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## Using the construct of perceived autonomy support to understand social influence within the theory of planned behavior

Nikos L.D. Chatzisarantis<sup>a,\*</sup>, Martin S. Hagger<sup>b</sup>, Tracey Brickell<sup>c</sup>

<sup>a</sup>*School of Sport Sciences, University of Exeter, EX1 2LU England, UK*

<sup>b</sup>*University of Nottingham, UK*

<sup>c</sup>*Back to Motion Rehabilitation, Canada*

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### Abstract

**Objectives:** The present study examined the role of perceived autonomy support within the theory of planned behavior in a physical activity context. In accordance with self-determination theory [Ryan, R.M., & Deci, E.L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development and well being. *American Psychologist*, 55, 68–78], it was hypothesized that perceived autonomy support would predict intentions to participate in physical activity behavior directly and indirectly via attitudes.

**Design:** The study followed a prospective design where variables contained in the theory of planned behavior and past behavior were assessed at baseline and physical activity was measured 5 weeks later.

**Method:** Two hundred and thirty-five participants (male = 91, female = 144;  $M = 20.28$  years,  $SD = 6.59$  years) completed self-report measures of intentions, attitudes, subjective norms, perceived behavioral control, perceived autonomy support and behavior in a physical activity context.

**Results:** Results indicated that perceived autonomy support predicted physical activity behavior indirectly via the mediation of attitudes and intentions. Past behavior did not reduce the influence that perceived autonomy support exerted on physical activity.

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\*Corresponding author.

E-mail address: [nikos.chatzisarantis@exeter.ac.uk](mailto:nikos.chatzisarantis@exeter.ac.uk) (N.L.D. Chatzisarantis).

*Conclusions:* It was concluded that perceived autonomy support assists in the explanation of the social influences on intentions and physical activity behavior.

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*Keywords:* Autonomy support; Theory of planned behavior; Past behavior

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## Introduction

Self-determination theory is becoming a popular theory of human motivation in sport and exercise psychology (Ryan & Deci, 2000). Its popularity stems primarily from the fact that it can explain a great deal of variance in exercise and sport behavior on the basis of few principles related to psychological needs of self-determination, competence and relatedness (Ryan & Deci, 2000). Moreover, self-determination theory is attractive because it addresses limitations of other important theories of human motivation such as the theory of planned behavior (Hagger & Chatzisarantis, 2005). For example, research conducted by Chatzisarantis, Biddle, and Meek (1997) has shown that assumptions underlying self-determination theory are useful in understanding why intentions do not always translate into actions. The present study uses the construct of perceived autonomy support from self-determination theory to explain why Ajzen's (1991) theory of planned behavior is insufficient in capturing social influence.

### *The theory of planned behavior*

The theory of planned behavior postulates that a person's intention to perform a given behavior such as physical exercise is a central determinant of that behavior (Ajzen & Madden, 1986). Intention is an indicator of how hard people are willing to try, and of how much effort they are planning to exert toward performance of behavior (Ajzen & Fishbein, 1980). Intention is determined by three conceptually distinct variables: attitudes toward behavior, subjective norms and perceived behavioral control (Ajzen & Madden, 1986). Attitudes reflect a summary evaluation of a given behavior captured in evaluative dimensions such as good–bad, harmful–beneficial, pleasant–unpleasant (Ajzen & Fishbein, 1980). Subjective norms reflect the perceived social pressure that individuals may feel to perform or not to perform a given behavior (Ajzen & Fishbein, 1980). Perceived behavioral control describes the perceived ease or difficulty associated with execution of future behavior (Ajzen & Madden, 1986). Finally, the theory of planned behavior posits that perceived behavioral control predicts behavior directly only when behavior is not under complete volitional control and when perceived control reflects actual control accurately (Ajzen & Madden, 1986).

Assumptions underlying the theory of planned behavior have been corroborated by numerous meta-analytic reviews across a number of different behaviors (Armitage & Conner, 2001; Sheeran & Orbell, 1998) including physical activity (Hagger, Chatzisarantis, & Biddle, 2002). Tests of the theory of planned behavior have provided strong evidence for the overall predictive validity of intentions, and have shown that attitudes and perceived behavioral control influence intentions and behavior (Armitage & Conner, 2001; Hagger et al., 2002). For example, in a meta-analysis conducted by Hagger et al. (2002) the effects (beta coefficients) of attitudes and perceived control

on intentions were .20 and .28 respectively. Notwithstanding this corroborating evidence, the theory has its critics.

Previous research has shown that the theory of planned behavior does not capture antecedents of intentions and behavior sufficiently (Ajzen, 2002; Hagger et al., 2002). Hagger et al. (2002) reported that the effects of past behavior on physical activity intentions and behavior were .37 and .55 respectively after controlling for effects of the theory of planned behavior (e.g., intentions, attitudes, subjective norms, intentions and perceived behavioral control). These effects of past behavior reflect effects of factors that are not taken into consideration by the theory of planned behavior because past behavior reflects effects from innumerable factors that influenced intentions and behavior in the past. In addition, contemporary research shows that subjective norms insufficiently capture social influence (Courneya, Plotnikoff, Hotz, & Birket, 2000; Grube, Morgan, & McGree, 1986), for meta-analytic reviews (see Hagger et al., 2002) have shown that the direct effect from subjective norms to intentions is small ( $\beta = .09, p < .01$ ). The present study examines the contribution of perceived autonomy support (Ryan & Deci, 2000) to the resolution of problems surrounding the lack of prediction exhibited by the subjective norms construct.

#### *Perceived autonomy support and the theory of planned behavior*

In the theory of planned behavior, the construct of subjective norms reflects social pressure; measures of subjective norms indicate the extent to which people perceive that significant others pressure them to perform a behavior (Ajzen & Madden, 1986). Traditionally, however, research in social psychology has identified social pressure as a social factor that impedes motivation rather than as a factor that enhances motivation whereas non-pressuring forms of social influence have been shown to enhance motivation (Brehm & Brehm, 1981; Ryan & Deci, 2000). Therefore, one way to understand the influences that social factors exert on intentions is to incorporate non-pressuring forms of social influence within the theory of planned behavior. Autonomy support is a social influence construct proposed by self-determination theory that reflects non-pressuring forms of social influence (Deci & Ryan, 1985).

A tenet of self-determination theory is that the quality of the social context influences motivation and well-being of individuals who operate within them (Ryan & Deci, 2000). The theory proposes that three important properties in the interpersonal context affect motivation (Deci, Eghari, Patrick, & Leone, 1994). The first property is choice and refers to the extent to which significant others encourage choice and participation in decision making. Rationale is the second property thought to influence interpersonal context and refers to the extent to which significant others explain, in a meaningful way, why performance of an activity is important. Acknowledgment is the third influential contextual property and refers to the extent to which significant others minimize pressure and acknowledge people's feelings and perspectives (Deci et al., 1994; Deci, Koestner, & Ryan, 1999).

Self-determination theory suggests that the interplay between these three properties facilitates three distinct but inter-related interpersonal contexts (Deci & Ryan, 1985). The interpersonal context is said to be completely autonomy supportive when significant others provide choice, rationale and acknowledgement of personal feelings and perspectives during interpersonal communication (Deci et al., 1994). Individuals operating in autonomy supportive contexts do not

feel coerced but free to make their own decisions. The interpersonal context is said to provide incomplete autonomy support when two of the three factors that facilitate perceived autonomy support are absent in the environment (Deci et al., 1994). The interpersonal context is said to be controlling when significant others pressure people to act in specified ways by using pressuring language during interpersonal communication (e.g., use of modal operators such as “should” and “must”), and also when significant others do not provide choice and rationale (Deci et al., 1994). Individuals operating in incomplete autonomy supportive contexts and controlling contexts experience the environment as pressuring and coercing them to act in particular ways.

A clear conclusion to emerge from previous field and experimental studies is that perceived autonomy support enhances psychological well-being, attitudes and motivates performance of social behavior (Deci et al., 1999; Koestner, Bernieri, & Zuckerman, 1992; Ryan, Koestner, & Deci, 1991; Williams, McGregor, Zeldman, Freedman, & Deci, 2004). For example, in an experimental study, Deci et al. (1994) had participants work on an initially boring task under conditions of complete autonomy support, incomplete autonomy support or under controlling conditions in which participants were pressured to feel, think and behave in particular ways. Immediately after, the time participants spent on the task during a period in which they could engage in other attractive alternatives was measured. In addition, Deci et al. assessed participants' affective responses towards the task through measures that indicated how much useful and interesting the task was. Self-reported affect is equivalent to attitude measures proposed by the theory of planned behavior because according to the theory of planned behavior self-report interest and usefulness is a measure of attitude (Ajzen & Driver, 1991). Results from Deci et al. (1994) showed that while the provision of complete autonomy support motivated behavior (time spent with the task) and enhanced interest and usefulness (attitudes), the provision of incomplete autonomy support promoted overt behavior (time spent with a task) without influencing affective responses towards the task (see also Deci et al., 1999).

What is more, Deci et al. (1994) documented that the provision of complete autonomy support facilitated consistency between affective responses and behavior whereas the provision of incomplete autonomy support facilitated inconsistency between affective responses (attitudes), and behavior (see also Koestner et al., 1992; Ryan et al., 1991). Consistency between affective responses and behavior observed in autonomy-supportive contexts reflected, according to Deci et al. (1994), greater degrees of internalization of behavior that was facilitated in autonomy-supportive contexts because internalization is evident when behavior follows from internal psychological states such as beliefs, attitudes and emotions. In contrast, inconsistency between affective responses and behavior reflected lack of internalization because lack of internalization is evident when behavior does not follow from internal psychological states (Deci et al., 1994). Finally, there is evidence to suggest that not only actual but perceived autonomy support influences motivation and internalization (Gagné, Koestner, & Zuckerman, 2000; Williams et al., 2004).

Overall, there is evidence indicating that perceptions relating to autonomy support influence overt behavior and attitudes. Despite this, previous research has not examined the role of perceived autonomy support in the theory of planned behavior. The present study will fill this gap in the literature by examining the influences of perceived autonomy support on physical activity behavior within the theory of planned behavior.

### *Research hypotheses*

The present study examined four hypotheses related to the role of autonomy support within the theory of planned behavior. First, it was hypothesized that measures of subjective norms and perceived autonomy support would display discriminant validity ( $H_1$ ), for indicators of perceived autonomy support indicate form of social influence that is relatively free from social pressure whereas indicators of subjective norms indicate degrees to which people feel pressured by significant others. Second, it was hypothesized that results relating to the theory of planned behavior model would be consistent with previous research (Hagger et al., 2002), and suggest that subjective norms would predict intentions, albeit weakly ( $H_2$ ).

Third, it was hypothesized that the construct of perceived autonomy support would exert two types of indirect effects on physical activity behavior. The first indirect effect would be mediated by intentions only and it would be independent of attitudes ( $H_3$ ). This indirect effect reflects the partial internalization of physical activity behavior, which occurs in incomplete autonomy-supportive contexts where performance of behavior is independent from attitudes (Deci et al., 1994; Koestner et al., 1992). The second indirect effect would be mediated by attitudes and intentions ( $H_4$ ). This second indirect effect reflects the complete internalization of physical activity that is facilitated in complete autonomy-supportive contexts, because, according to Deci et al. (1994), complete internalization is evident when performance of behavior is dependent on attitudes. It is important to note that perceived autonomy support was hypothesized to predict physical activity behavior not directly but indirectly via intentions because, according to Deci and Ryan (1980), perceptions related to autonomy support affect social behavior through deliberative processes (Chaiken, 1980; Deci & Ryan, 1987; Fazio, 1990). Given that deliberative processes culminate in the formation of intentions (Gollwitzer, 1990), it was hypothesized that perceived autonomy support would influence physical activity behavior indirectly via intentions (Bargh, 1994).

Finally, the present study used measures of past behavior to control for effects that variables, not being taken into consideration by the theory of planned behavior, exert on intentions. As previously stated, the main effects from past behavior to intentions and behavior are considered to reflect effects from innumerable intentional antecedents that the theory of planned behavior does not take into consideration (Ajzen, 2002; Hagger et al., 2002). Therefore, in the present study past behavior serves the role of statistical control: the simultaneous estimation of the effects of past behavior and perceived autonomy support on attitudes and intentions enables estimation of effects of perceived autonomy support that are uncontaminated by third variables (Bagozzi, 1981).

## **Method**

### *Research participants and procedure*

Two hundred and ninety-one pupils ( $n = 73$ , male = 28, female = 45,  $M = 14.80$ ,  $SD = .61$ ), University students ( $n = 86$ , male = 31, female = 55,  $M = 20.10$ ,  $SD = .72$ ) and adults ( $n = 132$ , male = 50, female = 82,  $M = 34.21$ ,  $SD = 2.38$ ) with an age range of 13–39 years were initially

contacted. Pupils were recruited from schools while students were recruited from university campuses. Other adults were approached at their workplaces. Participants took 20 min to complete the questionnaires in small groups of fewer than 30 participants. A prospective design was employed. In the first wave of data collection, variables specified by the theory of planned behavior, past behavior and perceived autonomy support were assessed. After 5 weeks, participation in physical activities during leisure time was measured (Godin & Shephard, 1985). Prospective responses were matched with baseline responses using dates of birth and gender to match participants' responses. Response attrition was 19.24% (male = 25, female = 31,  $M = 27.62$  years,  $SD = 4.17$  years). However, a multivariate analysis of variance revealed that participants who participated in both waves of data collection did not differ from those who participated only in the first wave of data collection alone on attitudes, subjective norms, perceived behavioral control, intentions and past behavior ( $F = .98, p > .05$ ). The final sample consisted of 235 participants (male = 91, female = 144;  $M = 20.28$  years,  $SD = 6.59$  years). There were 70 pupils (male = 28, female = 42;  $M = 14.9$  years,  $SD = .61$  years), 63 university students (male = 23, female = 40;  $M = 20.01$  years,  $SD = .73$  years) and 102 adults (male = 46, female = 56;  $M = 26.51$  years,  $SD = 6.62$  years). Below we describe items used to measure psychological constructs. Pupils, university students and adults responded to the same set of items.

### *Measures*

#### *The theory of planned behavior and past behavior*

Development of a theory of planned behavior questionnaire followed the procedures recommended by Ajzen and Fishbein (1980), Ajzen and Madden (1986) and Courneya and McAuley (1994). Items measuring attitudes, subjective norms, perceived behavioral control and intentions are presented in Table 2. Four items drawn from Courneya and McAuley (1994) and Ajzen and Madden (1986) were used to measure behavioral intentions. Behavioral intentions were measured on scales anchored by “strongly agree” (7) to “strongly disagree” (1), “not at all” (1) to “every day” (7), “definitely no” (1) “definitely yes” (7) and on a scale allowing participants report the frequency with which (in days per week) they intended to participate in physical activities (I intend to do active sports and/or vigorous physical activity for at least 30 min–days per week...). Subjective norms were measured through two items, and on a 7-point scale ranging from “strongly disagree” (1) to “strongly agree” (7). Attitudes were assessed on 7-point semantic differential scales (Ajzen & Fishbein, 1980). Perceived behavioral control was assessed through three items on 7-point scales (Ajzen & Madden, 1986). Finally, past behavior was assessed on a 6-point scale, ranging from “not at all” (1) to “most of the days per week” (6) (Bagozzi, 1981).

#### *Perceived autonomy support*

Table 2 presents the items used to measure the perceived autonomy support construct. Perceived autonomy support was operationally defined as participants' perceptions about whether significant others (e.g., friends, family members, etc.) provided choice and rationale about physical activity as well as acknowledged personal perspectives and conveyed confidence in personal ability to exercise. The perceived autonomy support scale comprised 6 items, and it was adapted from the Health Care Climate questionnaire (Williams, Grow, Freedman,



Ryan, & Deci, 1996). The items yield a score on a 7-point Likert scale anchored by “strongly disagree” (1) and “strongly agree” (7).

#### *Self-report physical activity*

A modification of Godin and Shephard’s (1985) Leisure-Time Exercise Questionnaire, developed by Biddle, Goudas, and Page (1994), was used to assess leisure-time physical activity. This questionnaire asked how many days per week have participants been engaged in vigorous exercise for at least 30 min during the past 5 weeks’ rated on a 6-point scale, anchored by “not at all” (1) to “most of the days per week” (6). Independent evaluations of the Leisure-Time Exercise Questionnaire found it to be valid, reliable, easy to administer and to display concurrent validity with objective activities and fitness indexes (Jacobs, Ainsworth, Hartman, & Leon, 1993). In addition, previous research has shown that components of the theory of planned behavior predicted physical activity behavior that was measured through Godin and Shephard’s (1985) physical activity questionnaire (Biddle et al., 1994; Chatzisarantis & Biddle, 1998). It is important to stress that baseline measures corresponded with prospective measures of physical activity in action (physical activity), target (vigorous physical activity performed for at least 30 min 3 days per week), context (leisure time) and time (over the next 5 weeks; Ajzen & Fishbein, 1980). An exception was a perceived autonomy support item that corresponded with measures of behavior in action and context only (e.g., others who are important to me try to understand how I see active sports and/or vigorous physical activities during leisure time).

#### *Data analysis and model specification*

Confirmatory factor analyses and structural equation modeling were used to examine hypotheses (Bentler, 1989). The confirmatory factor analyses examined hypothesis 1 concerning discriminant validity between the constructs of perceived autonomy support and subjective norms by comparing two confirmatory models (Bagozzi, 1981). The first confirmatory model (Model 1) was a five-factor model and assumed that indicators of intentions, attitudes, perceived behavioral control, subjective norms and perceived autonomy support loaded to five different factors. Model 1 tested discriminant validity between perceived autonomy support and subjective norms because properties of that model assumed that indicators of perceived autonomy support and subjective norms loaded to different factors (Mulaik & Millsap, 2000). The second model (Model 2) was a four-factor model and assumed that while indicators of intentions, attitudes and perceived behavioral control belonged to three different factors, indicators of perceived autonomy support and subjective norms belonged to the same factor (Mulaik & Millsap, 2000). This Model 2 tested the hypothesis that measures of subjective norms and perceived autonomy support lacked discriminant validity because properties of Model 2 assumed that a single factor explained the covariance between subjective norms and perceived autonomy support. Results from the confirmatory factor analyses supported discriminant validity if (i) Model 1 explained the observed covariance matrix more satisfactorily than Model 2, and (ii) in Model 1, the confidence interval of the correlation between perceived autonomy support and subjective norms did not include unity (Bagozzi, 1981).

In addition, the present study specified a higher-order factor model (Model 3) that tested the assumption that a second-order factor would explain covariance between latent characteristics of

subjective norms and perceived autonomy support (Model 3). This is an important assumption to be rejected if the construct of perceived autonomy support does not measure a pressuring form of social influence. It could be suggested that subjective norms and perceived autonomy support measure different types of social influence if, in Model 3, loadings of the second-order factor were smaller than loadings of the first-order factors (Bagozzi, 1981). Parameters of all confirmatory models were estimated with the maximum likelihood method of estimation using the EQS statistical software (Bentler, 1989). In addition, all confirmatory models assumed zero cross-loadings and zero correlations at the residual space of the factors (Bentler, 1989).

The contributions of subjective norms ( $H_2$ ) and perceived autonomy support ( $H_3$  and  $H_4$ ) to the prediction of physical activity intentions and behavior were examined through structural equation modeling (Bentler, 1989). Hypothesis 2 concerning predictive validity of subjective norms was examined by specifying a model (Model 4) that had the same structure with the theory of planned behavior model. However, we fixed structural parameters of Model 4 to values that were estimated in Hagger et al.'s (2002) meta-analysis in order to examine consistency of results of the present study with previous research (Mulaik & Millsap, 2000). Hypothesis 2 was supported if Model 4 explained observations satisfactorily and the effects of subjective norms on intentions were small in comparison to effects exhibited by attitudes and perceived behavioral control.

Hypotheses 3 and 4 concerning indirect effects of perceived autonomy support on physical activity behavior via intentions and attitudes were evaluated by comparing three competing models (Models 5, 6 and 7). Model 5 had a similar structure to Model 4 but (i) fixed the path from intentions to behavior at a zero value and (ii) specified direct effects from perceived autonomy support to physical activity behavior (see Fig. 1a). Model 5 tested the hypothesis that perceived autonomy support exerted direct but not indirect effects on physical activity behavior via intentions or attitudes. Model 5 is a baseline model that should be rejected if intentions and attitudes completely mediate the effects of perceived autonomy support on physical activity behavior (Baron & Kenny, 1986). Model 6 had the same structure to Model 5 but introduced paths from (i) perceived autonomy support to intentions and attitudes, (ii) from intentions to behavior and (iii) eliminated the direct path from perceived autonomy support to behavior. Model 6 tested the hypotheses 3 and 4 that perceived autonomy support exerted only indirect effects and no direct effect on physical activity behavior via attitudes and intentions (see Fig. 1b). Hypotheses 3 and 4 can be accepted if (i) Model 6 displays better fit than Model 5 and (ii) the indirect effects of perceived autonomy support on physical activity via intentions and attitudes are statistically significant (Baron & Kenny, 1986). Moreover, Model 7 had the same structure as Model 6 but re-introduced the direct effects from perceived autonomy support to behavior (see Fig. 1c). Model 7 tested the hypothesis that perceived autonomy support exerted both direct and indirect effects on physical activity behavior. In Model 7, the direct effects of perceived autonomy support on physical activity behavior should not be statistically significant if perceived autonomy support exerts indirect effects alone on physical activity behavior via intentions (Baron & Kenny, 1986). Finally, we estimated effects of past behavior by specifying a model (Model 8) that had the same structure as Model 7 but estimated effects from past behavior to attitudes, subjective norms, perceived control, intentions and physical activity behavior (see Fig. 1d). Specification of past behavior effects enable estimation of effects of perceived autonomy support that are uncontaminated by third variables because past behavior reflects effects from unmeasured antecedents, not being accounted for by the theory of planned behavior (Ajzen, 2002).



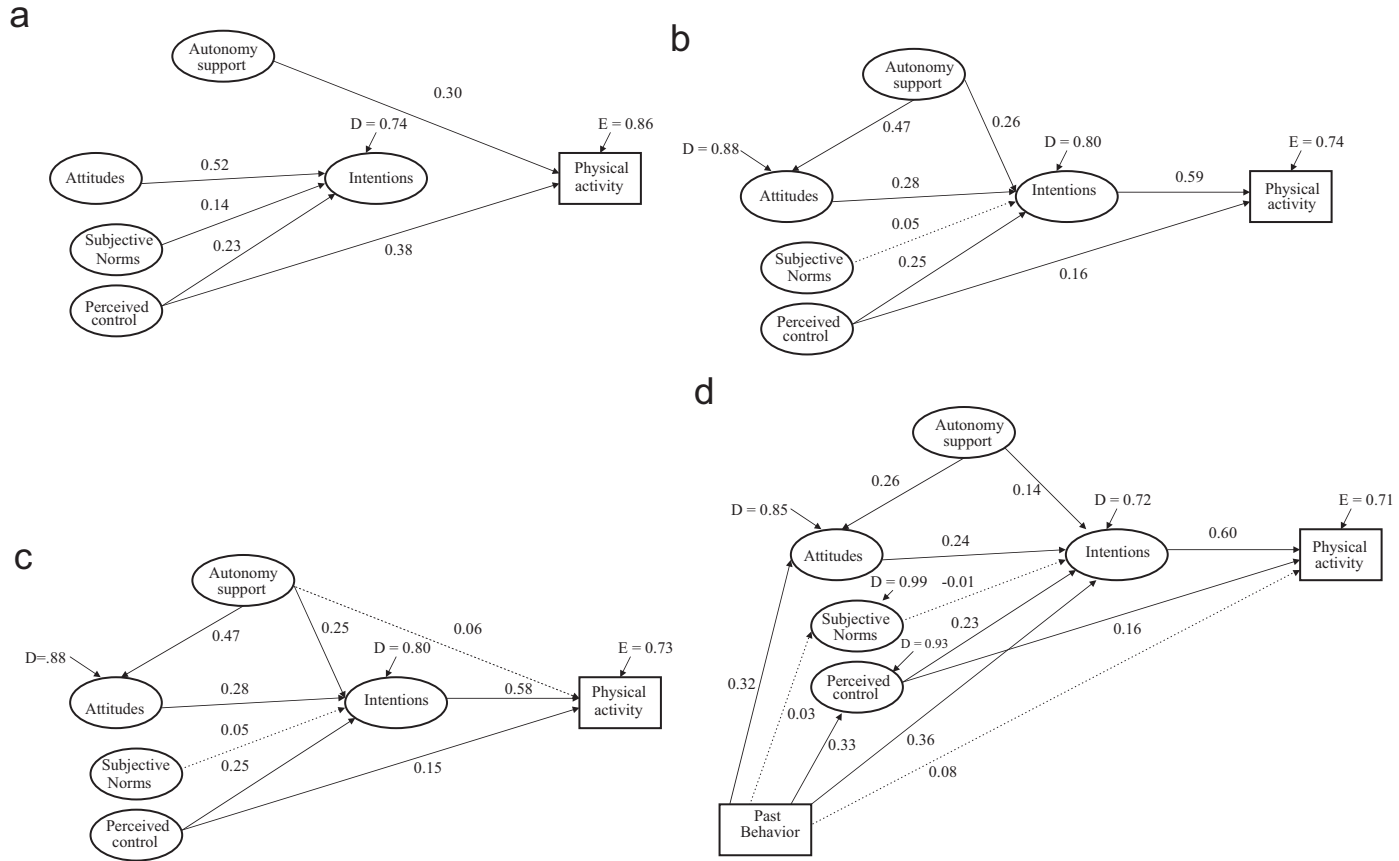


Fig. 1. (a) An unmediated structural equation model (Model 5) specifying direct effects of perceived autonomy support on physical activity behavior. (b) A fully mediated structural equation model (Model 6) specifying indirect effects of perceived autonomy support on physical activity behavior via attitudes and intentions. (c) A partially mediated structural equation model (Model 7) specifying direct and indirect effects of perceived autonomy support on physical activity behavior via attitudes and intentions. (d) A structural equation model (Model 8) specifying relationships among the Theory of Planned Behavior variables, perceived autonomy support and past behavior. *Note.* Dashed arrows indicate not statistically significant paths. In (d), Model 8 also estimates the correlation between past behavior and autonomy support ( $r = .34, p < .05$ ).

### *Assessment of model fit*

We used Comparative Fit Index (CFI) and Standardized Root Mean Square Residual (SRMSR) as a means of evaluating model fit because previous research has shown that these fit indices displayed restricted random variation under various conditions of model misspecification, sample size and estimation methods (Fan, Thompson, & Wang, 1999). A cutoff value close to .95 for the CFI and a cut off value close to .08 for the SRMSR were used to evaluate the adequacy of models because the Type I and Type II error rates associated with these criteria are low (Hu & Bentler, 1999). Akaike's Information Criterion (AIC; Akaike, 1987) was utilized to compare models. When used for model comparisons, the model that obtains the lowest AIC is considered to demonstrate the best fit. We also used Friedman's test of ranked residuals to compare confirmatory Models 1 and 2 (Ridgon, 1999). The Friedman's test treats residuals of confirmatory models as scores and compares these residuals across competing models. Friedman's method was used because it is relatively independent of sample size, it is resistant to overparameterization, and it performs well when assumptions of normal distribution and of independence are violated (Ridgon, 1999).

## **Results**

### *Discriminant validity between subjective norms and perceived autonomy support*

The fit indexes presented in Table 1 showed that Model 1 exceeded recent criteria of good fit whereas this did not hold for Models 2 and 3. In addition, the AIC of Model 1 was much lower than that of Models 2 and 3. This suggests that Model 1, which assumed that perceived autonomy support and subjective norms were distinct concepts, explained observations more satisfactorily than Models 2 and 3.<sup>1</sup> Likewise, the Friedman's test pointed out that the residuals of Model 1 were lower than the residuals of Model 2 ( $\chi^2 = 4.86$ ,  $p_{\text{asympt}} = .04$ ) and of Model 3 ( $\chi^2 = 5.14$ ,  $p_{\text{asympt}} = .02$ ). This also supports the conclusion that properties of Model 1 explained observations more satisfactorily than the properties of Models 2 and 3.

Examination of parameters of Model 1 (see Table 2) showed that loadings of indicators of all constructs were significant, positive and surpassed the widely accepted minimum of .40 (Ford, McCallum, & Tait, 1986). The average magnitude of the standardized loadings for the perceived autonomy support factor was .66. In direct contrast, the average magnitude of the standardized loadings for the second-order factor model (Model 3) was .44, which is below the average magnitude of standardized loadings of the first-order factor model. Finally, Model 1 showed that the correlation corrected for attenuation between perceived autonomy support and subjective norms was medium and positive ( $r = .30$ ,  $p < .05$ ), and the confidence interval of this correlation did not include unity (confidence interval = [.17: .30: .45]; Bagozzi, 1981). Overall, these findings support discriminant validity between perceived autonomy support and subjective norms ( $H_1$ )

<sup>1</sup>An alternative model that hypothesized a perfect correlation ( $r = 1.00$ ) between perceived autonomy support and subjective norms displayed worst fit than Model 1 ( $\chi^2 = 477.59$ ; CFI = .85, SRMSR = .15, AIC = 145.59; Anderson & Gerbin, 1988).

Table 1  
Fit indexes for competing models

	$\chi^2$ (df)	CFI	SRMSR	AIC
Model 1: Five-factor model	213.61 (160)	.96	.05	−106.39
Model 2: Subjective norms and autonomy support loading onto the same factor (four-factor model)	398.67 (164)	.93	.06	70.67
Model 3: Second-order factor model	399.14 (164)	.91	.07	71.14
Model 4: The theory of planned behavior	158.21 (88)	.97	.07	−17.79
Model 5: A non-mediated model testing direct effects from perceived autonomy support to physical activity behavior	420.49 (183)	.90	.16	54.49
Model 6: A fully mediated model testing indirect effects of perceived autonomy support to physical activity behavior via intentions and attitudes	290.45 (182)	.96	.08	−71.54
Model 7: A partially mediated model testing direct and indirect effects of perceived autonomy support on physical activity behavior via attitudes and intentions	280.39 (181)	.96	.06	−81.61
Model 8: A model estimating past behavior effects	328.76 (217)	.94	.063	−105.24

*Note:* In Models 1 and 2, variances of factors were fixed at 1.0 (Bentler, 1989), cross-loadings and residual correlations were fixed to zero. In Model 3, the variance of second-order factor was fixed to one, cross-loadings and correlations between residuals and disturbances were fixed to zero. Loadings and disturbances of the second-order factor were assumed to be equal so that the structure of the second-order factor could be identified (Bentler, 1989).

(Mulaik & Millsap, 2000). Finally, the loadings of the second-order factor model indicate that perceived autonomy support and subjective norms do not measure forms of social influence that belong to the same conceptual domain. Hence, perceived autonomy support does not measure social pressure.<sup>2</sup>

*Descriptive statistics and correlations*

Table 3 presents descriptive statistics for the psychological measures, and as indicated, all measures attained satisfactory levels of internal consistency given that  $\alpha$  coefficients were greater or equal to .70. Correlations corrected for attenuation pointed out that behavioral intentions were positively associated with attitudes, perceptions of control and subjective norms (see Table 3). Physical activity behavior was also positively correlated with behavioral intentions, perceived control, and measures of perceived autonomy support. Finally, correlations indicated that while perceived autonomy support was associated with attitudes, the relationship between subjective norms and attitudes was not statistically significant.

<sup>2</sup>Before conducting structural equation analysis, we examined the discriminant validity between perceived autonomy support and attitudes in order to rule out the possibility that these constructs are empirically identical. Discriminant validity was examined by comparing Model 1 to an alternative model, which assumed that attitudes and perceived autonomy support belonged to the same factor. Results from this analysis supported discriminant validity between perceived autonomy support and attitudes. This is because (i) the fit of the alternative model did not exceed recent criteria of good fit ( $\chi^2 = 656.07, p < .005; CFI = .76; SRMSR = .15$ ) and (ii) the AIC of the alternative model was much greater (AIC = 318.00) than the AIC of Model 1.

Table 2  
Loadings and residual variances of psychological variables

Item	$\lambda$	$E$
<i>Intentions</i>		
I intend to do active sports.... (strongly agree–strongly disagree)	.90	.44
I intend to do active sports.... (definitely no–definitely yes)	.92	.40
I intend to do active sports.... with the following regularity (not at all–every day)	.84	.52
I intend to do active sports and/or vigorous physical activity for at least 30 min–days....	.91	.35
<i>Perceived behavioral control</i>		
How much control do you have...	.90	.56
If I wanted to I could....	.70	.67
I feel in complete control over whether I....	.85	.52
<i>Attitude</i>		
Enjoyable/unenjoyable	.77	.63
Bad/good	.88	.46
Useless/useful	.65	.78
Boring/interesting	.57	.83
Harmful/beneficial	.57	.84
<i>Subjective norms</i>		
Significant others think that I should do....	.97	.11
Significant others pressure me to do....	.44	.88
<i>Perceived autonomy support</i>		
Significant others provide me with choice and options...	.56	.86
Significant others understand my choices...	.52	.86
Significant others convey confidence in my ability to....	.68	.71
Significant others encourage me to ask questions...	.70	.76
Significant others listen to how I would like to do....	.79	.60
Significant others try to understand how I see active sports and/or physical activities....	.70	.72

Note: The symbol  $\lambda$  denotes factor loadings and the symbol  $E$  denotes residual variances of indicators of factors. All coefficients are statistically significant at .05  $\alpha$  level.

Table 3  
Descriptive statistics and correlations corrected for attenuation

	$M$	$SD$	$\alpha$	1	2	3	4	5	6	7
1. Physical activity	3.38	1.35	—	1.0						
2. Intentions	4.50	1.75	.93	.68*	1.0					
3. Attitudes	5.52	1.42	.82	.45*	.50*	1.0				
4. Perceived control	5.34	1.34	.83	.44*	.44*	.31*	1.0			
5. Subjective norms	4.07	1.51	.70	.11	.11*	.09	−.04	1.0		
6. Autonomy support	4.38	1.09	.82	.34*	.38*	.37*	.18*	.31*	1.0	
7. Past behavior	2.90	1.88	—	.48*	.57*	.39*	.36*	.13	.34*	1.0

Note: \* $p < .05$ .

*The indirect effects of perceived autonomy support on physical activity behavior*

The CFI and SRMSR of the theory of planned behavior model (Model 4) satisfied recent criteria of acceptable fit (see Table 1). In accordance with hypothesis 2, parameters of Model 4 showed that the effects of subjective norms on intentions were smaller ( $\beta = .07, p > .05$ ) than the effects of attitudes ( $\beta = .40, p < .05$ ) and perceived behavioral control ( $\beta = .33, p < .05$ ). Considering that the structural parameters of Model 4 were set to be equal to structural parameters estimated within Hagger et al.'s (2002) meta-analysis, the fit of Model 4 indicated a level of consistency between results of the present study and results from previous research applications of the theory of planned behavior. Therefore, it can be suggested that the measurement tools employed within the present study, facilitated accurate predictions given that results are very much in line with previous applications of the theory of planned behavior in the context of physical activity (Hagger et al., 2002).

The SRMSR and the CFI of Model 5, the unmediated model that specified direct effects of perceived autonomy support on physical activity behavior (Model 5), did not exceed recent criteria of acceptable fit (see Table 1; Hu & Bentler, 1999). In contrast, Model 6, the fully mediated model that specified indirect effects from perceived autonomy support to behavior via intentions and attitudes, displayed better fit than Model 5 (see Table 1). In accordance with hypotheses 3 and 4, parameters of Model 6 also supported statistically significant indirect effects of perceived autonomy support on physical activity behavior via intentions ( $\beta = .15, p < .05$ ) and attitudes ( $\beta = .08, p < .05$ ). Most important, perceived autonomy explained an additional 3% of the variance on intentions improving predictive validity of the theory of planned behavior model from 32% to 35% ( $\Delta F = 26.84, p < .05$ ).

Finally, while Model 7, the partially mediated model that specified direct and indirect effects of perceived autonomy support on physical activity behavior, exceeded recent criteria of good fit (Hu & Bentler, 1999), parameters of the model did not support direct effects of perceived autonomy support on physical activity behavior. Interestingly, comparison of parameters of Models 5, 6 and 7 satisfied Baron and Kenny's (1986) criteria of complete mediation. This is because while the direct effect of perceived autonomy support on physical activity behavior was statistically significant in Model 5 (see Fig. 1a), the same direct effect was not statistically significant in Model 7 after specifying the indirect effects of perceived autonomy support via attitudes and intentions (see Fig. 1c).<sup>3</sup>

Turning now into the effects of past behavior, it can be seen in Table 1 that although Model 8, the model that specified effects from past behavior to attitudes, perceived behavioral control, subjective norms, intentions and behavior, did not exceed recent criteria of good fit, it was

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<sup>3</sup>Additional hierarchical regression analysis supported statistically significant effects of perceived autonomy support across different age groups and gender. Specifically, the effects of perceived autonomy support on intentions were statistically significant for pupils ( $\beta = .31, p < .05$ ), university students ( $\beta = .23, p < .05$ ), adults ( $\beta = .25, p < .05$ ), males ( $\beta = .19, p < .05$ ) and females ( $\beta = .26, p < .05$ ) after controlling for the effects of past behavior and the theory of planned behavior. In addition, the effects of perceived autonomy support on attitudes were statistically significant for pupils ( $\beta = .28, p < .05$ ), university students ( $\beta = .22, p < .05$ ), adults ( $\beta = .18, p < .05$ ), males ( $\beta = .34, p < .05$ ) and females ( $\beta = .18, p < .05$ ) after controlling for past behavior. We did not conduct multiple-group structural equation analysis to examine invariance of perceived autonomy support effects across different age groups because the sample size underlying each age group was not sufficient.



provisionally accepted as a correctly specified model. This is because when the sample size comprises less than 250 observations, as is the case with the present study, fit indexes display downward bias and random variation (Fan et al., 1999). Further, Hu and Bentler (1999) derived criteria from a simulation of a three-factor confirmatory model that comprised 15 indicators. In the present study, Model 8 is a more complex model; it comprises 23 indicators and five factors. Consequently, deviations from the .95 criterion should be expected.

Fig. 1d presents structural parameters of Model 8. Consistent with assumptions underling the theory of planned behavior (Ajzen & Madden, 1986), Model 8 indicated that attitudes ( $\beta = .14$ ,  $p < .05$ ) and perceived behavioral control ( $\beta = .14$ ,  $p < .05$ ) exhibited indirect relationships with physical activity behavior via intentions. Subjective norms did not exert an indirect effect on behavior ( $\beta = -.01$ ,  $p < .10$ ). In addition, Model 8 supported a direct relationship from perceived behavioral control to physical activity, and from past behavior, attitudes, and perceived control to intentions (see Fig. 1d). Finally, past behavior did not reduce the effects of perceived autonomy support on physical activity behavior. The total indirect effect of perceived autonomy support on physical activity behavior via attitudes and intentions was statistically significant ( $\beta = .21$ ,  $p < .05$ ) after controlling for past behavior effects.<sup>4</sup>

## Discussion

The purpose of the present study was to examine the influences of perceived autonomy support on physical activity intentions and behavior within the theory of planned behavior. Results demonstrated that measures of perceived autonomy support and subjective norms possessed discriminant validity, and that perceived autonomy support contributed to the prediction of physical activity intentions. Therefore, results from the present study supported inclusion of the construct of perceived autonomy support within the theory of planned behavior.

### *The relationship between subjective norms and perceived autonomy support*

The confirmatory factor analysis indicated that the perceived autonomy support and subjective norms latent constructs possessed discriminant validity. This is because a model that assumed discriminant validity between subjective norms and perceived autonomy support (Model 1) explained observations more satisfactorily than a model that assumed lack of discriminant validity (Model 2). Further, Model 3 showed that perceived autonomy support and subjective norms measured different types of interpersonal context, for loadings of a second-order factor were smaller than loadings of the first-order factors. These results are consistent with our initial hypothesis that postulated that perceived autonomy support and subjective norms measure different types of social influence (Deci et al., 1994). According to self-determination theory, perceived autonomy support assumes an interpersonal context that is relatively free from social pressure. This is likely because indicators of perceived autonomy support assess the degree to

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<sup>4</sup>Hierarchical regression analysis revealed that the interactions between perceived autonomy support and attitudes (perceived autonomy support  $\times$  attitudes) did not predict intentions ( $\Delta F = .61$ ,  $p > .05$ ) or physical activity behavior ( $\Delta F = 1.07$ ,  $p > .05$ ). In addition, the interaction between perceived autonomy support and intentions (perceived autonomy support  $\times$  intentions) did not predict physical activity behavior either ( $\Delta F = .83$ ,  $p > .05$ ).

which people are provided with choices (Deci et al., 1994). In contrast, the construct of subjective norms measures social pressure. This is because indicators of subjective norms tap the extent to which people perceive that significant others pressure them to engage in physical activity. Therefore, a conclusion that emerges from the confirmatory factor analysis is that perceived autonomy support and subjective norms measure seemingly different types of interpersonal context, and, for this reason, it may be important to include measures of perceived autonomy support within the theory of planned behavior.

Although the confirmatory factor analysis supported discriminant validity between perceived autonomy support and subjective norms, the correlation between these constructs was positive and statistically significant. This positive correlation may seem to be inconsistent with our hypothesis that autonomy-supportive contexts are relatively free from social pressure. There may be two reasons explaining this positive correlation. First, although a function of *acknowledgment of conflict*, which is an indicator of perceived autonomy support, is to reduce pressure associated with performance of behavior, there is evidence to suggest that provision of choice, which is another indicator of perceived autonomy-supportive contexts, enhances pressure (Festinger & Carlsmith, 1959). Therefore, although a product of autonomy supportive contexts is concerned with reduction of pressure associated with behavioral performance, still these contexts may be relatively, but not totally, free from social pressure. Second, the correlation between perceived autonomy support and subjective norms may reflect common method variance given that both constructs target significant others as a source of social influence.

#### *Perceived autonomy support and the theory of planned behavior*

In accordance with the second hypothesis, parameters of Model 4 revealed that the effect of subjective norms on physical activity intentions was small and not statistically significant. These results compare favorably with previous physical activity research, which also pointed out small relationships between subjective norms and intentions (Hagger et al., 2002). In contrast, in accordance with hypotheses 3 and 4, Models 5 and 6 indicated that perceived autonomy support predicted behavior in two different ways. The first process was mediated by intentions and it was independent from the effects that attitudes, perceptions of control and past behavior exerted on physical activity intentions and behavior. This direct effect also supported the conclusion that perceived autonomy support can compensate for effects that unfavorable attitudes, unfavorable past experiences with physical activity behavior and incomplete control over physical activity exert on intentions. The second process through which perceived autonomy support influenced physical activity behavior was mediated by attitudes and intentions. This indirect effect from perceived autonomy support to intentions also implies that stronger intentions to exercise ensue from attitudes that, in part, develop when significant others are perceived to provide choice. Notably, the construct of subjective norms did not identify the influences that social factors exerted on attitudes given that the correlation between subjective norms and attitudes was not statistically significant (see Table 2). Therefore, a conclusion that emerges from the present findings is that the construct of perceived autonomy support helps identify the influences that significant others exert on intentions, and, consequently, it may be worthwhile to include this construct within the theory of planned behavior.

Although the present study confirmed indirect effects of perceived autonomy support on physical activity behavior via attitudes and intentions, the design of our study does not enable us understand these effects more thoroughly. Specifically, the design of our study does not allow us to investigate whether the indirect effects of perceived autonomy support via attitudes and intentions are due to “complete” and “incomplete” autonomy support, respectively. This is because our study was not experimental and consequently it could not differentiate between complete and incomplete autonomy-supportive contexts. Therefore, it is very important for future experimental studies to extend results of the present study by investigating the effects of complete and incomplete autonomy support on attitudes, intentions and behavior (see Deci et al., 1994).

Despite this, the findings concerning effects of perceived autonomy support on intentions raise a number of interesting issues. Previous applications of the theory of planned behavior have focused primarily on the effects that pressuring forms of social influence exerted on intentions. For example, previous research has pointed out that descriptive norms, a construct that indicates perceived social pressure (Fishbein, 1993), predicted intentions (Grube et al., 1986). The present study showed that perceived autonomy support, a construct that measures non-pressuring forms of social influence, predicted intentions. The present results, therefore, suggest that it may be fruitful to consider both pressuring and non-pressuring forms of social influence within the theory of planned behavior given that perceived autonomy support, a social influence construct that indicates an interpersonal context that is relatively free from social pressure (Deci et al., 1994), predicted intentions.

### *Limitations and conclusions*

Although the present study has demonstrated independent predictive effects for measures of perceived autonomy support within the theory of planned behavior, the design does not permit comparison of the effects that perceived autonomy support exerts on intentions with effects that other social influence constructs exert on intentions (i.e., social support, group identification, group attitudes). Previous research has shown that social support, a construct that indicates the extent to which significant others are perceived to assist performance of behavior, influences physical activity (Courneya et al., 2000). Further, tangible forms of social support have been shown to influence intentions directly and indirectly via perceived behavioral control (Rhodes, Jones, & Courneya, 2002). Moreover, it is important to acknowledge that our measures of subjective norms are not optimal given that they did not include indicators of perceived approval from others (Ajzen & Fishbein, 1980) and/or of descriptive norms (Grube et al., 1986; Rhodes et al., 2002). Therefore, future studies might usefully compare effects of perceived autonomy support with other social influence constructs (e.g., motivation to comply, perceived approval, social support, descriptive norms, tangible support). This would allow one to look for similarities between perceived autonomy support and other social influence constructs.

In conclusion, the present study contributes to the resolution of problems surrounding the lack of prediction exhibited by the subjective norms variable in the theory of planned behavior by introducing perceived autonomy support. Findings support the notion that people’s attitudes toward physical activity and intentions can be based upon their perception that the context is one that supports free choice and autonomy. The present study also underlines the need for health

practitioners and others concerned with promotion of physical activity not to impose their own understandings to people, but to base policy and interventions on people's existing perspectives, practices and understandings of physical activity.

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