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Research article

Prediction of enjoyment in school physical education

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Abstract

The specific aim of this study was to examine whether motivational climate, perceived physical competence, and exercise motivation predict enjoyment in school physical education within the same sample of adolescents across three years of secondary school. A sample of 639 students (girls = 296, boys = 343) aged between 13- to 15-years at the commencement of the study completed the Intrinsic Motivation Climate in Physical Education Questionnaire, Physical Self-Perception Profile, Physical Education Motivation Scale, and Physical Education Enjoyment Scale. Results derived from path analyses indicated that task-involving motivational climate predicted enjoyment in physical education via perceived physical competence and intrinsic motivation in both girls and boys. In particular, these results supported previous findings of Vallerand et. al (1997) with the self-determination theory and the achievement goal theory. Ego-involving climate was not a significant predictor either in girls or boys. The current results provide continuing support for the investigation of Vallerand's model in the physical education setting, and highlight that motivational climate is an area that requires further evaluation as a contributing factor in the improvement of physical education teaching. A better understanding of the role of motivational climate may assist efforts to promote children's and adolescents' perceived physical competence, intrinsic motivation, and enjoyment in the school physical education setting.

Key words: enjoyment, motivation, school, physical education, path analysis.

Introduction

According to the recommendations of health experts, all primary school-aged children and secondary school adolescents should accumulate at least 60 minutes of moderate to vigorous intensity physical activity (PA) daily (World Health Organization, 2012). The review of recent studies (Adolescents Health and Lifestyle Survey, 2005; Finnish Board of Education's Physical Education Evaluation, 2010; School Health Promotion Study, 2010), shows that a large part of Finnish adolescents fail to achieve the recommended levels of daily PA. A number of studies have revealed that the level of PA declines during adolescence as they transfer from childhood into adulthood (e.g. Corbin, Pangrazi and Le-Masurier, 2004; Currie et al., 2008). It is generally believed that exercise motivation is one crucial factor behind PA (Chen, 2001; Ntoumanis et al., 2004; Yli-Piipari, 2011). Furthermore, a plethora of studies have demonstrated that enjoyment represents a key factor underlying the exercise motivation for children and adolescents to maintain positive

engagement in both PA and physical education (PE) (Prochaska et al., 2003; Sallis, Prochaska and Taylor, 2000; Wallhead and Buckworth, 2004; Yli-Piipari et al., 2009). The current research was grounded in the self-determination (Deci and Ryan, 1985; 1991; 2000), and achievement goal frameworks (Ames, 1992; Nicholls, 1989), which has been successfully applied to the context of education (Ryan and Deci, 2006; Vallerand, Fortier and Guay, 1997) and recently also in PE (Ntoumanis, 2005; Soini, 2006; Standage, Duda and Ntoumanis, 2005; Yli-Piipari, 2011).

According to the achievement goal theory (Nicholls, 1989), motivational climate in PE refers to student perceptions of achievement goals addressed by instructors in learning environments (Ames, 1992). Two types of motivational climate are proposed to exist, a task-involving climate and an ego-involving climate (Nicholls, 1989). Task-involving motivational climate refers to structures that support effort, cooperation, emphasis on learning and task orientation, and student evaluation on the basis of self-referenced criteria (Ames, 1992; Ames and Archer, 1988). In contrast, ego-involving motivational climate refers to situations that foster normative comparisons, competition, and evaluation on the basis of normative competence criteria (Ames and Archer, 1988; Duda, 1996). Previous studies have shown that task-involving climate in PE is related to perceived physical competence (Wallhead and Ntoumanis, 2004), intrinsic motivation (Digelidis and Papaioannou, 1999), and enjoyment (Digelidis and Papaioannou, 2002; Soini, 2006; Wallhead and Ntoumanis, 2004). Student perceptions of an ego-involving climate in PE are more likely to lead to more controlling forms of motivation (Papaioannou, 1998), and low levels of enjoyment (Soini, 2006). In an intervention study involving a sample of 51 English boys with a mean age of 14.3 years, who were participating in the Sport Education Curriculum, a program based on a structure that focuses on a task-involving motivational climate, Wallhead and Ntoumanis (2004) reported these boys having higher post-intervention enjoyment scores than those students taught with the ego-involving approach. Limited number of intervention studies that have been conducted typically show that a task-involving motivational climate has a positive effect on enjoyment in PE (e.g. Solmon, 1996; Treasure and Roberts, 2001). However, the review of PE research within children and adolescents reveal that there are no studies reported investigating long-term influences of perceived motivational climate on enjoyment in PE.

Perceived physical competence is the desire to

interact effectively with the environment and to attain valued outcomes (Deci and Ryan, 1985), and it refers to one's beliefs about the ability to be successful in an achievement domain (Ferrer-Caja and Weiss, 2000). Previous research has revealed that perceived physical competence is linked with intrinsic motivation (Deci and Ryan, 2000; Ommundsen, 2005), enjoyment in PA (Biddle et al., 2003) and PE (Carroll and Loumidis, 2001; Fairclough, 2003). Considerable evidence has also shown that youth who report stronger beliefs about their physical competence are more likely to enjoy the activity than those reporting lower levels of physical competence (Ferrer-Caja and Weiss, 2000). Gender differences in perceived competence have also been consistently observed, with boys possessing more positive perceptions than girls (Carroll and Loumidis, 2001; Fairclough, 2003). In a study by Ferrer-Caja and Weiss (2000), perceived physical competence was one of the strongest predictors of intrinsic motivation in PE.

According to the self-determination theory (Deci and Ryan, 1985; 1991; 2000), human behaviors can be categorized as intrinsically motivated, extrinsically motivated or amotivated. The regulation of motivation reflects a continuum comprising different levels of self-determination ranging from intrinsic motivation through extrinsic motivation to amotivation. Intrinsic motivation involves pursuing an activity out of interest and enjoyment without external contingencies (Deci and Ryan, 2000). Previous evidence suggest that intrinsic motivation and more autonomous types of extrinsic motivation lead to positive behavioral consequences, such as greater enjoyment (Ntoumanis, 2001; Ryan and Deci, 2007; Yli-Piipari, 2011) whereas non-autonomous types of motivation have been shown to be related to negative outcomes (Ntoumanis, 2002; Standage, Duda and Ntoumanis, 2005). Four different types of extrinsic motivation exist within the continuum: specifically, external regulation, introjected regulation, identified regulation, and integrated regulation. External regulation is occurring if an activity is done because of external factors, such as rewards, constraints, or fear of punishment. Introjected regulation can be performed, for example, in order to avoid internal pressures or feelings of guilt. Identified regulation refers to the outcomes of the behavior that are highly valued and the latter is performed with less pressure even if it is not particularly pleasant. Integrated regulation represents behaviors which are performed out of choice in order to bring different parts of the self. Amotivation is defined as a state in which a person lacks the intention to behave and experience feelings of incompetence, expectancies of uncontrollability, and perform activities without purpose. Despite a number of research studies based on self-determination theory being conducted in school PE (Lonsdale et al., 2011; Ntoumanis, 2005; Ommundsen and Eikanger-Kvalo, 2007; Standage, Duda and Ntoumanis, 2005), the role of motivational climate, perceived physical competence, and intrinsically regulated motivation has yet to be investigated to clarify long-term influences on students' enjoyment in PE.

Enjoyment is a positive affect that reflects

generalized feelings such as pleasure, liking, and fun (Scanlan and Simmons, 1992), and most recently defined as a multidimensional structure related to enthusiasm, excitement, and cognitions such as perceptions of competence and attitude towards the activity (Hashim, Grove and Whipp, 2008). Enjoyment is an intrinsic element associated with exercise motivation to engage in PA (Dishman et al., 2005) and PE (Hashim, Grove and Whipp, 2008; Wallhead and Buchworth, 2004). Dishman et al. (2005) reported that increased enjoyment in PE resulted in higher levels of daily PA in a sample of Grade 9 and 10 adolescent girls. In a study targeting students in the U.S. at grades four to twelve, PE enjoyment was one of the strongest and most consistent correlates of PA (Sallis et al., 1999). Although, the importance of enjoyment in PE is widely accepted (Barr-Anderson et al., 2008; Ntoumanis, 2002; Standage, Duda and Ntoumanis, 2005), there is evidence suggesting an age-related decline in PE enjoyment (Digelidis and Papaioannou, 1999; Hashim, 2007; Prochaska et al., 2003). Moreover, Carroll and Loumidis (2001) found that boys scored higher than girls on enjoyment in a sample of 922 British Grade 6 students. A review of PE research within children and adolescents reveals there are no reports about studies attempting to test the theoretical assumptions regarding the effects of motivational climate, perceived physical competence, and exercise motivation on PE enjoyment.

The purpose of the current study was to examine the predictive relationships between motivational climate, perceived physical competence, exercise motivation and PE enjoyment using path analysis within the same sample of students over three secondary school years (Figure 1). In previous studies, statistically significant differences between girls and boys have been found in enjoyment (Carroll and Loumidis, 2001), perceived physical competence (Carroll and Loumidis, 2001; Fairclough, 2003), and extrinsic motivation (Yli-Piipari, 2011), boys scoring higher on each variable. Therefore, we used gender as grouping variable in subsequent path analyses. In line with previous findings (Digelidis and Papaioannou, 1999; 2002; Soini et al., 2007; Wallhead and Ntoumanis, 2004), it was hypothesized that the perception of task-involving climate at Grade 7 would be a positive predictor of PE enjoyment at Grade 9 via perceived physical competence and intrinsic motivation. Secondly, it was hypothesized that ego-involving climate at Grade 7 would be a negative predictor of PE enjoyment at Grade 9 via perceived physical competence and extrinsic motivation.

Methods

Participants

The participants of this study were recruited from eight secondary schools located in the region of Central Finland and sourced through direct contact with the school principals. The grade seven students were members of 32 different PE groups. All children in each PE class were invited to participate. The sample comprised 639 students (girls = 296, boys = 343) aged between 13- to 15-years at the commencement of the study. Data collection was

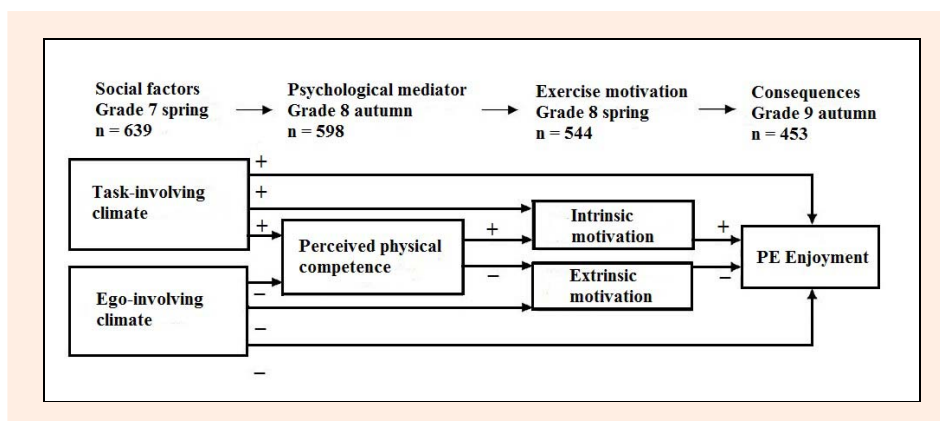


Figure 1. The hypothesized PE enjoyment model.

completed during the time period of 2008–2009. A cohort of 453 participants completed all measures at Grade 7, Grade 8, and Grade 9. Participation in this study was voluntary and no extra credit was awarded for participation. Permission to conduct the study was obtained from the Ethical Committee of the University of Jyväskylä and consent to participate in the study was obtained from all participants and their parents before the start of the study.

Measures

Intrinsic Motivation Climate in Physical Education Questionnaire: Motivational climate in PE was measured using the Finnish version of Intrinsic Motivation Climate in Physical Education Questionnaire (IMCPEQ; Soini et al., 2007), which consists of four subscales representing autonomy support, social relatedness, and task- and ego-involving climate. For the purpose of this study only the dimensions of task- and ego-involving climate were analysed. The individual item stem used in the measure is “*In my physical education class...*” The task-involving dimension consisted of five items (e.g. “*It is important for students to try their best in PE lessons*”), and the ego-involving dimension consisted of four items (e.g. “*It is important for students to succeed better than others in PE lessons*”). Responses were indicated on a five-point Likert-scale ranging from strongly disagree (1) to strongly agree (5). Soini et al. (2007) reported that the psychometric properties of the questionnaire were satisfactory to measure motivational climate in school PE based on data collected from a Finnish secondary school sample (Cronbach’s alpha for task-involving climate .80 and ego-involving climate .78). Confirmatory factor analysis of the entire measure reported by Kalaja et al. (2009) supported the construct validity of the scale (TLI = .96, CFI = .98, RMSEA = .055).

Perceived Physical Competence Scale: Perceived physical competence was analysed using the Finnish version (Jaakkola, 2002) of the Physical Self-Perception Profile (PSPP; Fox and Corbin, 1989). The subscale consisted of five items (e.g. “*I am confident in PE*”), and the stem was “*What I am?*” The students responded to each item using a five-point Osgood-scale from I’m among the best when it comes to athletic ability (1) to I’m not among the best when it comes to athletic ability (5).

Higher values reflected higher perceived physical competence. Kalaja et al. (2009) showed that the Cronbach’s alpha coefficients were above .70 demonstrating high internal consistency of the Physical Self-Perception Profile. Confirmatory factor analysis undertaken in that study supported the construct validity of the scale (TLI = .91, CFI = .97, RMSEA = .012).

Physical Education Motivation Scale: Contextual intrinsic motivation and extrinsic motivation were measured using the Finnish version (Jaakkola, 2002) of the Physical Education Motivation Scale, which is a modified version of the Sport Motivation Scale (SMS; Pelletier et al., 1995) for the context of PE. The scale used in this study had the individual item stem “*I’m currently participating in PE, because...?*” The instrument consists of seven subscales, comprising three types of intrinsic motivation and three types of extrinsic motivation, and amotivation. For the purpose of this study only dimensions of intrinsic motivation and extrinsic motivation were used. Each dimension consisted of four items and each was rated on a five-point Likert-scale ranging from strongly disagree (1) to strongly agree (5). Jaakkola et al. (2008) reported that the Finnish version of the PE Motivation Scale demonstrated adequate psychometric properties (Cronbach alphas between 0.71 and 0.93). Confirmatory factor analysis results detailed by Kalaja et al. (2009), however, did not fully support the construct validity of the PE Motivation Scale (TLI = 0.86, CFI = 0.88, RMSEA = 0.081).

PE Enjoyment Scale: Enjoyment in PE lessons was assessed using the Finnish version (Soini et al., 2007) of the Sport Enjoyment Scale (Scanlan et al., 1993). The subscale consists of four items (e.g. “*I like PE lessons*”), and the item stem was “*In my physical education class...*” Responses were indicated on a five-point Likert-scale ranging from strongly disagree (1) to strongly agree (5). Soini et al. (2007) reported that the Finnish version of the scale, which was modified to the context of PE, showed satisfactory internal consistency ($\alpha = 0.93$).

Procedures

The data were collected by the researchers on four occasions during the school’s allotted 90-minute PE lessons, typically held in the school gym under the supervision of the PE teacher. The participants were told

that their involvement was voluntary, with scores kept confidential. In addition, the participants were told ask for help if confused concerning either the instructions or the clarity of a particular item. To minimize students' tendency to give socially desirable responses, students were encouraged to answer honestly and were assured that their responses were confidential. The four measurement phases were carried out in March 2008 (Grade 7 spring), November 2008 (Grade 8 autumn), March 2009 (Grade 8 spring), and November 2009 (Grade 9 autumn) under consistent data collection arrangements.

Data analyses

Prior to statistical analyses, the normality, missing values and outliers of the data were examined. No modification due to normality or outliers was required. Missing values in several measurement points were not systematic and did not represent any particular school or group. Based on this observation, it can be assumed that missing values did not have biased effects on the final results of the path analysis.

Enjoyment contained 29.1%, intrinsic motivation 1.3%, perceived physical competence 6.4%, ego-involving motivational climate 17.0% and task-involving motivational climate 16.0% of missing values out of total 639 completed questionnaires. The high percentage of missing values for the enjoyment variable occurred because it was the final measure completed in the longitudinal sequence at Grade 9. Thirty-three students changed to other school during the time period of 2008–2009. Several scholars have advocated (e.g. Allison, 2002; Widaman, 2006) that imputation is the most practical option to deal with the data of several measurement points, because removing study units with missing values purely may remove a remarkable part of the original data. Study units containing missing values were not removed, but were imputed with the Expected Maximum (EM) imputation method (Tabachnick and Fidell, 2007). Expected maximum values were calculated for each missing value using means and standard deviations of the particular variables. Using the EM-imputation method, the units with missing values were approved for the subsequent analysis.

The hypothesized motivational model of the study was tested using the path analysis method (Amos 18.0 version), in which the maximum likelihood method was

selected for the path model analyses. Pearson's chi-square test (χ^2) was used as a test of the model's overall goodness-of-fit to the data. A non-significant difference between observed frequency distribution and theoretical distribution had an acceptable fit to the data. To determine the appropriateness of the model the root mean square residual (RMR) and the root mean square error of approximation (RMSEA), the normed fit index (NFI), the comparative fit index (CFI), the goodness-of-fit index (GFI) and the adjusted goodness of fit index (AGFI) were also examined (Arbuckle, 2006). A value of .05 or less for RMR indicate the reasonable magnitude of a varying quantity, a value .05 or less indicate a close fit of the model and values between .06–.07 for the RMSEA indicate an acceptable fit of the model in the relations to the degrees of freedom (Browne and Cudeck, 1993). The NFI, CFI, GFI and AGFI indices range from 0 to greater than 1. Fit indices greater than 0.9 are indicative of acceptable model fit. More-over, the proportion of variance predicted by independent variables for the dependent variables were investigated using squared multiple correlations (R^2).

Results

Descriptive statistics, internal consistencies and Pearson's correlations between variables were examined (Table 1). Descriptive statistics show that adolescents' perceived PE motivational climate was more task-involving than ego-involving. Task-involving climate demonstrated significant positive correlations with enjoyment, intrinsic motivation, extrinsic motivation, and perceived physical competence for both boys and girls. Ego-involving climate did not correlate significantly with any variables for girls but significant correlations were found for boys in both extrinsic motivation and task-involving climate.

Path analysis

The hypothesized motivational model revealed a non-acceptable fit for the data of girls and boys together. The next step was to formulate the most reasonable model for both groups by removing all non-significant path coefficients from the model. The final model had a good fit for the girls' data ($\chi^2 = [4] = 1.514$, $p > 0.05$; RMR = 0.010; RMSEA = 0.000; NFI = 0.99; CFI = 1.0; GFI = 1.0; AGFI = 0.99) and an acceptable fit to the model for the boys' data ($\chi^2 = [3] = 7.188$, $p > 0.05$; RMR = 0.014;

Table 1. Descriptive statistics, internal consistencies and Person's correlations (girls = 296, boys = 343).

	Gender	Mean	SD	α	1	2	3	4	5	6
1 Enjoyment	♀	3.47	.92	.92		.49***	.26***	.40***	.41***	.03
	♂	3.54	.76	.87		.44***	.22***	.29***	.45***	-.01
2 Intrinsic motivation	♀	3.13	.79	.96			.64***	.41***	.44***	.02
	♂	3.20	.65	.95			.63***	.39***	.44***	.10
3 Extrinsic motivation	♀	2.75	.76	.90				.37***	.19***	.10
	♂	2.95	.65	.91				.29***	.14**	.16
4 Physical competence	♀	3.16	.78	.90					.26***	-.04
	♂	3.43	.81	.89					.25***	.09
5 Task involving climate	♀	3.56	.74	.86						.02
	♂	3.61	.71	.87						.23***
6 Ego-involving climate	♀	2.93	.79	.87						
	♂	3.18	.63	.73						

** $p < 0.01$, *** $p < 0.001$

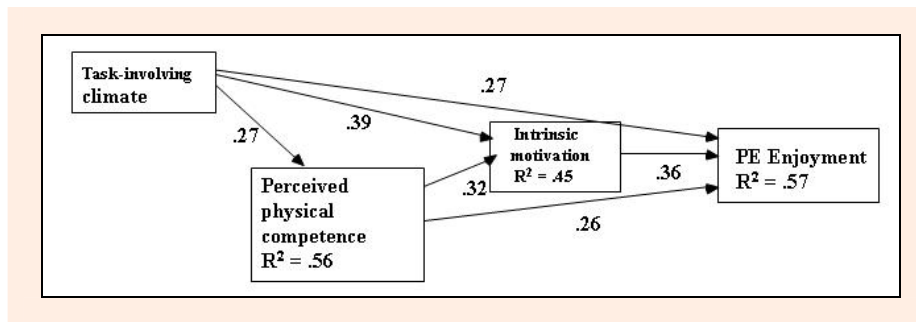


Figure 2. Path model of the study variables within girls ($n = 296$).

RMSEA = 0.064; NFI = 0.97; CFI = 0.98; GFI = 0.99; AGFI = 0.96).

The path model of the girls' data evidenced four paths from task-involving motivational climate to PE enjoyment (Figure 2). Firstly, there was a path from task-involving climate via perceived physical competence and intrinsic motivation to PE enjoyment. Secondly, the model revealed a path from task-involving motivational climate via intrinsic motivation to PE enjoyment. Thirdly, a path from task-involving motivational climate via perceived physical competence to PE enjoyment. Finally, there was a direct path from task-involving motivational climate to PE enjoyment. Squared multiple correlations showed that task-involving climate, perceived physical competence and intrinsic motivation strongly explained the variance in PE enjoyment. Task-involving climate also explained strongly the variance in perceived physical competence. Additionally, both task-involving climate, and perceived physical competence strongly explained the variance in intrinsic motivation.

The model based on the boys' data revealed four paths emanating from task-involving motivational climate (Figure 3). Firstly, a path from task-involving climate via perceived physical competence and intrinsic motivation to PE enjoyment. Secondly, a path from task-involving climate via intrinsic motivation to PE enjoyment. Thirdly, a path from task-involving climate via perceived physical competence to PE enjoyment. Finally, there was also a path from task-involving motivational climate directly to PE enjoyment. Squared multiple correlations for the model showed that task-involving motivational climate, perceived physical competence, and intrinsic motivation strongly explained the variance in PE enjoyment. Task-involving motivational climate also strongly explained the variance in perceived physical competence. Both task-involving motivational climate and perceived physical

competence moderately explained the variance in intrinsic motivation.

Discussion

Enjoyment has been identified as a significant factor underlying exercise motivation for children and adolescents to maintain their positive engagement in both PA and PE (Prochaska et al., 2003; Sallis, Prochaska and Taylor, 2000; Wallhead and Buckworth, 2004; Yli-Piipari et al., 2009). However, previous studies have revealed that adolescents' PA decreases across the secondary school years (Corbin, Pangrazi and Le-Masurier, 2004; Currie et al., 2008; Yli-Piipari, 2011). Therefore, it is important to understand how motivational climate, perceived physical competence and exercise motivation influence enjoyment in school PE. The aim of this study was to examine whether motivational climate, perceived physical competence, and exercise motivation variables predict enjoyment in school PE. It was hypothesized that the perception of task-involving climate at Grade 7 would be a positive predictor of PE enjoyment at Grade 9 via perceived physical competence and intrinsic motivation. Additionally, it was hypothesized that ego-involving climate at Grade 7 would be a negative predictor of PE enjoyment at Grade 9 via perceived physical competence and extrinsic motivation.

This study was the first, in which the effects of social-cognitive motivational factors (i.e. motivational climate, perceived physical competence, and intrinsic motivation) on PE enjoyment were analysed across the secondary school years among the same sample of adolescents. A large sample of 639 students were monitored across their entire involvement at secondary school and assessed at several key measurement points. Previous studies have been designed as available cohort investigations with samples changing across various time

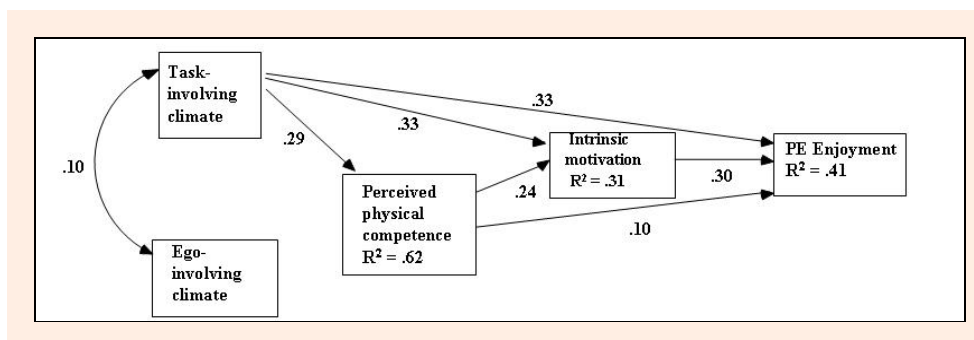


Figure 3. Path model of the study variables within boys ($n = 343$).

periods (e.g. Neumark-Sztainer, 2003) or relatively short-term interventions (e.g. Digelidis et al., 2003; Wallhead and Ntoumanis, 2004).

The findings of the current study support existing suggestions of Vallerand's (1997) model in which social factors mediated by a psychological mediator, and exercise motivation are related to positive consequences in the PE context such as fundamental movement skills (Kalaja et al., 2009), intentions to participate in optional PE courses (Ntoumanis, 2005), self-regulated motivation (Ommundsen and Eikanger-Kvalo, 2007), and concentration levels in PE (Standage, Duda and Ntoumanis, 2005). The hypothesized motivational model revealed a non-acceptable fit for the data with girls and boys together. In previous studies, PE enjoyment (Carroll and Loumidis, 2001), perceived physical competence (Carroll and Loumidis, 2001; Fairclough, 2003), extrinsic motivation (Yli-Piipari, 2011), and ego-involving motivational climate (Moreno-Murcia et al., 2011) have been shown to have statistically significant gender differences. Therefore, we used gender as a grouping variable in subsequent path analyses. As hypothesized, task-involving motivational climate predicted PE enjoyment via perceived physical competence and intrinsic motivation in both girls and boys. In particular, these results supported previous findings associated with the self-determination theory (Deci and Ryan, 1985; 1991; 2000) and the achievement goal theory (Nicholls, 1989) as demonstrated by the linking of task-involving climate in PE to perceived physical competence (Wallhead and Ntoumanis, 2004), intrinsic motivation (Digelidis and Papaioannou, 1999), and PE enjoyment (Digelidis and Papaioannou, 2002; Soini, 2006; Wallhead and Ntoumanis, 2004). The current results provide continuing support for the investigation of the Vallerand's model in the PE setting, and highlights that motivational climate is an area that requires continuing evaluation as a contributing factor in improving PE teaching.

In contrast, for the hypothesized model, ego-involving motivational climate had poor fit with the psychological outcomes in PE. Ego-involving climate did not fit either the data for the girls or boys. This finding did not support the model of Vallerand (1997), as PE lessons based on ego-involving motivational climate did not significantly influence on the level of PE enjoyment. This finding is similar to the results of the British study (Ntoumanis et al., 2005), in which they found that task-involving motivational climate was more conducive to the satisfaction of the three psychological needs compared to an ego-involving climate. Standage, Duda and Ntoumanis (2005) evidenced also that a lesser extent of perceptions of mastery climate positively impacted hypothesized mediating variables to foster self-determined motivation. Either extrinsic motivation did not fit into the hypothesized model, dissimilarly with previous findings of Ntoumanis (2002) and Standage, Duda and Ntoumanis (2005), in which non-autonomous types of motivation have been shown to be related to negative outcomes in PE. The possible reason for ego-involving climate and extrinsic motivation being removed from the hypothesized model might be the setting with several

measurement points. Although previous studies (Kalaja et al., 2009; Ntoumanis, 2005; Ommundsen and Eikanger-Kvalo, 2007; Standage, Duda and Ntoumanis, 2005) have lent some support for the Vallerand's model (1997), most of them have not been conducted using several measurement points through entire secondary school years.

The results also showed that task-involving motivational climate in PE lessons at Grade 7 had a strong association with PE enjoyment via perceived physical competence and intrinsic motivation at Grade 9 for both girls and boys. The few intervention studies previously reported have shown that task-involving motivational climate has positive effects on perceived physical competence (Weigand and Burton, 2002), exercise motivation (Jaakkola, 2002), and PE enjoyment (Wallhead and Ntoumanis, 2004). Similarly, previous research has revealed that perceived physical competence is strongly connected with both task-involving climate in PE (Wallhead and Ntoumanis, 2004) and enjoyment in PE (Carroll and Loumidis, 2001; Fairclough, 2003). The finding of this study in conjunction with previous findings are in line with the suggestion of Ferrer-Caja and Weiss (2000) that events that provide opportunities to satisfy an individual's need to perceive competence in dealing with the contextual motivational climate will maximize intrinsic motivation, and further enjoyment. Furthermore, Ferrer-Caja and Weiss (2000) proposed that adolescents who report stronger beliefs about their physical competencies are more likely to enjoy the activity than adolescents who report lower levels of physical competence. In accordance with previous research, intrinsic motivation is associated with positive behavioral consequences such as greater enjoyment in PE (Ntoumanis, 2001; Ryan and Deci, 2007; Yli-Piipari, 2011).

Additionally, PE enjoyment was explained rather strongly by task-involving climate, perceived physical competence, and intrinsic motivation among both girls and boys. These findings were congruent with the self-determination theory (Deci and Ryan, 1985; 1991; 2000) and the achievement goal theory (Nicholls, 1989), as enjoyment has been previously shown to be positively related to cognitions, such as intrinsic motivation (Vallerand, 1997; Yli-Piipari et al., 2009), perceptions of competence (Hashim, Grove and Whipp, 2008; Wankel, 1997), and task-involving motivational climate (Digelidis and Papaioannou, 2002). An interesting fact related to the current results was that PE enjoyment among girls was better explained by task-involving climate via perceived physical competence, and intrinsic motivation than for the boys. This finding is dissimilar with the findings of Carroll and Loumidis (2001), as they found that boys scored higher than girls on enjoyment in a sample of British Grade 6 students. Therefore, task-involving motivational climate could be used as a relevant method to promote perceived competence, intrinsic motivation, and further enjoyment in school PE, especially among girls.

From the point of view of PE enjoyment, school physical education could be most effective if based on

task-involving motivational climate, in which the main objective is increasing students' perceived physical competence, intrinsic motivation, and further enjoyment. In previous interventions, based on the TARGET model of Epstein (1989), task-involving methods have been shown to be valid to improve positive consequences in school PE. In the TARGET model, task- and ego-involving climate consist of certain motivational structures. These structures construct the teaching model, in which task (design of learning activities), authority (locus of decision-making), recognition (criteria for rewards), grouping (homogenous or heterogeneous ability), evaluation (criteria for success or failure), and timing (pace of instructions) create the TARGET acronym. Basically, teachers can manipulate these six features to influence the motivational climate in their PE classes to reflect either task- or ego-involving motivational climate. For instance, Wallhead and Ntoumanis (2004) found in their intervention that PE enjoyment increased in conjunction with perceived effort, perceived competence, and goal orientation when a) students chose personal skill practices from a range of offered practices, b) students were responsible for setting up equipment, c) recognition was based on individual progress, d) student worked together within same small cooperative group structure, e) student-coaches emphasized individual improvement in order to benefit team performance goals, and f) during lessons students often dictated the rate of progression through specific practices. Specifically, during the intervention, students led warm-ups, took responsibility for refereeing and the choice of tactics and team strategies, and were responsible for selecting individuals to fulfill each role of coach, referee, captain, and scorer. The results of the current study and previous practical findings support task-involving teaching methods to promote adolescent's PE enjoyment through secondary school years among both girls and boys.

A key limitation of this study is related to the use of subjective scales to evaluate the main variables. The truthfulness and accuracy of self-report measures may be compromised because some health and well-being behaviors such as PA are difficult to recall and may also be so sensitive that respondents are reluctant to provide exact details. In addition, adolescents may purposely under-report or over-report some health and well-being behaviors because they believe engaging in these behaviors is socially undesirable or desirable (Brenner, Billy and Grady, 2003). A further limitation of the study is the number of imputed missing values for the PE enjoyment variable. However, imputation was used as a method to save a remarkable part of the original data following the procedure proposed by Allison (2002), and Widaman (2006).

Future research should be directed towards the undertaking of additional longitudinal studies about the development of PE enjoyment from childhood to late adolescence, and the social-cognitive motivational processes behind PA engagement in PE. Specifically, these types of investigations could generate valuable evidence about the critical transition periods from

elementary school to secondary school and from secondary to upper secondary or vocational school. This information could be utilized in various practical applications, such as PE teacher training and the professional development of existing PE teachers by providing a clearer understanding of the development of adolescents' PA patterns and their motivational determinants.

Conclusion

The present study examined whether motivational climate at Grade 7, perceived physical competence, and intrinsic motivation at Grade 8 predict enjoyment in school PE at Grade 9. The results showed that task-involving motivational climate at Grade 7 predicted enjoyment in PE at grade 9 via perceived physical competence, and intrinsic motivation. A better understanding of the role of motivational climate may assist efforts to promote children's and adolescents' perceived physical competence, intrinsic motivation, and further PE enjoyment by task-involving climate in PE.

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Key points

- The findings of the current study support existing suggestions of Vallerand's (1997) model in which social factors mediated by a psychological mediator, and exercise motivation are related to positive consequences in the PE context.
- Task-involving motivational climate predicted PE enjoyment via perceived physical competence and intrinsic motivation with both girls and boys. Task-involving motivational climate in PE lessons at Grade 7 had a strong association with PE enjoyment via perceived physical competence and intrinsic motivation at Grade 9 for both girls and boys.
- Ego-involving climate did not fit either the data for the girls or boys, as PE lessons based on ego-involving motivational climate did not significantly influence on the level of PE enjoyment.
- The results of the current study and previous practical findings support task-involving teaching methods to promote adolescent's PE enjoyment through secondary school years. School PE could be most effective if based on task-involving motivational climate, in which the main objective is increasing students' perceived physical competence, intrinsic motivation, and enjoyment.

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