention as

a moderator of the planning-behavior relationship. The strength of this relationship was found to increase along with intention strength. Planning was a weak and nonsignificant predictor of behavior under low, $\beta = -.24$, *ns*, and moderate, $\beta = .14$, *ns*, levels of intention. In contrast, planning was a stronger and significant predictor of behavior under high levels of intention, $\beta = .52$, $p < .01$.

³ The intention and planning items were subjected to a principal components analysis with varimax rotation. Inspection of the scree plot suggested two factors explaining 74.0% and 13.1% of the variance in item scores. The items loaded onto the two factors (i.e., above .40) in line with expectations. The first factor included the 4 planning items (factor loadings .77 to .89), the second factor contained the 3 intention items (factor loadings .86 to .93).

⁴ The intention $\times$ planning interaction was also decomposed by assessing intention as a moderator of the planning-behavior relationship. The strength of this relationship was found to increase along with intention strength. Planning was not predictive of behavior under low levels of intention, $\beta = .12$, *ns*. In contrast, planning became a stronger and significant predictor of behavior under moderate, $\beta = .35$, $p < .001$, and high, $\beta = .59$, $p < .001$, levels of intention.

⁵ Consistent with this view, additional simple slopes analyses assessing intention as a moderator of the planning-behavior relationship revealed that planning was a weak and nonsignificant predictor of behavior among those with weak intentions. The strength of the planning-behavior relationship was found to increase along with intention strength, such that planning was a stronger and significant predictor among those with moderate (in Study 2) and strong intentions (in both studies).

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