

**Functional significance of psychological variables that are included in the Theory of Planned Behaviour: A Self-Determination Theory approach to the study of attitudes, subjective norms, perceptions of control and intentions**

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*Abstract*

*The Theory of Planned Behaviour was proposed by Ajzen (1985) in an attempt to expand the applicability of the Theory of Reasoned Action (TRA) to situations where behaviour is not under complete volitional control. However, recent research does not address the issue of the stability of intentions, yet this is considered a boundary condition of the TRA on theoretical grounds. Therefore, the purposes of the present article were, first, to make a theoretical approach to the study of the stability of behavioural intentions by discussing assumptions underlying self-determination theory. Second, because, according to self-determination theory (Deci & Ryan, 1985), stability of intentions is related to the functional significance of psychological events, investigation of the functional significance of attitudes, subjective norms and perceived behavioural control was attempted through a study dealing with leisure-time physical activity. Because investigation of functional significance requires instruments assessing behavioural regulations, instrument development took place. Results partially supported the validity of behavioural regulations with respect to leisure-time physical activity. Furthermore, subjective norms were found to represent only the controlling dimension of functional significance. Attitudes and perceived behavioural control were found to represent both the controlling and informational dimensions of functional significance. Results are discussed in relation to assumptions underlying the Theories of Reasoned Action and Planned Behaviour and the Theory of Trying. Implications for theory development are made. © 1998 John Wiley & Sons, Ltd.*

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## INTRODUCTION

The purpose of the Theory of Reasoned Action (TRA; Fishbein & Ajzen, 1975; Ajzen & Fishbein, 1980) is to predict and explain behaviour. Figure 1 (straight arrows) depicts the model describing the TRA. According to this model, intentions to act are the most immediate determinants of social action. The construct of intention represents individuals' plans to perform or not to perform the behaviour in question (Ajzen & Fishbein, 1980). Intentions to act are, in turn, functions of two variables, one personal in nature and another reflecting social influence. The social variable is termed 'subjective norms' and it represents pressures that are generated by 'important others' with respect to the behaviour in question. The personal variable is termed 'attitudes toward the behaviour' and it represents feelings of favourableness or unfavourableness toward the behaviour (e.g. the extent to which individuals evaluate the behaviour as useful/useless; enjoyable/unenjoyable). Attitudes towards the behaviour and subjective norms are themselves functions of behavioural beliefs and normative beliefs respectively. Behavioural beliefs represent expectations of attaining outcomes through performance of the behaviour. Expected outcomes and the value that individuals attach to each of these outcomes determine attitudes. Normative beliefs represent pressures that are generated from specific others such as parents and friends with respect to the behaviour in question. Normative beliefs and the personal motivation to comply with such beliefs and significant others determines subjective norms.

### Theory of Reasoned Action: Boundary Conditions

The model described so far represents the TRA and it is considered to predict and explain behaviours that are under complete volitional control. A behaviour is under complete volitional control when environmental barriers and/or personal factors do not interfere with performance of the behaviour. With respect to physical activity, transportation, location of a gym and a physical disability may constitute examples of environmental and personal barriers. When certain barriers prevent individuals from performing the behaviour, individuals may not be able to carry out intended behaviour, the consequence being inconsistency between measures of intention and behaviour. Another boundary condition of the TRA concerns the stability of

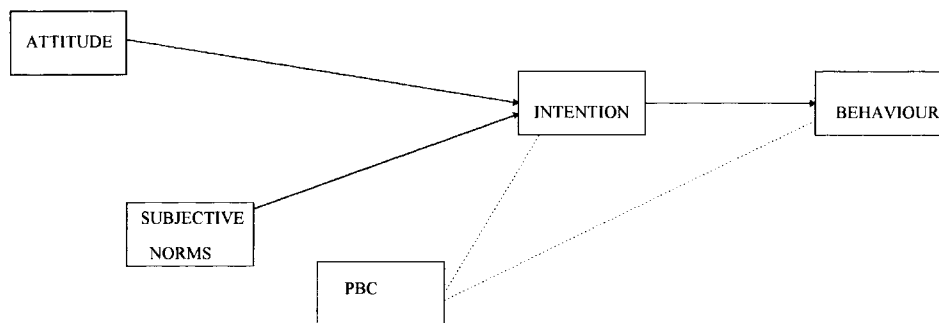


Figure 1. The theories of Reasoned Action and Planned Behaviour

intention. The predictive utility of intention is lowered if intention changes before the behaviour is observed. It follows that in prospective studies as time elapses intentions are less likely to predict behaviour because intention is more likely to change. In this regard, to maximize behavioural prediction, Ajzen and Fishbein (1980) suggest that intention must be assessed just prior to the behaviour.

### **The Theory of Planned Behaviour**

The Theory of Planned Behaviour (TPB; Ajzen, 1985) builds upon the TRA in an attempt to predict and understand behaviours when control is incomplete. Therefore, the TPB model deals with the boundary condition of volitional control and not necessarily with the issue of intentional stability. Figure 1 (straight arrows plus dotted lines) depicts the model describing the TPB. As shown, the TPB model is identical to the model describing the TRA in that attitudes and subjective norms predict behaviour indirectly through intentions. The TPB differs from the TRA in that a new variable—Perceived Behavioural Control (PBC; see Ajzen & Madden, 1986)—predicts intentions and behaviour directly in situations where control over the behaviour is incomplete (see Theodorakis, 1994). PBC is defined as the perceived ease or difficulty of executing the behaviour (see Ajzen & Madden, 1986), and it is also assumed to cover individuals' ability to cope with events that are most likely to interfere with the behaviour in the future.

So far, therefore, two boundary conditions of the TRA seem to limit its utility to predict and understand social action. Current research trends deal with the boundary condition of volitional control but not with the boundary condition of intentional stability. If intention cannot predict behaviour the longer the time interval between assessments of intention and behaviour then determinants of intention cannot also predict behaviour indirectly through intentions. It follows that any change in intention that may be obtained through changes on attitudes, subjective norms and PBC is less likely to be translated into behavioural change that is going to persist across time. In the next section a theoretical approach to the boundary condition of intentional stability is attempted by discussing assumptions underlying self-determination theory.

### **Autonomous Versus Controlling Intentional Behaviour: A Self-Determination Theory Approach**

Like TRA and TPB, self-determination theory (Deci & Ryan, 1985) considers psychological events and cognitive processes to be important determinants of social action. However, self-determination theory distinguishes between two kinds of intentional behaviour. Extrinsic motivation refers to a behaviour that is associated with pressure, tension and decreases in enjoyment. Extrinsically motivated or controlling intentional behaviours are usually done for the attainment of an extrinsic outcome such as a reward or praise from others. Intrinsic motivation refers to a behaviour that is associated with the experience of positive affect and the absence of pressure. Intrinsically motivated or autonomous intentional behaviour is performed for experiencing the interesting aspects of the activity itself.

The extrinsic/intrinsic distinction proposed by self-determination theory has important implications for the stability dimension of motivation. Ryan, Frederick, Leepes, Rubio and Sheldon (in press) found that intrinsic motivation was associated with adherence to exercise, whereas extrinsic motivation was associated with dropping out. It follows that under intrinsic motivation, behaviour is more stable and therefore intention may be more likely to predict behaviour. In contrast, under extrinsic motivation, behaviour is likely to be less stable and therefore intention may not predict behaviour so well.

Events that contribute to the development of intrinsic or extrinsic motivation may be situational and/or interpersonal in nature. However, the impact of an event on motivation is not determined by the objective characteristics of the event but rather by its psychological meaning. Deci and Ryan (1985) term the psychological meaning of the event *functional significance* of the event. Three kinds of functional significance are recognized. An informational functional significance of an event facilitates autonomous intentional behaviour and maintains or enhances enjoyment. Informational events provide effectance-relevant information in the context of choice. A controlling functional significance of an event induces pressure and tension, undermines enjoyment, and facilitates controlling intentional behaviour. Controlling events pressure people to think, feel or behave in specified ways. Finally 'amotivating' events promote non-intentional behaviour (amotivated functioning) by making salient one's incompetence.

Research operating from within self-determination theory's assumptions have shown that when the situation makes the activity instrumental for the receipt of a reward (Leepes, Sagotsky, Dafoe, & Green, 1982) and/or imply evaluation (Smith & Pitman, 1978), enjoyment is undermined and controlling intentional behaviour is displayed. When the situation allows individuals to choose among behavioural options and acknowledges the conflict that may be experienced from doing an uninteresting activity then enjoyment is enhanced and autonomous intentional behaviour is displayed (Deci, Eghari, Patrick, & Leone, 1994). Task involvement is an example of an informational intrapersonal event because it motivates individuals to focus on the interesting aspects of the activity. In contrast, ego involvement is an example of a controlling interpersonal event because it motivates individuals to focus on the attainment of extrinsic outcomes (Deci & Ryan, 1985).

The functional significance of psychological events relates to motivation through the concept of behavioural regulation (Ryan, 1993). Behavioural regulations are descriptors of motivational processes (goal-directed behaviours) differing in the extent to which they are experienced as autonomous or controlling. It is theorized that when behavioural regulation is controlling, action is directed by controlling psychological events. Motivational processes are not experienced as enjoyable nor as an expression of oneself but rather as alien to the self and hence pressuring. In contrast, when behavioural regulation is autonomous, action is directed by informational events. Motivational processes are enjoyable and experienced as one's own.

### **Assessments of Behavioural Regulations**

In general, measures of behavioural regulations can be obtained by assessing motives for performing a social action. Motives can reflect experience of behavioural

regulations because they can reflect the extent to which the need for autonomy energizes and regulates social action. Autonomy refers to the need to perform tasks of one's choice and to have input in the way that behavioural tasks are performed (Deci & Ryan, 1985). It follows that the need for autonomy is satisfied when behaviour is directed by informational events and therefore when intentional behaviour is autonomous. When this is the case individuals report motives related to enjoyment and personal improvement. In contrast, the need for autonomy is not satisfied when behaviour is directed by controlling events and therefore when intentional behaviour is controlling. When behavioural regulation is controlling, individuals report motives reflecting controlling contingencies that are perceived to direct social action.

Ryan and Connell (1989) developed an instrument assessing behavioural regulations in the academic domain. They assessed behavioural regulations through motives for doing academic-related work. Four types of behavioural regulation are recognized and are termed external regulation, introjection, identification, and intrinsic motivation. External regulation falls into the controlling category of personal experience. It refers to a behaviour that is regulated by the expectation of 'getting a reward' and praise from others. Research has shown that when behaviour is directed by these expectations the need for autonomy is thwarted, positive affect is undermined and individuals experience pressure (see Deci & Ryan, 1985). Introjection also represents a controlling category of motivational processes and therefore behaviour is directed by internal structures that are experienced as pressuring. In the psychological literature, internal pressures such as 'fear of punishment' and the avoidance of negative emotions such as guilt and shame are examples of controlling psychological events that can motivate action under introjection.

Like introjection, identification falls also into the controlling category of motivational processes. However, identification is not experienced as such a controlling form of behavioural regulation as external or introjected regulation. Behaviour is directed by goals and/or outcomes that are important to the individual and in this regard behaviour is considered to be directed by informational events. However, the experience of control is not totally absent from identified behavioural regulation because the behaviour interferes with other responsibilities and roles that individuals have to carry out in their life.

The experience of pressure and conflict is totally absent when the motivational process is intrinsically motivated. Intrinsic motivation refers to a behaviour that is directed by the spontaneous feelings that are experienced during performance of the task. Such outcomes are termed 'experiential' or 'intrinsic' outcomes and refer to the experience of joy, fun and excitement.

### **Behavioural Regulations in the Context of Physical Activity**

Recently Pelletier, Fortier, Vallerand, Tuson, Briere, and Blais (1995) have tested the validity of a self-report measure of behavioural regulations in the sport domain. Pelletier *et al.* consider behavioural regulations to comprise amotivation, external regulation, introjection, identification and intrinsic motivation. Intrinsic motivation is also considered to comprise three dimensions that are termed intrinsic motivation to know, to accomplish and to experience stimulation. Types of behavioural regulation are also assumed to differ in the degree they are experienced as autonomous. The

experience of autonomy is totally absent from amotivation and external regulation, and it is totally manifested in intrinsic motivation. Also, the relative autonomy that individuals experience in action is proposed to be calculated by assigning negative weights to external regulation and introjection and positive weights to measures of identification and intrinsic motivation.

In the domain of leisure-time physical activity (LTPA) there is no instrument assessing types of behavioural regulation. In this regard, Deci and Ryan (1985) claim that controlling forms of behavioural regulation may be less likely to hold because people seek out LTPA for fun and for the opportunity to be free from extrinsic pressures. However, it is argued that an excessive concern of public health professionals for altering individual behaviour toward a healthy lifestyle may constitute an environmental structure that promotes a controlling form of behavioural regulation. If this assumption holds then behavioural regulations that involve concerns about health-related benefits of physical activity may constitute controlling forms of behavioural regulation.

Exercising for attaining health-related outcomes may be experienced more or less as a controlling form of behavioural regulation and this may be dependent on the quality of health-related outcomes that direct behaviour. Some people may exercise for improving their health condition not out of an integrated understanding of the health benefits of physical activity but because health professionals say so. In this case individuals may be likely to exercise because of their doctor's advice. This form of behavioural regulation is termed external regulation. It is also assumed to be experienced as a more controlling form of behavioural regulation than behavioural regulation that is represented by 'a worry about health' (introjection). Exercising on the 'doctor's advice' and/or out of a 'worry about health' can represent controlling forms of behavioural regulation to the extent that they display a negative correlation with intrinsic forms of behavioural regulation. Intrinsic motivation is represented by feelings of fun and enjoyment (intrinsic motivation to experience stimulation) and by motives related to improvements in athletic skills (intrinsic motivation to accomplish) (Pelletier *et al.*, 1995).

## Hypotheses

The first purpose of this paper is to test moderating effects of behavioural regulations on the intention-behaviour relationship. If behaviour is unstable only when behavioural regulation is controlling then it is hypothesized that under controlling forms of behavioural regulation the intention-behaviour relationship will be weaker than under autonomous forms of behavioural regulation. Moderating effects of behavioural regulations will be tested by not specifying 'time' in measures of intention and behaviour (see Ajzen & Fishbein, 1980). Time is not specified in psychological measures because if it is found that behavioural regulations influence the predictive validity of intention given the non-specification of time, then there is evidence supporting the importance of behavioural regulations in investigating intention-behaviour relationships irrespective of time.

The second purpose is to assess the functional significance of attitudes, subjective norms and PBC. This can be done by investigating the relationships between attitudes, subjective norms and PBC with intentions and behaviour under controlling and

autonomous forms of behavioural regulation. It is thought that attitudes will carry a controlling functional significance, and therefore will be likely to predict intention under controlling forms of behavioural regulation when attitudinal appraisals are associated with extrinsic outcomes. Attitudes are also thought to carry an informational functional significance and therefore to predict intention when behavioural regulation is autonomous and when attitudinal appraisals are associated with informational intrinsic outcomes (e.g. focus on self-improvement and on interesting aspects of the activity). In the TPB the operational definition of attitudes does not distinguish between attitudes that are associated with extrinsic cues and attitudes that are associated with intrinsic cues. For this reason, it is hypothesized that attitudes will be equally important in predicting intention irrespective of types of behavioural regulation.

PBC is expected to predict intention only under controlling forms of behavioural regulation when factors taxing one's control over the behaviour reflect an internal conflict that a person might experience. An example of an internal conflict that might tax one's control is the experience of the behaviour as being incongruent with personal inclinations. PBC is expected to predict intention only under autonomous forms of behavioural regulation when the same person taxes his/her control over the behaviour by choosing to perform challenging tasks. In the TPB the operational definition of PBC does not account for the extent to which internal conflicts or the same person makes control over the behaviour incomplete. PBC is a measure of individual's ability to cope with barriers which are not considered to differ in qualitative terms. For this reason, PBC is hypothesized to predict intention irrespective of types of behavioural regulation.

Subjective norms are hypothesized to carry the controlling dimension of functional significance and therefore to predict intention only when behavioural regulation is controlling. Subjective norms are hypothesized to be a controlling psychological event because its operational definition implies motivation contingent on identities and requests of others rather than personal choice and freedom. Finally, in addition to these hypotheses the present paper will also test the validity of an instrument assessing behavioural regulation in the context of LTPA.

## METHOD

### Participants and Procedure

Four hundred questionnaires were randomly distributed to full-time employees on a university campus, and 50 questionnaires were distributed to railway employees, both groups being located in the south-west of England. A further 50 questionnaires were distributed to employees in a workplace in North Yorkshire, England. All questionnaires were circulated and collected by mail. The final sample consisted of 102 adults, representing a 20.4 per cent response rate. The mean age was 39.96 years (*S.D.* = 10.66) with males ( $n = 51$ ) and females ( $n = 50$ ) equally represented. One participant was unidentified by gender. With respect to the occupation of the research participants, 25 were involved in manual work (cleaners, porters etc.), 31 in academic work (lecturers and researchers) and 46 in academic-related or administrative work (secretaries, librarians etc.).

## Instrumentation

Research participants completed a questionnaire designed to measure the social-psychological variables that are included in the TPB (intentions, attitudes, subjective norms, PBC), a questionnaire assessing behavioural regulations, and a modified version of Godin and Shephard's (1985) self-report measure of physical activity. With respect to the wording and scaling of the social-psychological variables of the TPB, the recommendations of Ajzen and Fishbein (1980), Ajzen and Madden (1986) and Theodorakis (1994) were followed. Furthermore, all variables were phrased specifically to be congruent with the behaviour in terms of action (physical activity), context (when I am at home, at my work or in my leisure time), target (for at least 15 minutes three times per week) but not time.

Behavioural regulation was assessed through perceived reasons for engaging in LTPA (Deci & Ryan, 1985). The meaning of external regulation was assessed via two questions representing the motive of 'doctors advice' and the motive of 'bad health condition'. The content of introjected regulation was measured via two questions that dealt with the motive of 'worrying about health condition' and the motive of 'acquiring confidence about health condition' when doing physical exercise.

Assessment of autonomous forms of behavioural regulation were based on the work of Pelletier *et al.* (1995). Intrinsic motivation to accomplish was assessed through two questions representing 'interest to learn athletic skills' and 'interest to do well in physical exercise tasks'. Intrinsic motivation to experience stimulation was assessed via three questions dealing with feelings of enjoyment, excitement and fun associated with physical activity. All items were measured on 7-point scales. Because the present study targeted active and inactive populations those who did not participate in physical activities for at least 15 minutes, three times per week were asked to report their motives to exercise hypothetically (e.g. if I were to take part in physical activities ...).

## RESULTS

### Validity of Controlling Forms of Behavioural Regulation

This part of the analysis tests the validity of controlling forms of behavioural regulation in the domain of LTPA. This was examined through confirmatory factor analysis (CFA). Construct validity is supported when: (a) the variance/covariance matrix reproduced by parameters of a 4-factor model do not differ significantly from the observed variance/covariance matrix; (b) a 4-factor model explains a satisfactory portion of observed variance/covariance, and, in the meantime, the variance/covariance not explained by the model is low; and (c) measures of controlling forms of behavioural regulation display the most negative correlations with measures of intrinsic motivation. Using the EQS statistical package (Bentler, 1995), one can evaluate the adequacy of a model through a chi-square statistic and goodness-of-fit indices. Table 1 presents fit indices and chi-square statistics of the CFA of motives for physical exercise participation.

The chi-square statistic of the 4-factor model was significant indicating a poor fit of the model to the data. Gerbin and Anderson (1993) suggest that in small sample sizes



Table 1. Fit indices of the measurement model of motives for exercise participation

Non-normed fit index	0.90
Comparative fit index	0.93
LISREL GFI	0.89
SRMSR	0.02
Delta <sup>2</sup>	0.98
Chi-square ( <i>df</i> )	53.8 (23), $p < 0.001$

the chi-square statistic lacks power as it is too forgiving of important misspecifications. In addition, this statistic does not provide information regarding the degree of fit. For these reasons, utilization of fit indices is considered to be a more rigorous method of evaluating model adequacy. The non-normed fit index (NNFI) and the comparative fit index (CFI) assess the model's fit by the degree to which the model accounts for the sample covariances relative to the null model. Values above 0.90 are considered satisfactory. Standardised root mean square residual (SRMSR) evaluates the model's adequacy by accounting for the observed variance/covariance that the model under consideration cannot explain. Therefore, SRMSR is a 'badness-of-fit index'. Values below 0.10 indicate a good fit of the model to the data.

As shown in Table 1, values of the CFI and the NNFI are above 0.90. In addition, the SRMSR is below 0.10. These results support a good fit of the model to the data. The goodness-of-fit index (GFI) assesses the degree of fit in terms of the measured variance/covariance that the model under consideration can account for. Therefore, it is a goodness-of-fit index reflecting model-data consistency. Again values above 0.90 support a good fit of the model to the data. In the present study, GFI is 0.89 indicating a good fit of the model to the data given the small sample size of the present study (Gerbin & Anderson, 1993).

Joreskog and Sorbom (1988) suggest that fit indexes are measures of the overall fit of the model to the data. Based only on fit indexes, the extent to which specific parts of the model do not reproduce observed data cannot be evaluated. For instance, it can happen that the overall fit of the model is very good, but specific relationships in the model could be poorly determined. For this reason, in the present study the model's adequacy is also assessed by examining factor loadings and error variances that are displayed by each measure of motives for exercise participation (see Table 2).

Table 2. Factor loadings and error variances of motives for exercise participation

	Factor loadings	Error variances
External regulation	0.47	0.87
	0.47	0.87
Introjection (re-labelled identification)	0.54	0.84
	0.54	0.83
Intrinsic motivation to accomplish	0.69	0.71
	0.80	0.59
Intrinsic motivation to experience stimulation	0.87	0.48
	0.90	0.42
	0.91	0.40

Table 3. Correlation matrix between latent factors

	1	2	3	4
1. External regulation	—			
2. Introjection (re-labelled identification)	-0.02	—		
3. Intrinsic motivation (accomplish)	-0.54	0.61	—	
4. Intrinsic motivation (stimulation)	-0.46	0.59	0.76	—

Factor loadings of measures reflecting external regulation, introjection and intrinsic motivation to accomplish are relatively low and display high error variances. These results indicate that although the 4-factor measurement model fits the data, measures of external regulation, introjection and intrinsic motivation to accomplish are not explained well by their respective latent factors.

To assess whether controlling forms of behavioural regulation are antithetical to intrinsic motivation, the intercorrelation matrix between latent factors was investigated (see Table 3). Although external regulation is negatively correlated with measures of intrinsic motivation, the correlation between introjection and intrinsic motivation is positive and high in magnitude. Research dealing with forms of behavioural regulation point out nonsignificant or negative correlations between introjection and intrinsic motivation. These findings suggest that results of the present study display inconsistency with prior research findings. These may be due to sampling error. According to Hunter, Schmidt and Jackson (1982), magnitudes of correlations may differ across studies because each correlation is based on a different sample size. In this regard the credibility interval of the weighted mean average correlation between introjection and intrinsic motivation to experience stimulation of three studies conducted up to now was calculated (Goudas, Biddle, & Fox, 1994; Pelletier *et al.*, 1995; Ryan & Connell, 1989). If the correlation of the present study falls outside the credibility interval of the corrected correlation then one can conclude that results display inconsistency with prior research findings. If not then inconsistency is likely due to sampling error.

The weighted mean average correlation of studies conducted up to now is 0.23 with a standard deviation of 0.075. In contrast, results of the present study reveal a correlation of 0.59, which falls outside the credibility interval. These results lead us to conclude that the correlation between introjection and intrinsic motivation to experience stimulation displays inconsistency with prior research findings. Further analyses indicated that our correlation displayed more consistency with correlations between *identification* and intrinsic motivation appearing in the literature than with correlations between *introjection* and intrinsic motivation. Therefore, it was concluded that our measure of motives for physical exercise participation may measure identification rather than introjection, and for this reason measures of introjection are re-labelled as 'identification'. This issue will be elaborated on in the Discussion section.

### Descriptive Statistics for the Whole Sample

Table 4 presents descriptive statistics of the social-psychological variables included in the TPB for the whole sample. Self-report measures of physical exercise participation

Table 4. Descriptive statistics and intercorrelations for the whole sample

	Mean	S.D.	Reliabilities					
			(alpha)	1	2	3	4	5
1. Physical exercise	49.9	27.0	—	—				
2. Intention	4.7	2.0	—	0.36	—			
3. Attitudes	5.3	1.1	0.89	0.20	0.66	—		
4. Subjective norms	5.8	1.2	0.80	0.05	0.24	0.35	—	
5. PBC	5.9	1.3	0.80	0.03	0.30	0.29	0.12	—

indicate that, on average, participants exercised more than three times per week. Internal consistency (alpha coefficients) for measures of attitudes, subjective norms and PBC were all satisfactory. The zero-order correlation coefficient between the two items measuring intentions was 0.88.

The zero-order correlation coefficients between measures of physical exercise, intentions, attitudes, subjective norms and PBC provided support for the validity of the TPB. That is, intention was correlated with measures of physical exercise ( $p < 0.05$ ), attitudes toward physical exercise were positively correlated with measures of intention ( $p < 0.01$ ) and intentions were correlated with measures of PBC and subjective norms ( $p < 0.05$ ) (see Table 4).

### Subsample Analyses

This part of the analysis investigated the subjective experience of variables that are included in the TPB. Respondents were stratified into two groups—an 'autonomy group' and a 'controlling group'—on the basis of their scores on a Relative Autonomy Index (RAI). RAI can be calculated by averaging scores on types of behavioural regulation as follows: external regulation  $\times (-2)$ , identification (re-labelled from introjection)  $\times (-1)$ , intrinsic motivation to accomplish  $\times (1)$ , intrinsic motivation to experience stimulation  $\times (2)$ . Thus, participants scoring high on external regulation and introjection display a negative RAI. These participants are also considered to regulate exercise behaviour in a controlling manner. Participants scoring high on intrinsic motivation and identification display a positive RAI and they are considered to regulate behaviour in a more autonomous manner. Subjective experience of variables that are included in the TPB can be assessed by investigating strength of attitudes, subjective norms and PBC to predict intention and/or physical exercise participation in the autonomous and controlling groups separately.

Table 5 presents descriptive statistics of the social-psychological measures that are included in the TPB for the controlling and autonomous groups. Statistics for the autonomy group are based on 43 people (mean of age 37.1 years, male ( $n = 23$ ), female ( $n = 20$ )) and for the controlling group on 59 people (mean of age 42.1 years, male ( $n = 29$ ), female ( $n = 29$ )).

The autonomy group scored higher on the self-report measures of LTPA, intention, attitudes and PBC than the controlling group ( $p < 0.05$ ). Scores on subjective norms did not differ between the groups ( $p > 0.05$ ). With respect to the controlling group, significant correlations were observed between intention and behaviour ( $p < 0.05$ ) and between intention, attitudes and subjective norms ( $p < 0.05$ ). For the

Table 5. Descriptive statistics and intercorrelations for the autonomy group and controlling group<sup>a</sup>

	Autonomous group		Controlling group		1	2	3	4	5
	Mean	S.D.	Mean	S.D.					
1. Physical exercise	55.9	25.9	45.5	27.1	—	0.34	0.20	-0.03	0.20
2. Intention	5.8	1.4	4.0	2.0	0.31	—	0.47	-0.15	0.48
3. Attitudes	5.9	0.9	4.8	1.1	0.25	0.62	—	0.00	0.31
4. Subjective norms	85.4	55.2	85.9	47.0	-0.04	0.37	0.30	—	0.20
5. PBC	6.2	1.0	5.6	1.5	-0.04	0.15	-0.17	-0.16	—

<sup>a</sup>Correlation coefficients for the controlling group are presented below the diagonal.

autonomous group, significant correlations were observed for LTPA with intention and PBC ( $p < 0.05$ ), and intention with attitudes and PBC ( $p < 0.05$ ).

In both controlling and autonomous groups, alpha coefficients, assessing internal consistency for measures of attitude (0.71) and PBC (0.89) were satisfactory. Correlations between the items measuring intentions were 0.96 and 0.72 for the controlling and autonomous group respectively. The high zero-order correlation between measures of intention indicate a possibility of bloated specific measures (see Kline, 1993). However, this is not considered to limit construct validity of intention because measures of intention are significantly correlated with subjective norms, behaviour and attitudes.

Strength of relationships between psychological variables was assessed through two path analyses that were conducted in the controlling group and autonomy group separately (see Figure 1). Multiple-group analysis was also conducted to compare the strength of relationships across groups under investigation. Both in the path analyses and in the multiple-group analysis, parameters of the model were estimated by using maximum likelihood methodology. Due to normality assumptions underlying maximum likelihood methodology, indices estimating normality of observed data were also investigated using Mardia's coefficient and the normalized estimate.

With respect to the autonomous group, Mardia's coefficient (0.16) and the normalized estimate (0.06) were close to zero, supporting normality of the multivariate distribution of the observed data. With respect to the controlling group, Mardia's coefficient (3.6) and the normalized estimate (1.4) support partial normality of the multivariate distribution. According to Bentler (1995), when the multivariate distribution of the data is not normal, path analysis using maximum likelihood methodology may result in biased estimates. However, in the present study a second path analysis using Arbitrary Generalized Least Squares methodology revealed results similar to those derived from maximum likelihood methodology. For this reason, results of the maximum likelihood methodology only are presented.

Table 6 presents chi-square statistics and fit indices of the path analyses of the TPB model in the controlling group and autonomy group separately. Chi-square statistics are not significant. Both the autonomy group and the controlling group displayed goodness-of-fit indices above 0.90, whereas SRMSRs were below 0.10. These findings support an excellent fit of the TPB model to both groups.

Figure 2 presents a path diagram of the TPB model. Model modification indices (Lagrange Multiplier Test) indicated that in the controlling group, correlations

Table 6. Fit indexes of the TPB model for the controlling and autonomy groups

	Autonomy group	Controlling group
Comparative fit index	1.0	1.0
Lisrel GFI	0.99	0.97
SRMSR	0.002	0.02
Chi-square ( <i>df</i> )	1.1 (4) $p = 0.67$	5.6 (7) $p = 0.43$

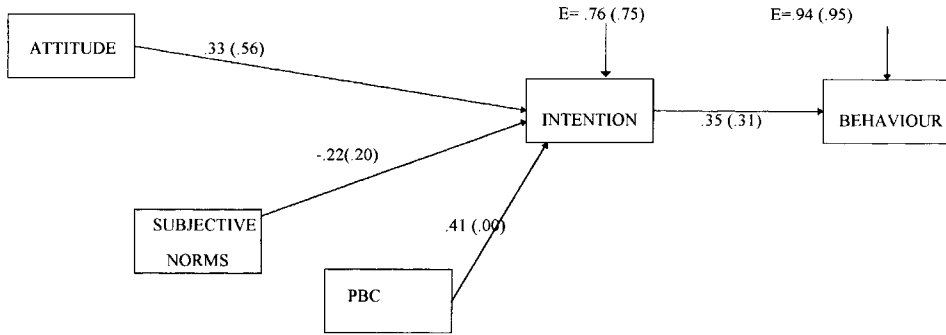


Figure 2. A path diagram of the TPB model under controlling and autonomous regulations (Parameters estimated for the controlling group are presented in parenthesis)

between attitude and subjective norms ( $r = 0.29, p < 0.05$ ), and between attitude and PBC ( $r = 0.29, p < 0.05$ ) must be set as free parameters to be estimated. With respect to the autonomy group only the correlation between attitude and PBC ( $r = 0.28, p < 0.05$ ) was set as a free parameter to be estimated. These correlations are not presented in the path diagram of Figure 2.

Figure 2 shows that intentions to exercise predict participation in both the autonomous and controlling groups. Therefore, as far as proximal behaviour is concerned, intentions to act seem to do well in predicting behaviour irrespective of the types of behavioural regulation involved. In a similar vein, attitudes predict intentions to exercise in both groups. Therefore, attitude appears to cover both the autonomous and controlling dimension of subjective experience. On the other hand, subjective norms displayed negative regression coefficients with intention in the autonomy group. In the controlling group this regression coefficient was positive. Hence, subjective norms might cover only the controlling dimension of subjective experience. The relationship between PBC and intention was significant in the autonomy group and not in the controlling group. PBC then might cover the autonomous dimension of experience.

According to Hunter *et al.* (1982), subgroup analysis increases the likelihood of drawing false inferences. That is, due to small and unequal sample sizes the likelihood of committing Type 1 error increases at 0.10 and the likelihood of committing Type 2 error increases dramatically. This is due to upward bias magnitudes of coefficients and standard errors when incorporating small sample sizes. A more rigorous method of evaluating the strength of relationships across multiple groups involves a multiple-sample analysis. In multiple-sample analyses, parameters of a model are compared for equality after accounting for sampling error. Appropriateness of equality constraints is also assessed through a chi-square statistic, goodness-of-fit indices and Lagrange Multiplier Test (LMT).

Table 7. Multiple sample analyses

	First multiple group analysis	Second multiple group analysis
Chi-square ( <i>df</i> )	19.3 (13), $p = 0.11$	11.5 (12), $p = 0.47$
Normed-fit index	0.72	0.86
Non-normed fit index	0.84	1.01
Comparative fit index	0.90	1.00

In the present study paths from intention to behaviour, and from attitudes, PBC and subjective norms to intention were freed and tested for equality across the autonomous group and the controlling group. To the extent that most of these parameters are unequal the chi-square statistic multiple-group analysis will be significant and goodness-of-fit indices will fall below 0.90. Table 7 presents results from this multiple-sample analysis.

As shown, the probability of the chi-square statistic was not significant and most of the fit indices were below 0.90. These results suggest that there is room for improvement in the multiple-sample analysis. Investigation of the LMT revealed only the regression coefficient of intention on subjective norms to be of unequal magnitude (chi-square (*df*) = 7.16(1)  $p < 0.05$ ). Regression coefficients between intention and behaviour, between intention and PBC, and between intention and attitude were all of equal magnitude. A second multiple-group analysis, relaxing the equality constraint between regression coefficients of the subjective norms–intention relationship, revealed goodness-of-fit indices above 0.90 and a nonsignificant chi-square statistic. Therefore, it was concluded that only the path from subjective norms to intention was not equal across the two groups. Considering also the directions of path coefficients displayed in the autonomous and controlling groups, it can be concluded that subjective norms cover only the controlling dimension of experience. Attitudes and PBC appear to cover both the controlling and autonomous dimension of subjective experience. Furthermore, subjective experience of behavioural regulations does not moderate the intention–proximal behaviour relationship.

## DISCUSSION

The purpose of the present study was to examine the validity of an instrument assessing behavioural regulations in the context of leisure-time physical activity and exercise. In addition, the functional significance of social-psychological variables that are included in the TPB was also assessed by investigating moderating effects of behavioural regulation on the intention–behaviour relationship and on intention formation.

### Validity of Behavioural Regulations

Results of the CFA partially support construct validity of the behavioural regulations in the context of physical activity. Fit indices indicated that a 4-factor model

representing external regulation, introjection and intrinsic motivation to accomplish and to experience stimulation satisfactorily explained self-report measures of motives for acting. Nevertheless, a more detailed investigation of factor loadings and error variances indicated measures of external regulation, introjection and intrinsic motivation to accomplish to display high residual variances. This may be due to the number of variables that have been used to assess these constructs. Two indicators per factor result in biased estimations of factor loadings and error variances when using maximum likelihood methodology (Gerbin & Anderson, 1993). Therefore, the content of external regulation, introjection and intrinsic motivation to accomplish was likely to be poorly covered and future research must enrich this content in the domain of physical activity.

The fact that in the present study the content of these constructs was poorly covered does not reject the hypotheses that measures of motives for physical exercise participation do not measure these constructs. According to Deci and Ryan (1985), this hypothesis can be rejected if measures of external regulation and introjection are uncorrelated, and are not antithetical to measures of intrinsic motivation. Investigation of the correlation matrix between latent factors indicated that although external regulation was negatively correlated with measures of intrinsic motivation, introjection was not. In addition, introjection was positively correlated with measures of intrinsic motivation and it was also uncorrelated with external regulation. The positive correlation between introjection and intrinsic motivation was also high and inconsistent with previous research findings.

Therefore, it appears that our measures of motives for physical activity measure external regulation but not introjection. Also, controlling forms of behavioural regulation exist in the domain of exercise as far as external regulation is concerned. With respect to introjected regulation there is no indication that motives for physical exercise measure this construct. Future research must also discover the content of introjected regulation in the domain of physical activity/exercise and to assess its validity alongside other forms of behavioural regulation.

The fact that our motives do not measure introjection does not reject the hypothesis that they do not also measure controlling forms of behavioural regulation. Introjection, as it was assessed here, displayed a positive correlation with intrinsic motivation because its content may better represent identification rather than introjection. In a factor analytic study, Kasser and Ryan (in press) found that health-related outcomes were closely related to intrinsic aspirations such as affiliation, self-acceptance and community contributions. In contrast, appearance-related outcomes were associated with more extrinsic aspirations such as desires for money and fame. Therefore, results from Kasser and Ryan suggest that concerns about health may not constitute such a controlling form of behavioural regulation as we hypothesized. In contrast, more controlling forms of behavioural regulations may be represented by appearance-related concerns, a factor that has not been assessed in the present study and is considered deserving of future research.

If measures of motives for exercise participation measure identification but not introjection, and they also share similarities with intrinsic motivation, why were they utilized as a criterion to classify subjects into a controlling group? According to Deci and Ryan (1985), although identification shares similarities with intrinsic motivation, it is still a controlling form of behavioural regulation because behaviour conflicts with other behaviours and roles that people have to carry out. Pelletier *et al.* (1995) also

consider identification as a controlling form of behavioural regulation though it is positively correlated with measures of intrinsic motivation.

Overall, results of the present study support, in part, the construct validity of controlling forms of behavioural regulation in the domain of physical activity and exercise. Motives for participation measure external regulation and identification but not introjection. Construct validity is not supported in terms of content validity. That is, contents of external regulation, introjection and intrinsic motivation to accomplish were not covered adequately. As Kline (1993) postulates, two indicators per factor result in unreliable measures of the factor, and therefore in less valid factors. Therefore, the discovery of the content of introjection and the enrichment of the content of external regulation and identification seem to be fruitful lines for future research.

### **Behavioural Regulations and the Intention–Behaviour Relationship**

A second purpose of the present study was to investigate moderating effects of behavioural regulations on the intention–behaviour relationship. This was attained by investigating relationships between intention and behaviour under controlling and autonomous forms of behavioural regulations.

The path analyses indicated that intention to exercise does predict activity in the controlling and autonomous groups. In addition, the multiple-sample analysis revealed that the strength of the intention–behaviour relationship did not differ significantly across groups. It seems, therefore, that personal experience of motivation, as it is reflected on measures of behavioural regulations, does not affect predictive validity of intentions when time is left unspecified.

This conclusion is in line with Deci and Ryan's (1985) predictions that behavioural regulations are more important in determining behavioural adherence. A great deal of evidence has shown that both externally-regulated and intrinsically-motivated individuals do engage in tasks. Therefore, a positive correlation between intentions and behaviour is expected, especially when time is left unspecified. However, only when behavioural regulation is autonomous are individuals expected to keep engaging in tasks, and therefore to display stable motivation. When behavioural regulation is controlling, individuals are expected to keep engaging in tasks as long as external controls are in effect. When controls are withdrawn their effects on motivation extinguish, thus causing changes in motivation. If these considerations hold then behavioural regulations are likely to moderate the intention–behaviour relationship the longer the time gap between assessments of intention and behaviour.

Under controlling forms of behavioural regulation, intention is less likely to predict behaviour because intention may be unstable. This is because controlling events contributing to intention formation motivate individuals to act in an unstable manner. In contrast, under autonomous forms of behavioural regulation, intention is more likely to be stable because the informational factors contributing to intention formation reflect an ongoing motivational sequence. Therefore, the investigation of the functional significance of attitudes, subjective norms and PBC, and of the extent to which these variables reflect a stable or unstable motivation, is important in understanding stability of intention and behavioural adherence.



### **Functional Significance of Subjective Norms**

Subjective norms is an example of an internal psychological event that can represent control and not autonomy. The path analyses revealed that subjective norms predicted intentions to exercise only when behavioural regulation was controlling. When behavioural regulation was autonomous, subjective norms were negatively associated with intentions to exercise. In addition, the multiple-group analysis revealed regression coefficients between intentions to exercise and subjective norms not to be of equal magnitude across groups.

Subjective norms may represent pressure and control either due to the operational definition of the construct itself or because the content of social agendas is experienced as pressuring. If it is the latter, then efforts must be directed towards educating the autonomous supportive practice of communication to public health professionals. For example, exercising to look like 'the much-heralded models of the media' (Deci & Ryan, 1991, p. 278) is a controlling form of intentional behaviour that may be induced by significant others. That is, to the extent that society, through the media, associates exercise with such extreme body shapes, controlling patterns of interpersonal communication and of intentional behaviour are likely to develop in exercise. Autonomous intentional behaviour is more likely to develop when society presents exercise as a behaviour that can take multiple forms and can be performed by all people irrespective of age, culture, body shape and physical ability.

With respect to the operational definition of subjective norms, Ajzen and Fishbein (1980) claim that subjective norms represent actors' perceptions about pressures generated from important significant others with respect to the behaviour. Measures of subjective norms also reflect a personal tendency to comply with pressures generated from significant others. According to self-determination theory, psychological events that include compliance and pressure represent control and therefore it is argued that subjective norms cover only the controlling dimension of personal experience. Under this consideration, future research must operationalize the autonomous supportive dimension of social influence and test its utility in predicting intentions alongside subjective norms. Assessment of the 'autonomy support' dimension of social influence can be obtained by asking people to report whether important others support performance of a 'chosen' behaviour (see Deci & Ryan, 1991).

### **Functional Significance of Attitudes**

Results of the path analysis also revealed attitude to be an important determinant of intention irrespective of the types of behavioural regulation. In addition, the multiple-sample analysis revealed motivational effects of attitude to be of equal magnitude in both the autonomy group and the controlling group. Therefore, it is concluded that the attitude construct, as it is conceived by the TPB, carries both the controlling and the informational dimension of functional significance.

Attitudes predict intentions irrespective of behavioural regulations because the operational definition of attitudes does not distinguish between attitudes that are formed on the basis of extrinsic outcomes from those formed on the basis of intrinsic outcomes. Attitudes under the TRA/TPB are global unidimensional evaluations (see Bagozzi & Kimmel, 1995). According to Deci and Ryan (1985), the extent to which

individuals derive satisfaction, and therefore evaluate behaviour as useful and enjoyable from the achievement of extrinsic or intrinsic outcomes, is important in understanding intention and attitude formation under the controlling and autonomous motivational processes.

A more elaborated understanding of intention formation under controlling and autonomous forms of behavioural regulation can be obtained by incorporating Bagozzi and Kimmel's (1995) 'Theory of Trying' concepts of attitudes toward success, attitudes toward failure and attitudes toward process. As Bagozzi and Kimmel argue, succeeding and failing refer to 'end-state' outcomes while process refers to consequences en route to the desired end-state. It is argued that attitudes toward success and failure can carry the controlling dimension of functional significance to the extent that extrinsic outcomes are used for operationalizing end-state outcomes. Furthermore, attitudes toward process can carry the informational dimension of functional significance if intrinsic outcomes are used to operationalize process-related outcomes.

Attitudes toward success, failure and toward process are also useful in understanding the stability of intentions and behaviour. Attitudes toward success and failure may represent evaluations that develop from expected extrinsic outcomes. It follows that with the achievement of these outcomes, and if a new outcome is not introduced, attitudes lose their motivational content, intention strength decreases, and individuals may drop out. If a new outcome is introduced, individuals may sustain the behaviour. However, attitude, intention and behaviour change because the expected outcome is now different.

In contrast, when attitude is associated with process-related cues, any achievement or failure to achieve extrinsic outcomes does not play an important role in motivated behaviour. Process-related outcomes are consequences that are experienced during performance of the task. It follows that these outcomes are attained once the person engages in the task. Because experiential outcomes have been found to be associated with behavioural adherence (Deci & Ryan, 1985), it can be argued that attitudes toward the process will always motivate intention and behaviour.

### **Functional Significance of PBC**

With respect to PBC, results of the path analysis revealed the intention–PBC path not to differ significantly across groups under investigation, though in the single-group analyses PBC predicted intention significantly only in the autonomous group. Therefore, PBC can cover both the controlling and informational dimensions of functional significance. In discussing the concept of control and self-efficacy, Deci and Ryan (1985) claim that perceptions of control are very important for a behaviour to be intentional irrespective of personal experience of motivation. Therefore, individuals may intend to act because they evaluate positively gains in outcomes or in the behavioural experience itself. However, if control of the behaviour is problematic, PBC is expected to predict intention.

PBC is taxed, in the autonomous and controlling motivational processes, from different factors. When the behavioural regulations are controlling, control over the behaviour may become problematic because the achievement of the outcome through performance of the behaviour may induce an internal conflict to the individual taxing control over the behaviour. Examples of internal conflicts that may tax individual's

control over the behaviour is the experience of the behaviour as being incongruent with one's inclinations and/or as being in conflict with other roles and requests that individuals 'have to' or 'want to' carry out (see Deci *et al.*, 1994). When this is the case, individuals do not intend to act only to the extent that attainment of the outcome arouses positive affect and reduces negative affect but also to the extent that conflicting factors reduce one's efforts to cope with environmental barriers. Therefore, under controlling forms of behavioural regulations, PBC over the behaviour is taxed and becomes an important determinant of intention due to internal conflicts individuals attempt to solve through social action.

When the behavioural regulation is intrinsic, individuals do not experience any internal conflict so PBC is less likely to be taxed. Behaviour is integrated with other roles and requests that have to be carried out in life. As Deci and Ryan (1991) state: 'one comes to experience organization among regulatory processes within which they can harmoniously coexist. This would be accompanied by the feelings of integrity in action and cohesion of the self. As one becomes more integrated, these various identifications would not remain "isolated molecules" but rather would find a smooth and balanced synthesis being reciprocally assimilated and meaningfully hierarchically organized' (pp. 256–257).

Although under intrinsic motivation PBC is not taxed by conflicting factors, PBC can be taxed by the same person. An abundance of research has shown that when the process is intrinsically motivated, individuals are likely to choose difficult tasks (Deci & Ryan, 1985). Individuals choose difficult tasks in an attempt to explore their competencies and further improve themselves. Therefore, when behavioural regulation is intrinsic individuals do not only intend to act for experiencing positive affect but also for feeling competent and effective in the social world. Since the task is chosen, successful or unsuccessful attempts to perform the activity are less likely to result in reductions or enhancements of PBC and therefore in unstable intentions. Individuals can regulate control over the behaviour by choosing to perform easier or more difficult tasks.

## **Conclusion**

Overall, the present study proposes investigation of moderating effects of behavioural regulations on the intention–behaviour relationship over long intervals of time (e.g. 4, 6, 8 weeks etc.). If intention is less likely to predict behaviour when behavioural regulation is controlling then the TPB can easily lead to applications that undermine intrinsic motivation and adherence to social behaviours. Then research can proceed with the modification of the constructs that are included in the TPB in a way that the informational and controlling distinction of functional significance is made more salient. The modification of these constructs can be attained by integrating three leading theories of social action (TRA/TPB and the Theory of Trying). This modification is considered to go beyond reasoned and planned behaviours and therefore to go beyond initiation of behaviour. This integration attempts to result in the understanding of integrated behaviour and therefore in the understanding of behavioural adherence.

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