Psychology of Sport and Exercise 10 (2009) 52–60

Contents lists available at ScienceDirect

Psychology of Sport and Exercise

journal homepage: www.elsevier.com/locate/psychsport

# Perceived autonomy support, behavioural regulations in physical education and physical activity intention

B. S. Coral Lim, C. K. John Wang*

*National Institute of Education, Nanyang Technological University, Blk 5 #03-20, 1 Nanyang Walk, Singapore 637616*

ARTICLE INFO

*Article history:*
Received 14 December 2007
Received in revised form 28 May 2008
Accepted 6 June 2008
Available online 13 June 2008

*Keywords:*
Physical education
Self-determination theory
Perceived autonomy support
Behavioural regulations
Physical activity intention

ABSTRACT

*Objectives:* The purpose of this study was to examine the relationships between students' perceived autonomy support, behavioural regulations and their intentions to be physically active outside of school.

*Method:* Participants were 701 secondary school students aged between 13 and 17 years from Singapore. Questionnaires were used to assess perceived autonomy support, behavioural regulation, and intentions to be physically active outside school.

*Results:* Results supported the hypothesised model in that perceived autonomy support fosters more self-determined forms of behavioural regulations in PE. These forms of behavioural regulations in turn, enhanced more autonomous forms of intentions. The results also yielded an interesting finding that amotivation positively predicted students' intention to be physically active outside school.

*Conclusion:* The findings highlight the importance of perceived autonomy support in fostering more self-determined forms of behavioural regulations in PE and intention to be physically active outside school.



## Introduction

One of the most important aims of PE in school was to promote regular physical activity participation among students. Although the benefits of regular physical activity participation have been widely studied and there is strong evidence to suggest that regular physical activity has important health benefits, such as cardiovascular fitness, psychological health, skeletal health and body composition (e.g., Biddle, Sallis, & Cavill, 1998; Watts, Jones, Davis, & Green, 2005), young people in many countries are consistently reporting low levels of physical activity (Armstrong, 1989; Dishman, 1994; Wang, Chia, Quek, & Liu, 2006).

According to Sallis and McKenzie (1991), positive experiences in PE can influence young people to adopt physically active adult lifestyles which can improve public health. Taylor, Blair, Cummings, Wun, and Malina (1999) echoed similar findings and argued that adolescents' inactivity or negative experiences with physical activities track into adulthood and greatly impede the probability of them becoming physically active adults. Similarly, Shephard and Trudeau (2000) suggested that a physically active lifestyle in adulthood may originate from an active lifestyle in one's adolescent years. Given research findings that argue about the greater likelihood of an active adolescent to become an active adult (e.g., Ntoumanis, 2005; Shephard & Trudeau, 2000), and that one major measure of the ultimate success of PE hinges on the ability of PE teachers to increase the participation rate of young people in physical activities, it is thus pertinent and important to understand the motivational, cognitive and affective processes of adolescents in PE. The purpose of this study was to examine the relationships between students' perceived autonomy support, behavioural regulations and their intentions to be physically active outside of school.

A useful theory in understanding the motivational, cognitive and affective processes of adolescents in PE is self-determination theory (SDT; Deci & Ryan, 1985, 1991, 2000). This theoretical approach has been successfully applied to the context of education (e.g., Ryan & Deci, 2006; Vallerand, Fortier, & Guay, 1997) and sport (e.g., Hollembeak & Amorose, 2005; Thogersen-Ntoumani & Ntoumanis, 2006). Nonetheless, research adopting the SDT approach to understanding motivation in PE is scarce (Hagger, Chatzisarantis, Culverhouse, & Biddle, 2003).

The SDT proposes that human beings have innate psychological needs for autonomy, competence and relatedness. Intrapersonal and interpersonal contexts that support the satisfaction of these needs will promote a person's enjoyment of activities and the autonomous self-regulation of behaviours. According to Gagne (2003), people are more likely to be intrinsically motivated, that is, to do an activity simply for the enjoyment they derive from it, when they can freely choose to pursue an activity (autonomy/choice),

* Corresponding author. Physical Education and Sports Science, National Institute of Education, Nanyang Technological University, Blk 5 #03-20, 1 Nanyang Walk, Singapore 637616. Tel.: +65 67 903 702; fax: +65 68 969 260.
*E-mail address:* john.wang@nie.edu.sg (C.K.J. Wang).

1469-0292/$ – see front matter © 2008 Elsevier Ltd. All rights reserved.
doi:10.1016/j.psychsport.2008.06.003

when they master the activity (competence) and when they feel connected and supported by important people, such as a manager, a parent, a teacher or teammates (relatedness).

In SDT, motivation for engaging in a task can be described by three distinct motivational states – amotivation, extrinsic motivation, and intrinsic motivation (Deci & Ryan, 1985). Extrinsically motivated behaviours are further characterised by four types of regulation: external regulation, introjected regulation, identified regulation and integrated regulation.

External regulation occurs when behaviour is regulated through external means such as rewards and constraints (Pelletier, Fortier, Vallerand, & Brière, 2001). For example, an individual may participate in an activity because he/she feels compelled to do so by a significant other or fears punitive measures for failure to adhere to the activity/behaviour. Introjected regulation represents the first form of internalisation. According to Ryan (1993), internalisation refers to the process by which external regulations (linked to extrinsic incentives) are transformed into regulations by the self, that is, becoming more self-determined. Although introjected regulation is a form of motivation that comes from within, it is not fully self-determined. The internalisation is only partial, as the external regulatory process is taken in but not accepted as one's own (Williams & Deci, 1996). Introjection-based behaviours are performed to avoid guilt and shame or to gain ego enhancements and feelings of worth (Deci & Ryan, 2002). For example, an individual may take part in PE because he/she would feel bad about himself/herself if he/she did not.

In contrast, identified regulation is more autonomous or self-determined (Deci & Ryan, 1991). The behaviour is valued and perceived as being chosen out of one's own volition. The motivation is extrinsic because the activity is not performed for itself, for pleasure or satisfaction, but instead, as a means to an end (e.g., achievement of personal goals). Nevertheless, the behaviour is self-determined because the individual has decided that the activity is beneficial and important, and thus chooses freely to perform it. In this case, the person experiences a sense of direction and purpose, instead of obligation and pressure, in performing the activity. For example, one may take part in PE because he/she wants to improve his/her sport skills.

Deci and Ryan (2002) describe integrated regulation as the basis for the most autonomous form of extrinsically motivated behaviour. Integrated regulation refers to behaviours that result when identifications have been evaluated and brought into congruence with personally endorsed values, goals and needs that are already part of the self. For instance, one may participate in PE because he/she knows that it is very important for him/her to have a healthy lifestyle. Integrated extrinsic motivation shares many qualities with intrinsic motivation but is still considered extrinsic because the behaviours are done in order to attain personally important outcomes rather than for the inherent interest and enjoyment in the activity. Notwithstanding this, Vallerand (1997) suggested that integrated regulation is more often encountered in adults than in children as the range of behaviours that can be assimilated to the self increases over time with increased cognitive capacities and ego development (Loevinger & Blasi, 1991).

According to Deci and Ryan (1991), intrinsically motivated behaviours can occur without external rewards (e.g., prizes), are engaged in for their own sake, that is, for the pleasure, fun, and satisfaction derived from participation itself, and are optimally challenging. Activities that lead the individual to experience these feelings are intrinsically rewarding and are likely to be performed again.

The three motivational states are ordered along a self-determination continuum and movement along this continuum is in part governed by internalising motives for participating (Prusak, Treasure, Darst, & Pangrazi, 2004). The SDT further proposes that as one's motivational state moves towards intrinsic motivation, deeper understanding, increased participation, persistence or effort, and more positive attitude will result (e.g., Reeve, 2002; Vansteenkiste, Simons, Lens, Soenens, & Matos, 2005). High levels of intrinsic motivation in PE are desirable because this will mean that students will participate for reasons not limited to the influence of the setting, that is, they will be more likely to become physically active on their own.

Vallerand (1997) proposed a comprehensive model of motivational sequence which posits that the different motivational types are influenced by a number of social factors. The influence of these social factors is exerted through the satisfaction of the basic psychological needs of competence, autonomy and/or relatedness. The model predicts that the different types of motivation will lead to important cognitive, affective and behavioural consequences.

Vallerand (2001) further presented evidence that self-determined behaviours occur at different levels of generality – situational, contextual and global. In PE settings, situational context refers to how the student feels about that particular PE lesson. The contextual level reflects the attitude of the students to PE in general. The global context or global dispositions, refer to life traits (e.g., attitudes, beliefs, perceptions) that are most stable and enduring as they guide adult behaviours. He found that consistent and repetitive occurrences of increased self-determined behaviour in a lower level of generality will change that at a higher level. This has significant implications for PE teachers – increased self-determined behaviour at the situational level leads to that in the contextual level and ultimately shapes the global dispositions of the students, thereby fostering physically active adults.

As mentioned earlier, research adopting the SDT approach to understanding motivation in PE is scarce (Hagger et al., 2003). However, the same cannot be said of SDT research in the educational settings. Reeve (2002) presented a summary table of studies that examined motivation in the educational settings using the SDT. He concluded based on two decades of empirical work that autonomously motivated students thrived in educational settings and that students benefited when teachers supported their autonomy. He highlighted the significance of looking into students' needs for autonomy support, especially in the context of PE where SDT research evidence is lacking.

In PE, a teacher who provides choice of behaviours and tasks, hence encouraging autonomy, reduces controlling pressures for uniform behaviour and enhances motivation (Blanchard & Vallerand, 1996; Vallerand & Losier, 1999). Nonetheless, instead of looking at motivation as a unitary phenomenon or combine to a single index called Relative Autonomy Index (Ryan & Deci, 2000), Chatzisarantis et al. (Chatzisarantis, Hagger, Biddle, Smith, & Wang, 2003) argued that different types of behavioural regulations reflect qualitatively different reasons for the behaviour chosen. Assessing each behavioural regulation separately may provide further insight into how adolescents differ in their motivational profiles (Wang & Biddle, 2001; Wang, Chatzisarantis, Spray, & Biddle, 2002).

According to the theory of planned behaviour (Ajzen, 1991), people's overt statement of intention is the strongest predictor of behaviour. Hagger et al. (2003) proposed that intention summarised a person's general affective and cognitive orientation towards the behaviour (attitude), the perceived pressure placed on them by significant others to participate in the target behaviour (subjective norm), and their competence-related evaluation of their faculties and capacities towards the behaviour (perceived behavioural control). As such, more self-determined forms of behavioural regulations (which effect more positive consequences or adaptive outcomes) are more likely to enhance stronger intentions from a person.

The purpose of this study was to examine the relationships between students' perceived autonomy support, behavioural

regulations and their intentions to be physically active outside of school. Based on the SDT framework, we hypothesised that:

a. Perceived autonomy support will predict intrinsic motivation and identified regulation positively, and predict introjected regulation, external regulation and amotivation negatively.
b. Intention will be positively predicted by intrinsic motivation and identified regulation while negatively predicted by external regulation and amotivation. In view of findings by Vallerand et al. (1992) and Pelletier et al. (1995), intention is not expected to be predicted by introjected regulation.

## Methods

### *Participants and procedure*

Responses were obtained from 701 students (325 males, 354 females, 22 did not specify their gender) aged between 13 and 17 years ($M = 15$, $SD = 1.45$) from four different coeducational secondary schools. One intact class was randomly selected for each level in the four schools (from Secondary 1 to Secondary 5) to minimise potential disruption to the school curricular. This particular age group was chosen because research (e.g., Sallis, 2000) showed that physical activity declined with age, with the steepest decline occurring between the ages of 13 and 18 years and the majority of secondary schoolchildren fall within the ages 13–17 years.

Firstly, ethical clearance was obtained from the university's ethical review board. Next, the Ministry of Education and schools' permission to gather research data were sought. Arrangements were made with the contact persons from the schools for administration of the questionnaire. One researcher conducted the data collection in quiet classroom conditions, following a standard protocol/standard set of instructions. Prior to data collection, the students were briefed on the purpose of the questionnaire. In addition, it was emphasised to the students that there were not any right or wrong responses and that they should answer honestly regarding their feelings towards PE. The participants were also be given the option to withdraw from the study at any point in time without negative repercussions. The questionnaires were completed anonymously to protect the confidentiality of the students.

### *Measures*

#### *Perceived autonomy support in PE*

According to Deci and Ryan (1987), perceived autonomy support is the degree to which people perceive others in positions of authority to be autonomy-supportive. A modified version of the Sport Climate Questionnaire (SCQ) was used to measure perceived autonomy support during PE (Brickell, Chatzisarantis, & Pretty, 2006; Deci, 2001; Hagger et al., 2003). The wording of the SCQ was changed slightly to suit the PE context. Perceived autonomy support was measured through six items, for example, "I feel that my PE teacher provides me with choices and options" and "My PE teacher listens to how I would like to do things in PE lessons." Responses to the items were recorded on a seven-point Likert scale, ranging from 1 (strongly disagree) to 7 (strongly agree).

#### *Behavioural regulations*

Students' behavioural regulation for PE was assessed using Goudas, and his colleagues' Perceived Locus of Causality scale (PLOC; Goudas, Biddle, & Fox, 1994). The students in the present study responded to 17 items (four items for external regulation and introjected regulation and three items for identified regulation, intrinsic motivation and amotivation) measured on scales ranging from 1 (strongly disagree) to 7 (strongly agree). Each item followed the stem "I take part in PE …" Examples of the questions are "because PE is fun" (intrinsic motivation), "because I want to learn sport skills" (identified regulation), "because I would feel bad about myself if I did not" (introjected regulation), "because I will get into trouble if I do not" (external regulation), and "but I do not see why we should have PE" (amotivation). The PLOC scale has been used in various studies in PE and has been shown to have clear factor structure and high internal reliabilities with the exception of introjected regulation whose Cronbach's alpha coefficient is usually slightly below 0.70 (e.g., Carr, 2006; Ntoumanis, 2001, 2005; Wang et al., 2002).

#### *Intention to be physically active outside of school*

Students' intentions to be physically active in their leisure time (outside of school) over a period of 2 weeks was assessed with three items drawn from Hagger et al. (2003). Based on the work of Ajzen and Madden (1986) and worded in a manner to correspond to behavioural criterion in time, context, target, and action (Ajzen & Fishbein, 1980), participants responded to three questions. Two items were rated on a seven-point scale. For example, "During my leisure time over the next 2 weeks, I intend to do active sports and/or vigorous physical activities for at least 30 minutes, 3 days per week.", "During my leisure time over the next 2 weeks, I plan to do active sports and/or vigorous physical activities for at least 30 minutes, 3 days per week." – the former anchored by 1 (unlikely) to 7 (very likely) while the latter anchored by 1 (definitely not) to 7 (definitely). One item was rated on a continuous open scale (e.g., "During my leisure time over the next 2 weeks, I plan to do active sports and/or vigorous physical activities for at least 30 minutes, ____ days per week.").

### *Data analysis*

The data collected were analysed in three parts. Firstly, Cronbach's alpha coefficients were calculated to assess the internal reliability of the subscales. In addition, descriptive statistics were computed followed by multivariate analysis of variance (MANOVA) and ANOVA to examine gender differences. Secondly, using EQS 6.1 for Windows, confirmatory factor analyses (CFA) of the SCQ and PLOC Scale were carried out. Thereafter, the measurement models were also tested for invariance across gender. Finally, path analysis using Structural Equation Modelling (SEM) was conducted.

In analysing the data, Byrne (2006) suggested that model modifications may be investigated through the use of the Wald and Lagrange Multiplier (LM) tests. The Wald test assesses if any free parameters of a model can be restricted without substantial loss of information (Bentler, 1995). The LM test assesses the opposite, that is, whether any parameters that were set to zero in the model are, in fact, not zero. In other words, it tests the effect of adding free parameters to a model (Bentler, 1995; Byrne, 2006). It is suggested that, although these post hoc modifications are influenced by chance, the information can provide useful insight to variations of the hypothesised model. Changes are usually advised only when theoretically or logically justified.

Due to the multivariate kurtosis of the data, the data were analysed using robust maximum likelihood analysis. As such, following the CFA, path analysis was carried out on the structural model proposed in Fig. 1 to test for its goodness of fit. The structural model was also tested for its invariance across gender. The robust comparative fit index (CFI) and root-mean square error of approximation (RMSEA) were used to evaluate the adequacy of the model as according to Fan, Thompson, and Wang (1999), these fit indexes have shown to be least influenced by sample size. The Bentler-Bonett non-normed fit index (NNFI), and the ratio of

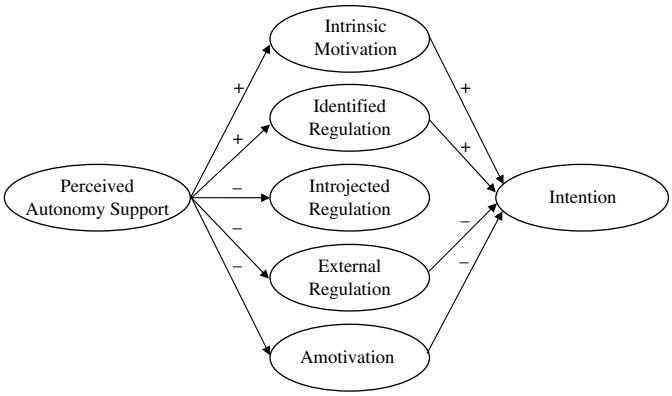


**Fig. 1.** Hypothesised model for the effects of perceived autonomy support on types of motivation and intentions to be physically active outside of school.

Satorra-Bentler scaled chi-square (S-B$\chi^2$) to the degrees of freedom were also used to evaluate goodness of fit. A cut-off value greater than 0.90 for the CFI, and a cut-off value less than or equal to 0.08 for the RMSEA were considered adequate for model fit, although values approaching 0.95 for the former are considered preferable, while values less than 0.06 for the latter are preferred (Hu & Bentler, 1999). In addition, a good fit of a specified model to the data is generally indicated when the NNFI is above 0.95, and when the S-B$\chi^2$/d.f. ratio is less than 3 (Hu & Bentler, 1999).

## Results

### *Descriptive statistics and intercorrelations*

Table 1 presents the means, standard deviations, Cronbach's alphas, and intercorrelations for the variables used in this study. All internal consistency coefficients indicated satisfactory reliabilities of at least 0.70, with the exception of introjected regulation.

An examination of the mean scores shows that the students' perception of autonomy support was high. The students also exhibited a self-determination profile with high scores on identified regulation and intrinsic motivation, and low scores on external regulation, introjected regulation and amotivation. The students tended to report moderate intentions to be physically active outside school.

Using the Pearson product–moment correlation, simple correlations were calculated to examine the relationships between all the variables tested in this study (see Table 1). Student's perceived autonomy support was positively related to identified regulation and intrinsic motivation, and negatively related to external regulation and amotivation. In addition, identified regulation and intrinsic motivation were positively related to intention, while external regulation and amotivation were negatively related to intention.

### *Gender differences*

The results of MANOVA showed significant differences between gender, Pillai's Trace = 0.053, $F(6, 672) = 6.28$, $p < 0.001$, $\eta^2 = 0.05$. Follow-up ANOVAs revealed that there was no significant difference between male and female students in their perceptions of autonomy support from their PE teachers. However, males tended to report higher autonomous regulation than females (see Table 2). The results of the ANOVA showed that male students reported higher intention to be physically active outside school compared to the female students. It is noteworthy that though significant, the effect sizes of these gender differences were small.

### *Confirmatory factor analysis*

The fit statistics for the measurement models produced reasonably well-fitting models for both the SCQ and PLOC constructs (see Table 3). The results also supported the invariance of the measurement models across gender. Table 4 presents the factor loading and residual of all the items used in the study.

### *SEM analysis*

Due to the relatively large normalised estimate of Mardia's coefficient (multivariate kurtosis = 73.43), the data were analysed using robust maximum likelihood analysis. The robust indices of fit indicate that the hypothesised model fit the data well (S-B$\chi^2 = 595.96$, $p < 0.01$; S-B$\chi^2$/d.f. = 2.17; NNFI = 0.95, CFI = 0.95, RMSEA = 0.04).[1] As hypothesised, perceived autonomy support positively predicted intrinsic motivation and identified regulation, while negatively predicted external regulation and amotivation (all paths significant at $p < 0.01$). Intention is also positively predicted by intrinsic motivation, and negatively predicted by external regulation (all paths significant at $p < 0.01$). As predicted, there was no association between introjected regulation and intentions. However, contrary to what was hypothesised, the results of the present study indicated that intention is also positively predicted by amotivation. Results also showed that the model in Fig. 2 is largely invariant across gender (S-B$\chi^2 = 851.35$, $p < 0.01$; S-B$\chi^2$/d.f. = 1.55; NNFI = 0.94, CFI = 0.95, RMSEA = 0.04).[2]

## Discussion

The results of the confirmatory factor analyses of the SCQ and PLOC constructs demonstrated that the instruments had factorial validity and were reliable as well. Multi-sample analysis of the SCQ and PLOC constructs to assess their invariance across gender revealed that the models were largely invariant across gender. This means that the constructs were similarly interpreted by both genders.

The purpose of this study was to test the hypothesised model (Fig. 1) in the Singapore PE context. Specifically, the study aimed to provide greater insight into the relationships between the students' perceived autonomy support from their teachers in PE, the varying types of behavioural regulation and the degree to which this motivation predicts the students' intentions to be physically active outside of school. The results were largely supportive of the proposed pattern of sequences, with the exception of the path between amotivation and intention.

Aligned with the theoretical tenet of the SDT (Deci & Ryan, 1985, 1991), strong and significant paths revealed that the students' perceived autonomy support from their PE teachers positively predicted the internal perceived locus of causality (intrinsic motivation and identified regulation) in the PE context. This is congruent to previous work in PE that have yielded similar findings (e.g., Hagger et al., 2003; Standage, Duda, & Ntoumanis, 2003) and supports extant literature that demonstrates the importance of enhancing students' innate psychological need for autonomy because it leads to more adaptive behaviour.

[1] SEM analysis was carried out using standardised Z-scores for intention.

[2] Additional analysis omitting the continuous open scale item measuring intention was conducted to ensure the integrity of the results. SEM analysis with two seven-point scale items measuring intention revealed similar results in all the predictions. The robust indices of fit indicate that the hypothesised model fit the data well (S-B$\chi^2 = 566.47$, $p < 0.01$; S-B$\chi^2$/d.f. = 2.26; NNFI = 0.94, CFI = 0.95, RMSEA = 0.04). Similarly, this model is also largely invariant across gender (S-B$\chi^2 = 836.87$, $p < 0.01$; S-B$\chi^2$/d.f. = 1.67; NNFI = 0.94, CFI = 0.95, RMSEA = 0.05).

**Table 1**
Descriptive statistics, Cronbach's alphas, and correlation of the main variables

| Variable | α | M | SD | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|---|---|
| 1. Perceived autonomy | 0.86 | 4.56 | 1.11 | | | | | | |
| 2. External regulation | 0.80 | 3.27 | 1.55 | −0.26** | | | | | |
| 3. Introjected regulation | 0.63 | 3.15 | 1.24 | −0.04 | 0.45** | | | | |
| 4. Identified regulation | 0.83 | 5.26 | 1.39 | 0.46** | −0.34** | 0.10** | | | |
| 5. Intrinsic motivation | 0.87 | 5.44 | 1.42 | 0.48** | −0.47** | −0.02 | 0.83** | | |
| 6. Amotivation | 0.74 | 2.52 | 1.42 | −0.34** | 0.60** | 0.30** | −0.52** | −0.62** | |
| 7. Intention | 0.83 | 3.74 | 1.42 | 0.17** | −0.25** | 0.02 | 0.38** | 0.33** | −0.23** |

Note. $^{**}p < 0.01$.

From a practical perspective, contexts such as PE, which includes activities that are desirable but not always intrinsically interesting to all students, pose a challenge to physical educators in motivating students towards uninteresting tasks (Standage, Gillison, & Treasure, 2007). Nonetheless, the above finding reiterates the importance of PE teachers adopting motivational strategies such as providing students with choices in their PE tasks (e.g., Chatzisarantis et al., 2003; Condon & Collier, 2002), giving them leadership roles and decision-making opportunities (e.g., Chen & Ennis, 2004; Whelan & Arnold, 1996), in order to foster more self-determined forms of student behaviour in PE. Also, providing the students with a clear rationale for the activities that they do may shift behavioural regulation towards identification (Pelletier et al., 2001).

In addition, the results of the SEM analysis in Fig. 2 also yielded theoretically consistent negative paths from perceived autonomy support to external regulation and amotivation (external perceived locus of causality). It is interesting to note that the magnitude of the standardised path coefficients became more negative as the paths moved along the PLOC continuum. The implication here for physical educators, is once again, the importance of being autonomy-supportive in order to foster more self-determined forms of behavioural regulations. According to Ryan and Deci (2000), experience of autonomy facilitates internalisation. On the other hand, non self-determined forms of regulations do not result in adaptive behaviours and also lead to outcomes which are not persistent over time (e.g., Miserandino, 1996; Reeve, Jang, Carrell, Jeon, & Barch, 2004).

In PE, many students engage in the activities because they are told to do so by the teacher, that is, their behaviours are mostly externally regulated. As such, the onus is on the teachers to adopt appropriate motivational strategies that may enhance intrinsic motive for learning in PE. Deci and Ryan (1991, 2002) recommended that to facilitate autonomous regulation, the PE teacher may provide students with the required information regarding a skill or tactic and then allowing the students choice in the way they wish to execute the task, or the scope that they like to adopt regarding the tactics and game plan. Other practical suggestions also include establishing peer learning groups in which students play different roles (such as demonstrating or refereeing) in the lesson, for example.

**Table 2**
Results of multivariate analysis of variance for gender differences

| Variable | Gender mean (d.f. = 1) | | F | p | $\eta^2$ |
|---|---|---|---|---|---|
| | Male ($n = 325$) | Female ($n = 354$) | | | |
| 1. Perceived autonomy | 4.51 | 4.61 | 2.33 | 0.13 | 0.00 |
| 2. External regulation | 3.30 | 3.25 | 0.03 | 0.86 | 0.00 |
| 3. Introjected regulation | 3.35 | 2.97 | 13.89** | 0.00 | 0.02 |
| 4. Identified regulation | 5.42 | 5.08 | 10.36** | 0.00 | 0.01 |
| 5. Intrinsic motivation | 5.58 | 5.29 | 8.19** | 0.00 | 0.01 |
| 6. Amotivation | 2.41 | 2.61 | 3.35 | 0.07 | 0.00 |
| 7. Intention | 4.04 | 3.40 | 32.13** | 0.00 | 0.05 |

Note. $^{**}p < 0.01$.

The last part of the model tested the relationship between the various behavioural regulations and students' intention to be physically active outside school. In agreement with Vallerand's (1997) model, intrinsic motivation was found to positively ($p < 0.01$) predict students' intentions to be physically active outside school. Similar findings were reported in the review of literature, by Ntoumanis (2001), and Hagger et al. (Hagger, Chatzisarantis, Barkoukis, Wang, & Baranowski, 2005). This finding is theoretically expected and is particularly important considering the significant role of PE in promoting a physically active lifestyle and how this can in turn improve public health (Sallis & McKenzie, 1991). Moreover, when students display more self-determined forms of behavioural regulations, they are more likely to adopt autonomous intentions which better predict behaviour as purported by research (e.g., Brickell et al., 2006; Chatzisarantis, Hagger, Smith, & Sage, 2006). In contrast, when students feel less self-determined in PE, that is, pressured to participate in PE (external regulation) or feel that PE is a waste of their time (amotivation), they are more likely to adopt controlling intentions which are less likely to be translated into actual behaviour (e.g., Chatzisarantis, Biddle, & Meek, 1997; Hagger, Chatzisarantis, & Biddle, 2002b).

From a practical point of view, since autonomous intentions predict more behavioural variance than controlling intentions, development of autonomous intentions should be encouraged in a bid to motivate adherence to physical activity in adolescents. Autonomous intentions may be developed by providing the students with a rationale as to the importance of physical activity, thereby fostering identification. In addition, Deci and Ryan (1991, 2002) highlighted that when providing the students with a meaningful rationale for the activity, that there should be some expression of empathy or acknowledgement of the students' concerns so that the students feel understood and accepted. Furthermore, the PE teacher also needs to ensure that the expression of empathy or acknowledgement is not verbalised in a controlling manner such as, "You must…; You have to…". Instead, the teacher should portray choice and support with expressions like, "You may want to…; You can try to…".

Given this and earlier findings, the importance of fostering of an autonomy-supportive PE class climate is once again highlighted. Increased perceptions of autonomy support can lead to more self-determined forms of behavioural regulations which in turn lead to predictions of autonomous intentions, and this allows us to be able to better explain students' behavioural variance in physical activities outside school (e.g., Escarti & Gutierrez, 2001; Hagger, Chatzisarantis, & Biddle, 2002a; Hein, Muur, & Koka, 2004).

Contrary to the predictions of the SDT (Deci & Ryan, 1985, 1991), a moderate positive path ($p < 0.01$) between amotivation and students' intention to be physically active outside school emerged. Possible explanations for this can be approached from two perspectives. Firstly, the relevance, authenticity and coherency of the PE curriculum are discussed. Notwithstanding political and pragmatic constraints, Penney and Jess (2004) argue that if physical educators are serious about matters of relevance, authenticity and coherency from young people's perspectives, then the young

**Table 3**
Goodness-of-fit statistics of measurement models

| Measurement model | Robust fit indices | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | S-B$\chi^2$ | $p<$ | d.f. | S-B$\chi^2$/d.f. | NNFI | CFI | RMSEA | RMSEA, 90% CI |
| SCQ | 20.62 | 0.01 | 7 | 2.94 | 0.97 | 0.99 | 0.05 | 0.027, 0.080 |
| PLOC | 319.08 | 0.01 | 104 | 3.07 | 0.94 | 0.95 | 0.05 | 0.048, 0.062 |
| SCQ—gender invariance | 26.30 | 0.02 | 14 | 1.88 | 0.98 | 0.99 | 0.05 | 0.018, 0.081 |
| PLOC—gender invariance | 425.46 | 0.01 | 208 | 2.04 | 0.94 | 0.95 | 0.06 | 0.049, 0.064 |

people need to be involved in the curriculum development process, and not merely be at the receiving end of new policies, requirements or measures. The collaborative endeavour between the various parties (curriculum authorities, professional associations, schools, teacher education institution, and students) needs to be engaged in order to bring about a legitimate and viable PE curriculum for the future. However, the nature of PE in Singapore is largely prescriptive and the activities offered in any core PE curriculum are mostly typical team games such as basketball, soccer and volleyball, for example. Rarely are students sought for their input in the development of the core PE curriculum and even in cases where their inputs are sought, most attempts to change current core PE curriculum in order to meet changing needs are often deemed drastic in management terms and thwarted by constraints such as timetabling and the lack of facilities or expertise.

Applying to the local context what Fairclough, Stratton, and Baldwin (2002) argued, schools placed a significant amount of emphasis on team games, often at the expense of lifetime activities. If PE is to promote lifetime physical activity, then physical educators must recognise which activities have the greatest carry-over value into adult life, and aim to provide more opportunities for all students to experience these activities. Having said all these, it is hence, not surprising to discover that the students may not find what are being offered to them in PE interesting and relevant, and thus, the lack of motivation. However, this lack of motivation in PE may not necessarily translate to an inactive lifestyle outside of school as indicated by the finding. Students may in fact, exhibit greater intention to pursue physical activities of their choice/liking in their leisure time to make up for the lack of such fun and enjoyment in school or simply because they enjoy that particular activity. Moreover, many lifetime sports (e.g., inline skating, working out in a fitness gym, modern dance, yoga, pilates, sea sports, martial arts) which are more relevant to the students and which may better cater to their needs, are now readily available and often, at affordable prices given the nation's drive for a healthy and sporting nation (Singapore Sports Council, 2007).

Secondly, we examine another possible perspective why students may lack motivation in PE but have positive intentions to be physically active outside school by looking at the effects/influence of significant others. According to Pelletier et al. (2001), autonomy support occurs when a significant other (a parent, coach or teacher) takes the target's perspective, provides choice, reflects the target's feelings, and encourages the target's initiative. When significant others are autonomy-supportive and less controlling, individuals are more likely to be intrinsically motivated, and the internalisation of self-determined extrinsically motivated behaviours is more likely to be facilitated.

Students may lack motivation in PE because they feel controlled by the teacher and/or classmates. Nonetheless, they may have high intentions to be active outside school despite lacking motivation in PE due to the influence of peers, coaches or parents who support

**Table 4**
Factor loadings and residuals of all items

| Factor | Item description | Factor loading | Residual |
|---|---|---|---|
| Perceived autonomy support | 6) I feel that my PE teacher provides me choices and options. | 0.690 | 0.723 |
| | 7) I feel understood by my PE teacher. | 0.777 | 0.629 |
| | 8) My PE teacher seemed confident in my ability to do well in my PE lessons. | 0.741 | 0.672 |
| | 9) My PE teacher encouraged me to ask questions. | 0.654 | 0.757 |
| | 10) My PE teacher listens to how I would like to do things in PE lessons. | 0.669 | 0.744 |
| | 11) My PE teacher tries to understand how I see things before suggesting a new way to do things. | 0.666 | 0.746 |
| | I take part in PE… | | |
| Intrinsic motivation | 15) Because PE is fun. | 0.728 | 0.686 |
| | 20) Because I enjoy learning new skills. | 0.835 | 0.550 |
| | 25) Because PE is exciting. | 0.781 | 0.625 |
| Identified regulation | 14) Because I want to learn sport skills. | 0.804 | 0.595 |
| | 19) Because it is important for me to do well in PE. | 0.709 | 0.705 |
| | 24) Because I want to improve my skills in PE. | 0.865 | 0.501 |
| Introjected regulation | 13) Because I want the coach/teacher to think I'm a good student. | 0.528 | 0.849 |
| | 18) Because I would feel bad about myself if I didn't. | 0.463 | 0.886 |
| | 23) Because I want the other students to think I'm good. | 0.541 | 0.841 |
| | 28) Because it bothers me when I don't. | 0.427 | 0.904 |
| External regulation | 12) Because I'll get into trouble if I don't. | 0.720 | 0.694 |
| | 17) Because that's what I am supposed to do. | 0.488 | 0.873 |
| | 22) So that the teacher won't yell at me. | 0.825 | 0.565 |
| | 27) Because that's the rule. | 0.757 | 0.654 |
| Amotivation | 16) But I really don't know why. | 0.594 | 0.804 |
| | 21) But I don't see why we should have PE. | 0.755 | 0.655 |
| | 26) But I really feel I'm wasting my time in PE. | 0.757 | 0.653 |
| Intention | 29) During my leisure time over the next 2 weeks, I intend to do active sports and/or vigorous physical activities for at least 30 min, 3 days per week. | 0.909 | 0.416 |
| | 30) During my leisure time over the next 2 weeks, I intend to do active sports and/or vigorous physical activities for at least 30 min, _____ days per week. | 0.532 | 0.846 |
| | 31) During my leisure time over the next 2 weeks, I plan to do active sports and/or vigorous physical activities, for at least 30 min, 3 days per week. | 0.857 | 0.485 |

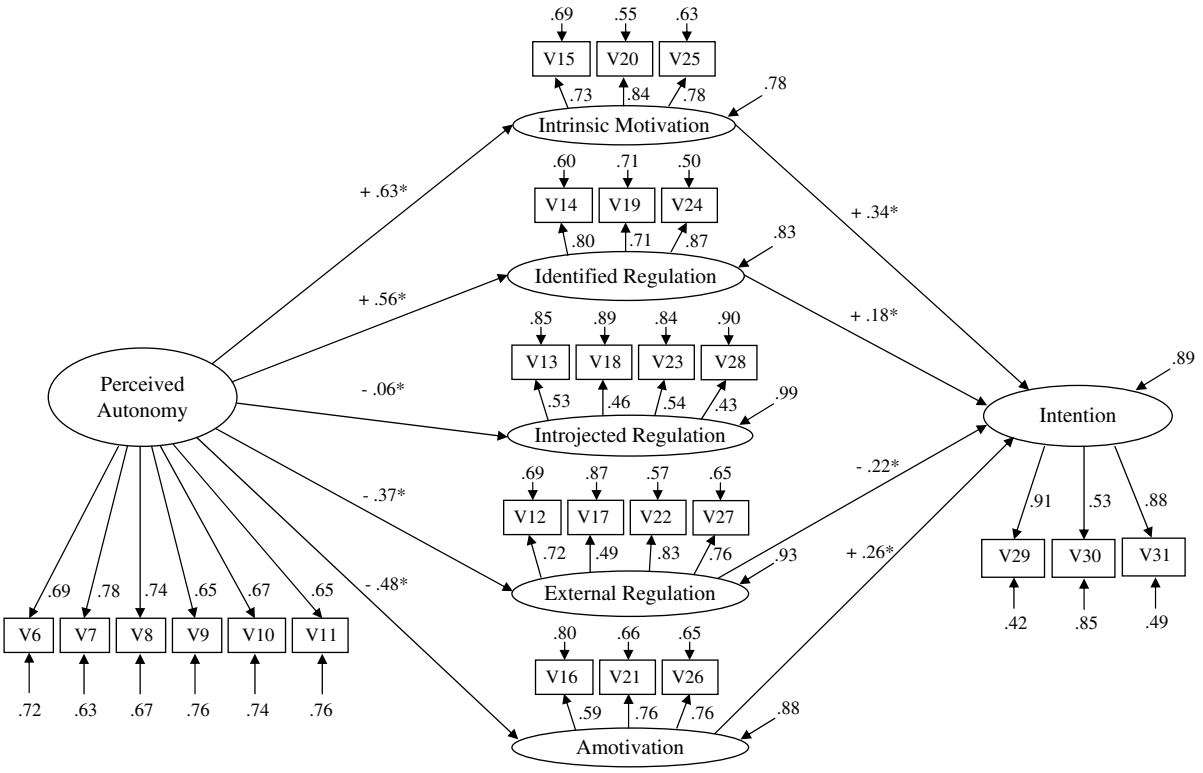


**Fig. 2.** Standardised estimates for the proposed model. Note. $^{*}p < 0.01$.

them in their choice of activities and/or affirm their abilities. For instance, Eccles et al. (1993), proposed that parents can influence student motivational processes. Further literature supports this and has demonstrated the pervasive influence of perceived peer-group support on adolescents' behaviour (Suls, Lemos, & Stewart, 2002) and the pervasive influence parents have on children's choice of leisure time activities (Ratelle, Guay, Larose, & Senécal, 2004; Ratelle, Larose, Guay, & Senécal, 2005).

*Limitations and recommendations for future research*

One of the limitations of this study is the cross-sectional nature of research design which only allowed for a slice-in-time model fit. Moreover, possible reciprocal links which may appear over time cannot be tested with this research design. It was also not within the scope of this study to look at school and developmental differences due to the sample size and homogeneous age group of the students involved in the study. Another limitation to this study is that although intention is a good predictor of actual exercise behaviour according to the TPB (Ajzen, 1985), it would have been more desirable to test how closely the effects found in the present study corresponded to the real practice of physical activity in adolescents outside of school by following up with some measures of actual behaviour (e.g., using pedometers and/or physical activity recall questionnaires).

In the SDT (Deci & Ryan, 1985, 1991, 2000), the role of perceived autonomy support from PE teachers tells only part of the picture in terms of the influences of innate psychological needs on pupils' motivation in PE. Future studies can look at the influence of all the three innate psychological needs and/or perceived autonomy support from parents and/or peers as well. This will help further our understanding of the environmental influences on autonomous motivation and action in and outside of the PE context. In addition, combining the quantitative test in this study with a follow-up qualitative analysis (e.g., interviews with the students) will help to better explain some of the findings, such as the positive prediction of intention by amotivation. As this is the only study to date that has found students' amotivation in PE to positively predict the students' intention to be physically active outside of school, more studies need to be done in order to reexamine and confirm this finding.

## Conclusion

Despite the limitation of the cross-sectional nature of the research design, the findings from the present study have important implications. They suggest that perceived autonomy support in a PE context enhances students' intentions to be physically active outside of school and may result in the initiation of physical activity behaviour outside of school. This adds further to the growing body of research on the positive effects of perceived autonomy support in educational (e.g., Hagger et al., 2005; Reeve, 2002) and PE settings (e.g., Prusak et al., 2004). The results of this study call for the promotion of self-determined motivation in PE in order to enhance students' positive experiences and potentially, their participation levels in and outside of school. In other words, it is important that an internal perceived locus of causality is fostered and promoted in PE because it can lead to positive outcomes and may facilitate the general aim of physical activity in adult life.

The data suggest that an important step in facilitating students' active lifestyles outside school may begin in schools, that is, PE has the potential to promote physical activity to a large number of young people and potentially facilitate public health (Sallis et al., 1992). However, the findings also reveal an interesting prediction between amotivation and students' intentions to be physically active outside school. This prediction highlights that the relevance of the current PE curriculum need to be reexamined and that despite lacking motivation in PE, students may still be active outside school, participating in physical activities chosen based on their efficacy and affective appraisals by significant others.

From an applied perspective, the findings provide some insight into how physical educators may begin to deal with the decrease in interest and participation levels of students. Specifically, the data suggest that PE teachers should seek to increase students' informed opportunities for choice (e.g., offer a wide variety of relevant activities, with rationales for doing them), provide increased opportunities for student input (e.g., allowing students to play different roles in the lesson, and making decisions with regard to how they want to carry out the activities), and empathise and acknowledge the students' concerns. These, coupled with use of appropriate expression of choice and support, promote class structures that are autonomy-supportive and curriculum that are interesting and relevant to the students.

## References


Ajzen, I. (1985). From intentions to actions: a theory of planned behaviour. In J. Kuhl, & J. Beckman (Eds.), *Action-control: From cognition to behaviour* (pp. 11–39). Heidelberg: Springer.

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes, 50*, 179–211.

Ajzen, I., & Fishbein, M. (1980). *Understanding attitudes and predicting social behavior*. Englewood Cliffs, NJ: Prentice-Hall.

Ajzen, I., & Madden, T. (1986). Prediction of goal-directed behavior: attitudes, intentions and perceived behavioral control. *Journal of Experimental Social Psychology, 22*, 453–474.

Armstrong, N. (1989). Children are fit but not active!. *Education and Health, 7*, 29–33.

Bentler, P. M. (1995). *EQS structural equations program manual*. [Computer software manual]. Encino, CA: Multivariate Software.

Biddle, S. J. H., Sallis, J. F., & Cavill, N. (Eds.). (1998). *Young and active? Young people and health-enhancing physical activity: Evidence and implications*. London: Health Education Authority.

Blanchard, C., & Vallerand, R. J. (1996). On the social and intrapersonal determinants of situational motivation. Unpublished manuscript, Université du Québec à Montréal.

Brickell, T. A., Chatzisarantis, N. L. D., & Pretty, G. M. (2006). Autonomy and control: augmenting the validity of the theory of planned behaviour in predicting exercise. *Journal of Health Psychology, 11*, 51–63.

Byrne, B. M. (2006). *Structural equation modeling with EQS. Basic concepts, applications, and programming* (2nd ed.). New Jersey: Lawrence Erlbaum Associates.

Carr, S. (2006). An examination of multiple goals in children's physical education: motivational effects of goal profiles and the role of perceived climate in multiple goal development. *Journal of Sports Sciences, 24*, 281–297.

Chatzisarantis, N. L. D., Biddle, S. J. H., & Meek, G. A. (1997). A self-determination theory approach to the study of intentions and the intention-behaviour relationship in children's physical activity. *British Journal of Health Psychology, 2*, 343–360.

Chatzisarantis, N. L. D., Hagger, M. S., Biddle, S. J. H., Smith, B., & Wang, J. C. K. (2003). A meta-analysis of perceived locus of causality in exercise, sport, and physical education contexts. *Journal of Sport and Exercise Psychology, 25*, 284–306.

Chatzisarantis, N. L. D., Hagger, M. S., Smith, B., & Sage, L. D. (2006). The influence of intrinsic motivation on execution of social behaviour within the theory of planned behaviour. *European Journal of Social Psychology, 36*, 229–237.

Chen, A., & Ennis, C. D. (2004). Goals, interests, and learning in physical education. *The Journal of Educational Research, 97*, 329–338.

Condon, R., & Collier, C. S. (2002). Student choice makes a difference in physical education. *Journal of Physical Education, Recreation and Dance, 73*, 26–30.

Deci, E. L. (2001). The sport climate questionnaire. Retrieved March 11, 2006 from. http://www.psych.rochester.edu/SDT/measures/auton_sport.html.

Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior* (2nd ed.). New York: Plenum Press.

Deci, E. L., & Ryan, R. M. (1987). The support of autonomy and the control of behavior. *Journal of Personality and Social Psychology, 53*, 1024–1037.

Deci, E. L., & Ryan, R. M. (1991). A motivational approach to self: integration in personality. In R. Deinstbier (Ed.), *Perspectives on motivation. Nebraska symposium on motivation, Vol. 38* (pp. 237–288). Lincoln, NE: University of Nebraska Press.

Deci, E. L., & Ryan, R. M. (2000). The "what" and "why" of goal pursuits: human needs and the self-determination of behavior. *Psychological Inquiry, 11*, 227–268.

Deci, E. L., & Ryan, R. M. (2002). Handbook of self-determination research. In E. L. Deci, & R. M. Ryan (Eds.), *Overview of self-determination theory: An organismic dialectical perspective* (pp. 3–33). Rochester, NY: The University of Rochester Press.

Dishman, R. K. (1994). *Advances in exercise adherence*. Champaign, IL: Human Kinetics.

Eccles, J., Midgley, C., Wigfield, A., Buchanan, C. M., Reuman, D., Flanagan, C., et al. (1993). Development during adolescence: the impact of stage – environment fit on adolescents' experiences in schools and families. *American Psychologist, 48*, 90–101.

Escarti, A., & Gutierrez, M. (2001). Influence of the motivational climate in physical education on the intention to practice physical activity or sport. *European Journal of Sport Science, 1*, 1–12.

Fairclough, S., Stratton, G., & Baldwin, G. (2002). The contribution of secondary school physical education to lifetime physical activity. *European Physical Education Review, 8*, 69–84.

Fan, X., Thompson, B., & Wang, L. (1999). Effects of sample size, estimation methods and model specification in structural equation modeling. *Structural Equation Modelling: A Multidisciplinary Journal, 1*, 56–83.

Gagne, M. (2003). The role of support and autonomy orientation in prosocial behavior engagement. *Motivation and Emotion, 27*, 199–223.

Goudas, M., Biddle, S. J. H., & Fox, K. R. (1994). Perceived locus of causality, goal orientations, and perceived competence in school physical education classes. *British Journal of Educational Psychology, 64*, 453–463.

Hagger, M. S., Chatzisarantis, N., & Biddle, S. J. H. (2002a). A meta-analytic review of the theories of reasoned action and planned behavior in physical activity: predictive validity and the contribution of additional variables. *Journal of Sport and Exercise Psychology, 24*, 3–32.

Hagger, M. S., Chatzisarantis, N., & Biddle, S. J. H. (2002b). The influence of autonomous and controlling motives on physical activity intentions within the theory of planned behavior. *British Journal of Health Psychology, 7*, 283–297.

Hagger, M. S., Chatzisarantis, N., Barkoukis, V., Wang, C. K. J., & Baranowski, J. (2005). Perceived autonomy support in physical education and leisure-time physical activity: a cross-cultural evaluation of the trans-contextual model. *Journal of Educational Psychology, 97*, 376–390.

Hagger, M. S., Chatzisarantis, N., Culverhouse, T., & Biddle, S. J. H. (2003). The processes by which perceived autonomy support in physical education promotes leisure-time physical activity intentions and behaviour: a trans-contextual model. *Journal of Educational Psychology, 95*, 784–795.

Hein, V., Muur, M., & Koka, A. (2004). Intention to be physically active after school graduation and its relationship to three types of intrinsic motivation. *European Physical Education Review, 10*, 5–19.

Hollembeak, J., & Amorose, A. J. (2005). Perceived coaching behaviors and college athletes' intrinsic motivation: a test of self-determination theory. *Journal of Applied Psychology, 17*, 20–36.

Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives. *Structural Equation Modeling, 6*, 1–55.

Loevinger, J., & Blasi, A. (1991). Development of the self as subject. In J. Stranss, & G. Goethals (Eds.), *The self: Interdisciplinary approaches* (pp. 150–167). New York: Springer-Verlag.

Miserandino, M. (1996). Children who do well in school: individual differences in perceived competence and autonomy in above average children. *Journal of Educational Psychology, 88*, 203–214.

Ntoumanis, N. (2001). A self-determination approach to understanding of motivation in physical education. *British Journal of Educational Psychology, 71*, 225–242.

Ntoumanis, N. (2005). A prospective study of participation in optional school physical education using a self-determination theory framework. *Journal of Educational Psychology, 97*, 444–453.

Pelletier, L. G., Fortier, M. S., Vallerand, R. J., & Brière, N. M. (2001). Associations among perceived autonomy support, forms of self-regulation, and persistence: a prospective study. *Motivation and Emotion, 25*, 279–306.

Pelletier, L. G., Fortier, M. S., Vallerand, R. J., Tuson, K. M., Brière, N. M., & Blais, M. R. (1995). Towards a new measure of intrinsic motivation, extrinsic motivation, and amotivation in sports: the sport motivation scale (SMS). *Journal of Sport & Exercise Psychology, 17*, 35–53.

Penney, D., & Jess, M. (2004). Physical education and physically active lives: a lifelong approach to curriculum development. *Sport, Education and Society, 9*, 269–287.

Prusak, K. A., Treasure, D. C., Darst, P. W., & Pangrazi, R. P. (2004). The effects of choice on the motivation of adolescent girls in physical education. *Journal of Teaching in Physical Education, 23*, 19–29.

Ratelle, C. F., Guay, F., Larose, S., & Senécal, C. (2004). Family correlates of trajectories of academic motivation during a school transition: a semiparametric group-based approach. *Journal of Educational Psychology, 96*, 743–754.

Ratelle, C. F., Larose, S., Guay, F., & Senécal, C. B. (2005). Perceptions of parental involvement and support as predictors of college students' persistence in a scientific curriculum. *Journal of Family Psychology, 19*, 286–293.

Reeve, J. (2002). Handbook of self-determination research. In E. L. Deci, & R. M. Ryan (Eds.), *Self-determination theory applied to educational settings* (pp. 183–203). Rochester, NY: The University of Rochester Press.

Reeve, J., Jang, H., Carrell, D., Jeon, S., & Barch, J. (2004). Enhancing students' engagement by increasing teachers' autonomy support. *Motivation and Emotion, 28*, 147–169.

Ryan, R. (1993). Agency and organization: intrinsic motivation, autonomy and the self in psychological development. In J. Jacobs (Ed.), *Developmental perspectives on motivation. Nebraska symposium on motivation, Vol. 40* (pp. 1–56). Lincoln, NE: University of Nebraska Press.

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist, 55*, 54–56.

Ryan, R. M., & Deci, E. L. (2006). Self-regulation and the problem of human autonomy: does psychology need choice, self-determination, and will? *Journal of Personality, 74*, 1557–1586.

Sallis, J. F. (2000). Age-related decline in physical activity: a synthesis of human and animal studies. *Medicine and Science in Sports and Exercise, 32*, 1598–1600.

Sallis, J. F., & McKenzie, T. L. (1991). Physical education's role in public health. *Research Quarterly for Exercise and Sport, 62*, 124–137.

Sallis, J. F., Simons-Morton, B. G., Stone, E. J., Corbin, C. B., Epstein, L. H., Faucette, N., et al. (1992). Determinants of physical activity and interventions in youth. *Medicine and Science in Sports and Exercise, 24*, S248–S257.

Shephard, R., & Trudeau, F. (2000). The legacy of physical education: influences on adult lifestyle. *Pediatric Exercise Science, 12*, 34–50.

Singapore Sports Council. (2007). Sports in Singapore: an overview. Retrieved November 18, 2007, from. http://www.ssc.gov.sg/publish/Corporate/en/about/Sporting_Singapore_An_Overview.html.

Standage, M., Duda, J. L., & Ntoumanis, N. (2003). A model of contextual motivation in physical education: using constructs from self-determination and achievement goal theories to predict physical activity intentions. *Journal of Educational Psychology, 95*, 97–110.

Standage, M., Gillison, F., & Treasure, D. C. (2007). Intrinsic motivation and self-determination in exercise and sport. In M. S. Hagger, & N. L. D. Chatzisarantis (Eds.), *Self-determination and motivation in physical education* (pp. 71–85). Champaign, IL: Human Kinetics.

Suls, J., Lemos, K., & Stewart, H. L. (2002). Self-esteem, construal, and comparisons with self, friends, and peers. *Journal of Personality and Social Psychology, 82*, 252–261.

Taylor, W. C., Blair, S. N., Cummings, S. S., Wun, C. C., & Malina, R. M. (1999). Childhood and adolescent physical activity patterns and adult physical activity. *Medicine and Science in Sports and Exercise, 31*, 118–123.

Thogersen-Ntoumani, C., & Ntoumanis, N. (2006). The role of self-determined motivation in the understanding of exercise-related behaviours, cognitions and physical self-evaluations. *Journal of Sports Sciences, 24*, 393–404.

Vallerand, R. J. (1997). Towards a hierarchical model of intrinsic and extrinsic motivation. In M. P. Zanna (Ed.), *Experimental social psychology* (pp. 271–361). New York: Academic Press.

Vallerand, R. J. (2001). A hierarchical model of intrinsic and extrinsic motivation in sport and exercise. In G. C. Roberts (Ed.), *Advances in motivation in sport and exercise* (pp. 263–319). Champaign, IL: Human Kinetics.

Vallerand, R. J., & Losier, G. F. (1999). An integrative analysis of intrinsic and extrinsic motivation in sport. *Journal of Applied Sport Psychology, 11*, 142–169.

Vallerand, R. J., Fortier, M. S., & Guay, F. (1997). Self determination and persistence in a real-life setting: toward a motivational model of high school dropout. *Journal of Personality and Social Psychology, 72*, 1161–1176.

Vallerand, R. J., Pelletier, L. G., Blais, M. R., Brière, N. M., Senecal, C., & Vallieres, E. F. (1992). On the assessment of intrinsic, extrinsic, and amotivation in education: evidence on the concurrent and construct validity of the academic motivation scale. *Educational and Psychological Measurement, 53*, 159–172.

Vansteenkiste, M., Simons, J., Lens, W., Soenens, B., & Matos, L. (2005). Examining the motivational impact of intrinsic versus extrinsic goal framing and autonomy supportive versus internally controlling communication style on early adolescents' academic achievement. *Child Development, 76*, 483–501.

Wang, C. K. J., & Biddle, S. J. H. (2001). Young people's motivational profiles in physical activity: a cluster analysis. *Journal of Sport and Exercise Psychology, 23*, 1–22.

Wang, C. K. J., Chatzisarantis, N. L. D., Spray, C. M., & Biddle, S. J. H. (2002). Achievement goal profiles in school physical education: differences in self-determination, sport ability beliefs, and physical activity. *British Journal of Educational Psychology, 72*, 433–445.

Wang, C. K. J., Chia, M., Quek, J. J., & Liu, W. C. (2006). Patterns of physical activity, sedentary behaviours and psychological determinants among Singaporean school children. *International Journal of Sport & Exercise Psychology, 4*, 227–249.

Watts, K., Jones, T. W., Davis, E. A., & Green, D. (2005). Exercise training in obese children and adolescents. *Sports Medicine, 35*, 375–392.

Whelan, J. X., & Arnold, D. S. (1996). Have students design their own fitness program. *Strategies, 9*, 26–29.

Williams, G. C., & Deci, E. L. (1996). Internalization of biopsychosocial values by medical students: a test of self-determination theory. *Journal of Personality and Social Psychology, 70*, 767–779.