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Ntoumanis, Nikolaos

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Nikos Ntoumanis

School of Sport and Exercise Sciences

University of Birmingham, UK

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Address for correspondence:
Dr. Nikos Ntoumanis
School of Sport and Exercise Sciences
University of Birmingham
Birmingham
B15 2TT
UK

Tel: + 44 (0) 121 4147981
Fax: +44 (0) 121 4144121
E-mail: N.Ntoumanis@bham.ac.uk

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Please address all correspondence to Dr. Nikos Ntoumanis, School of Sport and Exercise Sciences, University of Birmingham, Birmingham, B15 2TT, UK. E-mail: N.Ntoumanis@bham.ac.uk

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Abstract

This study examined whether contextual and personal motivational variables, taken from self-determination theory, could predict student cognitive and affective experiences in school physical education (PE), as well as participation in optional PE in the following school year. Structural equation modeling analysis with a sample of 302 British adolescents showed that need support provided by the PE teachers was related to student need satisfaction, which in turn predicted self-determined motivation. The latter predicted directly various motivational indices and indirectly future participation in optional PE. Furthermore, MANOVA tests showed that those who opted for PE (n = 171), compared to those who did not (n = 131), reported more positive motivational experiences in the previous school year. The findings call for the promotion of self-determined motivation in PE in order to enhance student positive experiences and participation rates.

Key Words: Need satisfaction, need support, motivation, physical activity, adolescents.

It is widely acknowledged that the physical activity levels of young people are currently below the levels thought to be sufficient to promote health benefits (Cavill, Biddle, & Sallis, 2001). Research evidence from industrialized countries indicates that physical activity declines with age, with the steepest decline occurring between the ages of 13 and 18 (Sallis, 2000). In response to this evidence, national organizations such as the Centers for Disease Control and Prevention (CDC, 1997) of the US Department of Health and Human Services, and the National Audit Office (2001) in the UK have recommended that school physical education (PE) programs should play a more central role in increasing the physical activity levels of young people. This is because many children do not engage in organized physical activity programs outside school. In contrast, PE classes contain virtually all members of an age cohort with quite discrepant physical ability levels.

However, in order to increase physical activity levels, it is important that children are sufficiently, and more importantly, appropriately motivated to participate in PE lessons. Whilst most students are intrinsically motivated to participate in PE classes, there are many children who are extrinsically motivated or lack motivation to participate (Ntoumanis, 2001; Ntoumanis, Pensgaard, Martin & Pipe, 2004). In view of this evidence, the primary purpose of this study is to test a model that describes salient social-contextual conditions and personal factors that determine student levels of motivation in PE classes. Furthermore, the ability of student motivation to predict a number of important consequences, including participation in optional PE classes, is also examined.

A theoretical framework that is being increasingly used to study motivation in PE is self-determination theory (SDT; Deci & Ryan, 1985; Ryan & Deci, 2000). SDT distinguishes among three types of behavioral regulation with varying degrees of self-

determined motivation: intrinsic motivation, extrinsic motivation and amotivation. Intrinsic motivation represents the highest degree of self-determined motivation and refers to situations in which individuals freely engage in activities that they find interesting and enjoyable, and which offer the opportunity for learning (Vallerand, Pelletier, Blais, Brière, Senécal & Vallières, 1992).

In contrast, extrinsic motivation is evident when individuals perform an activity because they value its associated outcomes (e.g., public praise, extrinsic rewards) more than the activity itself. Three types of extrinsic motivation have been measured in classroom education (Vallerand et al., 1992) and in PE (Goudas, Biddle, & Fox, 1994). These are identified regulation, introjected regulation and external regulation. Identified regulation represents behaviors with high degree of self-determined motivation (Ryan & Deci, 2000). Individuals with high identified regulation have internalized the value of certain behaviors which they perform out of choice but without necessarily enjoying them. For example, some students may participate in PE because they value the importance of exercise for their health. Introjected regulation describes extrinsically motivated behaviors which have been only slightly internalized and which are performed out of feelings of guilt or shame. For example, some students may participate in PE in order not to let their parents down. Lastly, external regulation represents the lowest degree of self-determined motivation and refers to behaviors carried out in order to attain tangible rewards (e.g., social status among peers) or to avoid punishment.

The third type of behavioral regulation described by Deci and Ryan (1985) is amotivation. Whereas both intrinsic motivation and extrinsic motivation represent different degrees of volition, amotivation represents the absence of motivation. Amotivation is evident when individuals lack the intention and willingness to engage

in a particular behavior. It often results from feelings of incompetence and uncontrollability and is frequently linked to decisions to drop out of PE (Ntoumanis et al., 2004) or school altogether (Vallerand, Fortier, & Guay, 1997).

The antecedents and outcomes of the different types of motivation have been described by Vallerand (1997) in his model of motivation. According to this model, a number of social factors (e.g., autonomy-supportive or controlling teaching styles) can impact on the various types of motivation via the satisfaction of the fundamental human needs for competence, autonomy, and relatedness. Social factors that satisfy these needs will promote self-determined forms of motivation. In contrast, social factors that undermine these needs will result in controlling motivation and amotivation. In turn, the various types of motivation can predict a number of cognitive, affective, and behavioral outcomes. Usually, intrinsic motivation and identified regulation predict the most positive outcomes, whereas amotivation and external regulation predict the most negative outcomes (Vallerand, 1997).

An important behavioral outcome that has been assessed in classroom education (e.g., Vallerand & Bissonnette, 1992; Vallerand et al., 1997) and sport (e.g., Pelletier, Fortier, Vallerand, & Brière, 2001; Sarrazin, Vallerand, Guillet, Pelletier, & Cury, 2002) is persistence (or drop out). For example, Vallerand et al. (1997) found support for a motivational model of high school drop out in a sample of 4537 Canadian students. The results of structural equation modeling analysis showed that the degree of autonomy support provided by parents, teachers, and the school administration influenced students' reported satisfaction of their needs for competence and autonomy (relatedness was not assessed). In turn, these two need satisfaction variables positively predicted an index of self-determined academic motivation. Finally, the more self-determined the students were the less likely they were to intend

to drop out of high school. These behavioral intentions positively predicted ($\beta = .24$) students' actual drop out behavior a year later.

Two studies have replicated the prospective design used by Vallerand et al. (1997) to examine drop out behavior (or persistence) in youth sport. Pelletier et al. (2001) used a prospective two-year design to examine persistence in competitive swimming in a sample of predominantly adolescent Canadian swimmers. The results of structural equation modeling analysis showed that swimmers' perception of coaches' autonomy support positively predicted self-determined motivation (intrinsic motivation and identified regulation), and unexpectedly, introjected regulation. In contrast, swimmers' perception of coaches' controlling style predicted swimmers' amotivation, external regulation, and introjected regulation. Self-determined motivation predicted participation in swimming at two follow-ups (10 and 22 months later). Introjected regulation was a positive predictor of persistence at 10 months, but not at 22 months. External regulation and amotivation were negative predictors of persistence at the second follow-up and both follow-ups respectively. Lastly, mean comparisons between persistent and drop out swimmers showed that the former had higher intrinsic motivation and identified regulation and lower external regulation and amotivation compared to the latter. No differences in introjected regulation were found. Pelletier et al. (2001) did not assess the three psychological needs which are postulated by SDT to mediate the effects of social factors on motivational regulations. Furthermore, autonomy support is only one aspect of the means by which coaches influence athletes' motivational experiences and behaviors.

In a subsequent study, Sarrazin et al. (2002) also tested a motivational model of drop out of sport (handball) with a sample of 335 French female adolescents. This study integrated aspects of SDT and achievement goal theory (e.g., Nicholls, 1989;

Ames, 1992). Sarrazin et al. (2002) examined the social factor of motivational climates (Ames, 1992), that is, whether coaches are perceived to evaluate and reward their athletes on the basis of task (self-referenced) or ego (comparative) competence criteria. The results of structural equation modeling analysis showed that a task-involving motivational climate was more conducive to the satisfaction of the three psychological needs compared to an ego-involving climate. Of the three need satisfaction variables, autonomy, and to a much lesser extent competence and relatedness, predicted an index of self-determined motivation. In turn, the latter negatively predicted behavioral intentions to drop out of handball. Twenty-one months later, 22% of the handball players dropped out of their sport. The path from behavioral intentions to drop out behavior was moderate ($\beta = .55$). Comparison of mean scores between persistent players and drop outs showed that the former perceived the motivational climate as being more task-involving, experienced greater satisfaction of their three psychological needs, and reported higher intrinsic motivation and lower amotivation and intentions to drop out.

The studies by Pelletier et al. (2001) and Sarrazin et al. (2002) are interesting because they clearly show the importance of contextual and personal motivational factors in predicting drop out behavior in sport. However, it is important to assess multiple outcomes, and not only intention and behavior, in order to have a more comprehensive understanding of how personal and environmental factors affect individuals' motivational experiences. Furthermore, both studies, as well as the study by Vallerand et al. (1997), relied exclusively on self-reports which inadvertently inflate common method variance. Admittedly, from a theoretical viewpoint, self-reports are more appropriate. This is because SDT argues that student perception of significant others' autonomy support is a more important determinant of their

motivational experiences compared to "objective" measures of autonomy support. Furthermore, self-reports are needed to assess students' motivational regulations as well as the degree to which their needs have been satisfied. However, in terms of student behavior, some more "objective" measures (e.g., teacher ratings) can be used.

In sum, the primary purpose of the present study was to expand on previous studies on dropout (Pelletier et al., 2001; Sarrazin, et al., 2002; Vallerand et al., 1997) by looking at multiple antecedents of self-determined motivation and how the latter can predict a number of important consequences, including drop out/participation in optional PE programs. More specifically, whilst most of the past research has restricted the examination of socio-contextual antecedents of motivation to autonomy support (or the lack of it), this study also assessed the extent to which PE teachers emphasized task-involving criteria for success and promoted cooperative learning (Ames, 1992). Research by Ntoumanis (2001) has shown that the emphasis PE teachers place on individual improvement criteria (e.g., mastering new or difficult skills) can result in student competence need satisfaction by reducing the controlling nature of interpersonal ability comparisons. In addition, the promotion of learning via student cooperation can result in stronger feelings of relatedness among students. In terms of the motivational outcomes assessed, besides intention and behavior which were measured in previous studies on drop out, this study also assessed levels of negative affect, concentration in the class, and effort. These variables were chosen because they have been shown to be indicators of student interest and investment in learning (e.g., Ferrer-Caja & Weiss, 2000; Ntoumanis, 2001). Lastly, similar to previous aforementioned research on dropout, a secondary purpose of this study was to examine whether there were significant mean differences between participants and

non-participants of optional PE courses in a number of motivational indices tapping experiences in compulsory PE in the previous school year.

A SDT-based motivational model was tested which hypothesized that the degree to which PE teachers supported their students' needs would predict the latter's need satisfaction. The indicators of need support were autonomy support, teacher emphasis on individual improvement criteria, and promotion of cooperative learning. It was also hypothesized that student need satisfaction would predict an index of self-determined motivation. In turn, it was expected that self-determined motivation would negatively predict negative affect, and positively predict student levels of concentration and effort in the class as well as their intentions to participate in optional PE. Lastly, it was expected that behavioral intentions would positively predict actual behavioral choices. In terms of mean differences between participants and non-participants, it was hypothesized that the participants would rate their past experiences in compulsory PE as more adaptive. More specifically, it was expected that the participants would report that their teachers used more task-involving criteria for success (see Sarrazin et al., 2002) and were more autonomy supportive compared to the teachers of the non-participants. Furthermore, the participants were expected to report greater need satisfaction, more self-determined motivation, and less controlling motivation and amotivation compared to the non-participants. Lastly, the participants were predicted to report more adaptive affective, cognitive and behavioral experiences in compulsory PE.

Method

Participants

The participants were 460 (females *n*= 145; males *n* = 315) British 15-year old school students from eight schools in the North of England. Almost all students were Caucasians. As explained in the *Procedure* below, follow-up information regarding participation status was obtained from 302 of those students. With the exception of the confirmatory factor analyses which used the full sample, all other analyses reported in the *Results* used the sub-sample of 302 students.

Measures

Learning Climate Questionnaire (LCQ; Williams & Deci, 1996). The short form of the LCQ (6 items) was used to measure student perceptions of the autonomy support provided by their PE teachers. The wording of the items was adapted to be applicable to PE classes. An example item is "My PE teachers encourage me to ask questions". Each item was measured on a five-point scale (1= *strongly disagree;* 5 = *strongly agree*). Williams and Deci (1996) reported that an exploratory factor analysis of the long form of the LCQ (15 items) produced one factor which had a Cronbach's alpha coefficient of .96.

Perceived Motivational Climate in Sport Questionnaire-2 (PMCSQ-2; Newton, Duda, & Yin, 2000). Two facets of a task-involving motivational climate were measured with a PE adaptation of the PMCSQ-2. These facets were the emphasis by the PE teachers on individual criteria for student improvement and the extent to which they promote cooperative student learning. An example item of the former factor is "In this PE class, the PE teacher makes sure students improve on skills they're not good at". An example item of cooperative learning is "In this PE class, students help each other learn". Both factors were measured on five-point scales (1= *strongly disagree*; 5 = *strongly agree*). Evidence for the validity of the PMCSQ-2

has been provided by Newton et al. (2000). In the same study, both factors were shown to have adequate internal reliability coefficients.

Basic Need Satisfaction Scale (BNSC; Deci, Ryan, Gagné, Leone, Usunov, & Kornazheva, 2001). This is a 21-item questionnaire that taps perceptions of competence (6 items), relatedness (8 items), and autonomy need satisfaction (7 items). The scale was used by Deci et al. (2001) to measure need satisfaction at work but it was modified in the present study to assess need satisfaction in PE. Example items are: "I feel like I can make a lot of inputs to deciding what to do in PE" (autonomy), "I really like the students I exercise with in PE" (relatedness), and "I have been able to learn interesting new skills in PE" (competence). All factors were measured on seven-point scales (1= *not at all true;* 7 = *very true*). Deci et al. (2001) reported adequate alpha coefficients for the three factors with a US sample, however, with a Bulgarian sample the alphas for relatedness and autonomy were low (α = .57 and α = .57 respectively).

Self-Regulation Questionnaire (SRQ; Goudas et al., 1994). To measure the different types of motivation postulated by SDT, a questionnaire presented by Goudas et al. (1994) was used. This questionnaire adapted to PE the Self-Regulation Questionnaire (Ryan & Connell, 1989) which measures intrinsic motivation, as well as identified, introjected and external regulations in the classroom. Furthermore, Goudas et al. (1994) adapted to PE the amotivation subscale of the Academic Motivation Scale (Vallerand et al., 1992). The students in the present study responded to 20 items measured on scales ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). Each item followed the stem "I take part in PE …". Example items are ''because PE is fun" (Intrinsic Motivation), ''because I want to improve in sport" (Identified Regulation), ''because I would feel bad about myself if I didn't"

(Introjected Regulation), ‘‘so that the teachers won’t yell at me” (External Regulation), and ‘‘but I can’t see what I am getting out of PE” (Amotivation). The adapted SRQ 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 alpha coefficient is usually slightly below .70 (e.g., Goudas et al., 1994; Ntoumanis, 2001).

Negative Affect in PE. Four adjectives which measure negative affect (e.g., “disappointed”, “embarrassed”) were used to assess typical negative affect experienced by students in PE. These adjectives were taken from Ebbeck and Weiss (1998). Each adjective was assessed on a five-point scale ranging from 1 (*never*) to 7 (*always*). Participants responded to the stem “In this PE class I feel….” Ebbeck and Weiss (1998) have provided psychometric evidence for the use of these items in youth sport.

Concentration in the PE Class. Three items were written in the present study to measure students’ concentration in PE classes. An example item is “In PE I concentrate on the skills/tasks I have to do”. Each item was assessed on a seven-point scales (1= *strongly disagree*; 7 = *strongly agree*).

Intention to Participate in Optional PE. Two items were written in the present study to measure students’ intention to participate in optional PE classes in the following school year. An example item is “I intend not to do PE next year”. Each item was assessed on a seven-point scale (1= *strongly disagree; 7 = strongly agree*).

Teacher Rating of Students’ Effort. The PE teachers were asked to provide an overall rating of each student’s levels of effort in PE. For each student, one PE teacher provided a single rating on a seven-point scale (1= *no effort at all*; 7 *exceptionally high levels of effort*). The PE teachers were told that an objective of the study was to

assess how hard the students try to improve their skills and whether they "give their best" during PE lessons.

Procedure

Informed consent was obtained from the participants and the Head Teacher of each school. The questionnaires were administered at the start of a PE lesson. Prior to questionnaire administration the students were told that their responses would be kept confidential and that they could decline to participate or withdraw at any time. The questionnaires were administered in late spring/early summer to 460 fifteen-year old students ("Year 11" students, according to the British school system). In the fall of the same year, the schools were contacted and were asked to confirm whether the students had enrolled on an optional "Year 12" PE program. In Great Britain, after the age of 16 years, participation in PE is optional. Academic, that is, science-based PE programs ("A level PE") offered by some schools to 16 year olds were not targeted, because the purpose of this study was to focus on health-enhancing physical activity programs. To protect anonymity, the students were matched based on their dates of birth, gender, and school identification. It was possible to obtain information for 302 students (females $n = 91$; males $n = 211$) of whom 171 (females $n = 39$; males $n = 132$) chose to enroll on an optional PE program. There are various reasons why it was not possible to obtain information for the remaining 158 students[1] (females $n = 54$; males $n = 104$): a) some students dropped out of school altogether, b) others relocated to a different part of the country, and c) some other students moved to a different school in the same area, but the new school declined to provide the necessary information.

Results

Preliminary analyses

Confirmatory factor analysis using the full sample of 460 participants was carried out for all scales to examine their factorial structure. To evaluate model fit, the two-index presentation strategy was used (Hu & Bentler, 1999). According to this strategy, the Standardized Root Mean Square Residual (SRMR) should be used along with one or more incremental or absolute fit indices to evaluate the fit of the confirmatory factor model. Hu and Bentler (1999) found that among all fit indices, the SRMR is the most sensitive to misspecification in both simple and complex models, and is less sensitive to sample size and violations of distributional assumptions. According to Hu and Bentler (1999), a value close to .08 for SRMR, combined with a value close to .95 for the Comparative Fit Index (CFI) and a value close to .06 for the Root Mean Square Error of Approximation (RMSEA), are indicative of good model fit.

For brevity reasons the results of the confirmatory factor analyses are not presented here, but are available upon request. All scales were found to have satisfactory fit indices with the exception of the need satisfaction scale whose fit indices were very poor: Sattora-Bentler χ^2 (186) = 838.60, $p < .001$; SRMR= .11; CFI= .70; RMSEA= .10. Inspection of the modification indices and the standardized loadings suggested the removal of all negatively worded items. Therefore, these items (3 from each need satisfaction subscale) were excluded from any further analyses. The revised need satisfaction scale had a satisfactory model fit: Sattora-Bentler χ^2 (186) = 838.60, $p < .001$; SRMR= .06; CFI= .93; RMSEA= .06.

Descriptive statistics and internal reliability coefficients (Cronbach's α) for the 302 participants are presented in Table 1. The descriptive statistics and alphas for the full sample of 460 students were almost identical and are not presented here.

According to Table 1, the participants' mean scores were slightly above the midpoint for all variables with the exception of amotivation, external regulation, introjected regulation and negative affect. The teachers' average ratings of student effort were moderate to high. The alpha coefficients for all the subscales were satisfactory with the exception of competence need satisfaction and introjected regulation whose reliabilities were marginal. The intercorrelations (see Table 2) among the need support factors and among the need satisfaction factors were moderate in size. Of the three need satisfaction variables, competence had in general the highest correlations with the need support factors. The three need satisfaction variables were positively correlated with self-determined motivation regulations and negatively with amotivation and external regulation. Negative affect was positively correlated with amotivation and external regulation and negatively with self-determined motivation regulations. The opposite pattern of relationships was observed between concentration, future intentions, participation status and the motivational regulations.

Testing a Motivational Model of Participation in Optional PE

A motivational model of participation in optional PE classes was constructed based on Vallerand's (1997) model of motivation and previous work by Pelletier et al. (2001), Sarrazin et al. (2002) and Vallerand et al. (1997). The model (see Figure 1) postulated that need support by PE teachers would relate to students' satisfaction of their psychological needs, which in turn would predict self-determined motivation. The latter was hypothesized to predict positive motivational consequences, such as high levels of concentration in the class, effort (as rated by the PE teachers), and intention to participate in optional PE classes in the following school year. Positive intentions were hypothesized to predict actual behavioral decisions to participate in optional PE.

A consideration in the present study was the ratio of the number of participants per estimated parameter. According to Bentler and Chou (1987), a ratio of 5:1 is considered as a minimum. To achieve this ratio, it was decided to collapse some scales. Following the example of Deci et al. (2001) and Gagnè (2003), an overall need satisfaction factor was postulated underpinned by the three composite scores representing the three psychological needs[2]. Furthermore, in the same way, an overall need support factor was created whose indicators were the three composite scores reflecting the extent to which the PE teacher supported students' autonomy, gave emphasis on individual criteria for improvement, and promoted student cooperative learning[3]. Following the example of many previous studies (e.g., Sarrazin et al. 2002; Standage, Duda, & Ntoumanis, 2003; Vallerand et al., 1997) an overall self-determination index was created with four indicators (see Vallerand, 1997). Higher scores on this index reflect higher levels of self-determined motivation.

The proposed model was tested with EQS 6.1 using structural equation modeling with robust maximum likelihood estimation method (Mardia's normalized estimate of multivariate kurtosis = 16.27). The ratio of sample size to estimated parameters was approximately 6:1 which is considered acceptable (Bentler & Chou, 1987). The results of the structural equation modeling analysis revealed that the hypothesized model fit the data relatively well but there was room for improvement: Sattora-Bentler χ^2 (204) = 393.42, $p < .001$; SRMR= .07; CFI= .91; RMSEA= .06. The modification indices suggested the addition of a path from teacher ratings to participation status which seemed appropriate. Furthermore, it was suggested that covariance links should be added between the errors of autonomy support and need for autonomy, and between the errors of cooperative learning and relatedness need satisfaction. These covariations were added in the model because links between the

two sets of variables have also emerged in studies by Ntoumanis (2001) and Standage et al. (2003). After implementing the changes suggested by the modification indices the model fit improved: Sattora-Bentler χ^2 (201) = 332.15, $p < .001$; SRMR= .07; CFI= .94; RMSEA= .05[4, 5]. No other changes suggested by the modification indices made theoretical sense[6].

An alternative model was also tested which included autonomy support, cooperative learning, improvement, autonomy, relatedness and competence need satisfaction, instead of the generic need support and need satisfaction factors. The model postulated a path from autonomy support to autonomy, from cooperative learning to relatedness, and from improvement to competence (see Ntoumanis, 2001). The three need satisfaction factors were hypothesized to predict self-determined motivation. The rest of the model was similar to the one presented in Figure 1. The ratio of participants to estimated parameters was very small (3.25). With the exception of the paths from autonomy and relatedness to self-determined motivation, all other paths were significant. However, the model did not fit the data well: Sattora-Bentler χ^2 (768) = 1142.61, $p < .001$; SRMR= .09; CFI= .88; RMSEA= .05. No changes suggested by the modification indices made theoretical sense. Therefore, the model was not explored further[4].

Motivational Differences Between Participants and Non-Participants

A secondary purpose of this study was to examine differences between those who chose optional PE and those who did not in terms of need support, need satisfaction, motivational regulations and certain motivational outcomes in the previous school year. As previous research has shown mean gender differences in many of the variables under investigation (e.g., Pelletier et al. 2001, Vallerand et al., 1997), and

because chi-square analysis indicated that there were significantly more males who opted for PE (χ^2= 10.05; p <.01), participation status was examined in conjunction with gender. Four two-way MANOVA tests were carried out looking at participation and gender differences in need support (autonomy support, cooperative learning, individual improvement), need satisfaction (competence, relatedness, autonomy) motivational regulations (intrinsic motivation, identified regulation, introjected regulation, external regulation, amotivation) and motivational consequences (negative affect, teacher ratings of effort, concentration, future intentions) respectively. An advantage of MANOVA over a series of ANOVA's is the protection against inflated Type I error due to multiple testing (Tabachnick & Fidell, 2001). In each MANOVA, following a significant omnibus test for main effect or interaction, Bonferroni adjustments were carried out to further protect against Type I error (see Table 3).

With regard to need support, only the main effect for participation status was significant: Hotelling's t = . 04; F (3, 295) = 4.28; p < .01; partial η^2 =.04. Follow-up analysis (see Table 3) showed that the participants reported significantly higher perceptions of teacher emphasis on student individual improvement criteria compared to the non-participants. No differences in autonomy support or cooperative learning were found. In relation to need satisfaction, there were significant effects for participation status (Hotelling's t = . 08; F (3, 293) = 7.83; p < .001; partial η^2 =.07), gender (Hotelling's t = .05; F (3, 293) = 4.64; p < .01; partial η^2 =.05), as well as for the interaction between age and gender (Hotelling's t = .03; F (3, 293) = 2.85; p < .05; partial η^2 =.03). Follow-up analysis (see Table 3) showed that the participants reported significantly greater competence, relatedness and autonomy need satisfaction compared to the non-participants. The only significant gender difference in need satisfaction was found with regard to relatedness with females scoring higher than

males. An interesting interaction also emerged between gender and participation status predicting autonomy need satisfaction. Whereas male participants and non-participants had very similar scores in autonomy need satisfaction (M = 4.08 and M = 4.12 respectively), female participants had substantially higher scores than female non-participants (M = 4.59 and M = 3.84 respectively).

The MANOVA test for motivational regulations showed significant main effects for participation status (Hotelling's t = .16; F (5, 290) = 8.99; p < .001; partial η^2 =.13) and gender (Hotelling's t = .09; F (5, 290) = 5.02; p < .001; partial η^2 =.08), but the interaction effect was not significant. More specifically, the participants were less amotivated and more self-determined compared to the non-participants. Surprisingly, no differences in controlling motivation were found. Furthermore, males scored significantly higher on intrinsic motivation compared to females. Lastly, with regard to the motivational outcomes assessed in this study, the MANOVA test revealed a significant main effect for participation status only: Hotelling's t = .17; F (4, 281) = 11.96; p < .001; partial η^2 =.15. The participants reported stronger intentions to opt for optional PE in Year 12 and their efforts in the class were rated higher by their teachers compared to the non-participants. No differences in negative affect or concentration levels were found.

Discussion

The primary purpose of this study was to test a motivational model of participation in optional PE classes grounded in SDT and Vallerand's (1997) model of motivation. The results showed that PE teachers' support of students' psychological needs for competence, relatedness and autonomy predicted student need satisfaction. Need satisfaction was related to greater self-determined motivation which in turn was linked to positive affective, cognitive, and behavioral indices, as well as to positive

intentions to participate in optional PE courses in the following school year. Lastly, there was a moderate path from behavioral intentions to actual behavioral decisions. The large path coefficient from need support to need satisfaction could be partly attributed to the common underlying conceptual theme (i.e., psychological needs) of the two factors. This coefficient could have been problematic if there was substantial similarity in the item wording of the two factors. However, this was the case only between some items of the autonomy support and autonomy need satisfaction indicators. There was no similarity in the wording of the other indicators of the two factors.

The results indicated that there were significant correlated errors between autonomy support and autonomy need satisfaction, and between cooperative learning and relatedness need satisfaction. Such correlations imply that there is shared variance among these variables that cannot be accounted for by the two underlying factors. Such shared variance could be due to methodological reasons, such as the similarity in the wording of some indicators, or could reflect substantive reasons, such as the presence of additional factors (Gerbing & Anderson, 1984). However, the alternative model which postulated three separate need support factors and three need satisfaction factors did not result in improved model fit. Despite the measurement perplexities, both models showed that PE teachers can play an important role in supporting students' psychological need satisfaction.

The results also showed that need satisfaction predicted self-determined motivation. This is in accordance with SDT (Deci & Ryan, 1985) which postulates that the satisfaction of the needs for competence, autonomy and relatedness is essential for intrinsic motivation and self-determination. Furthermore, in agreement with Vallerand's model (1997), self-determined motivation was found to predict

positive motivational outcomes. More specifically, self-determined motivation positively predicted levels of concentration in the class. This finding makes conceptual sense, because students who enjoy PE or appreciate its value will pay more attention to the teachers and will concentrate on the tasks at hand, compared to those who feel pressured or amotivated to participate in the lesson.

Furthermore, self-determined motivation was a negative predictor of negative affect and a positive predictor of student effort. These findings also make conceptual sense since individuals with high self-determined motivation do not feel guilty, pressured, or bored to participate in PE. Similar relationships between self-determined motivation and negative affect indices have been reported by Ntoumanis (2001) and Standage et al. (in press). The positive path between self-determined motivation and effort was also theoretically expected. Although internally controlling regulations can also predict what Ryan, Koestner and Deci (1991) labeled ego- involved (i.e., means-end) persistence, this is usually the case in experimental situations and for relatively short periods of time when one's self-worth is at stake. However, over the course of a school year, self-determined motivation is needed to sustain high levels of effort. The relatively weak path between self-determined motivation and effort might be due to a number of reasons. First, teacher ratings were obtained as opposed to student self-reports, reducing common method variance which inflates the strength of relationships. Second, it is possible that for various reasons teachers did not hold accurate perceptions of student effort. Third, a multi-item rating scale could have improved the reliability of the teacher ratings and could have potentially increased the size of the path coefficient between self-determined motivation and student effort.

One of the most interesting parts of the model was the significant path coefficient between intention to participate in optional PE courses and actual

behavioral choices. The path was positive indicating that holding positive behavioral intentions, based on need satisfaction and self-determined motivation, can lead to actual decisions to be physically active in PE. The size of the path coefficient was moderate in size; larger than the one reported by Vallerand et al. (1997), but smaller than the coefficient reported by Pelletier et al. (2002). An explanation for the modest size of the coefficient is that when the students reported their intentions to join optional PE programs in the following school year they were not aware of the type of sport activities that would be on offer. Perhaps if they were aware of the type of available activities the path coefficient would have been stronger. In addition, the modest path coefficients might reflect changes in students' priorities that took place after the spring data collection. Students in this age group start preparing for schools exams which can influence their future admission to University programs. Therefore, it is possible that some students might have decided to invest more time preparing for such exams as opposed to enroll in optional physical activity programs. From a public health perspective, it is important that future research examines whether the majority of students who do not participate in optional PE programs adopt a sedentary lifestyle, or whether they remain physically active in sport clubs outside schools. Obviously, in the latter case there is not much cause for concern. However, children who report negative experiences in PE because of low perceived ability, overemphasis on competition or social evaluation concerns, are unlikely to be physically active in or out of school (Ntoumanis et al., 2004).

A secondary purpose of this study was to examine differences between participants and non-participants of optional PE classes in terms of their motivational experiences in compulsory PE in the previous school year. The results were largely supportive of the study's hypotheses by showing that the participants reported more

motivationally optimal past experiences in PE. Although most significant differences (see Table 3) were small or moderate in size, such differences are meaningful because they are associated with participation in optional PE programs.

The participants reported significantly higher perceptions of teacher emphasis on individual (self-referenced) improvement criteria for student evaluation and recognition. Self-referenced criteria, which are promoted in task-involving motivational climates, are relatively controllable (Papaioannou & Goudas, 1999). Therefore, students who are evaluated and rewarded on the basis of such criteria are likely to report high levels of effort and persistence. Spray (2000) also found that participants in optional PE courses reported significantly higher perceptions of task-involving climate in compulsory PE compared to non-participants. There was also a non-significant trend (after the Bonferroni adjustment was applied) in the present findings indicating that participants perceived higher levels of autonomy support in the past by their PE teachers. Whilst autonomy support (e.g., granting students leadership roles or involving them in decision making) might benefit students who have some experience with particular sport activities or skills, it might be less effective with students who lack sport experience. In such situations, supporting student autonomy will have little effect on their motivation unless there is a certain degree of guidance and structure from their PE teachers. Reeve (2002) also argued that student motivation is optimal under conditions in which teachers provide optimal structure along with high autonomy support. Therefore, it would be informative if future studies examined whether autonomy support and structure can play a complimentary role in promoting motivation in PE classes.

In accordance with the study's hypotheses and previous research (e.g., Sarrazin et al., 2002), the participants reported significantly higher competence,

relatedness and autonomy need satisfaction in compulsory PE compared to the non-participants. Perceptions of competence are very important in PE because variations in physical ability level can be easily observed. Therefore, those students who feel physically competent are more likely to find P.E. interesting and fun, and, given the choice, will continue to participate in PE (hence, the medium effect size for competence need satisfaction). Relatedness is also important because young people often form friendships through their sport participation (Smith, 2003). Lastly, the participants reported greater autonomy need satisfaction compared to the non-participants. However, this difference was overshadowed by a significant gender by participation status interaction which indicated that autonomy need satisfaction was related to differences in participation status in females only. Prusak, Treasure, Darst and Pangrazi (2004) have also highlighted the role of gender when examining autonomy and choice in PE classes. The authors argued that adolescent girls are particularly underserved by traditional PE offerings, but their motivation can be increased if they are offered choices.

The participants were also significantly less amotivated and more self-determined compared to the non-participants. This finding is in line with existing results in the literature. For example, in an interview study of highly amotivated children, Ntoumanis et al. (2004) found that one of the various manifestations of amotivation in PE was the low intention of amotivated children to be physically active in the future. In contrast, intrinsic motivation and identified regulation have been found to correlate with intentions to be physically active (Chatzisarantis, Hagger, Biddle, Smith & Wang, 2003), as well as with self-reported physical activity behavior (Chatzisarantis, Hagger, Biddle, & Karageorghis, 2002). Contrary to the study's hypothesis (which was based on SDT), there were no differences between participants

and non-participants in external regulation and introjected regulation. Sarrazin et al. (2002) also found no differences between persistent handball players and drop outs in introjected and external regulations, whereas Pelletier et al. (2001) found differences between persistent swimmers and drop outs in external regulation only. It is possible that controlling motivation predicts better avoidance of non-desirable activities as opposed to choice of desirable activities. This possibility should be explored by future research. In fact, in the two studies by Chatzisarantis et al. (2002, 2003), intention to be physically active and actual physical activity correlated substantially higher with self-determined motivation than with controlling motivation.

In accordance with the study's hypotheses, the participants exhibited more effort in the class during the previous school year and had stronger behavioral intentions to participate in PE compared to the non-participants (the effect sizes for effort and intention were moderate). The finding that students who chose optional PE courses had received in the past higher ratings of effort from their PE teachers makes intuitive sense. However, it is not clear the extent to which a behavioral confirmation process was in operation (Pelletier & Vallerand, 1996). For example, it is possible that students who were perceived by their teachers to be self-determined were rated higher by their teachers or were given more attention compared to less self-determined students. Increased teacher attention may well explain why self-determined students exerted more effort and were more likely to choose PE compared to students whose teachers perceived them to be less self-determined. Ratings of student effort by independent observers could be used in future studies in conjunction with teacher and student ratings. The results of this study also showed a non-significant trend (after the Bonferroni adjustment was applied) indicating that participants reported lower negative affective experiences in compulsory PE compared to non-participants. In the

SDT framework, emotions are considered as sources of information that precede and energize behavior (Deci & Ryan, 1985). Negative affective experiences in PE, such as boredom or anxiety, have been previously related to amotivation (Ntoumanis et al., 2004). Further research is needed to examine whether such negative affective experiences are also associated with future behavioral choices. The lack of significant differences in concentration levels between participants and non-participants could be due to the possibility that even though some students may lack intrinsic interest in PE, they have to retain some levels of concentration during the class because of the interactive nature of many sport skills. Future research could use more sensitive measures of concentration which will assess the frequency with which students are distracted by non-relevant stimuli and thoughts during lessons.

Similar to Pelletier et al. (2001), very few significant gender differences emerged in the variables of interest. Specifically, males reported significantly higher intrinsic motivation and lower relatedness need satisfaction compared to females. However, all associated effect sizes were very small indicating that gender did not play a contributing role in the present findings. Nevertheless, chi-square analysis showed that males were more likely to opt for optional PE than females. This could be due to the fact that PE activities are traditionally oriented toward competitive team sports which males tend to favor.

Although causal inferences cannot be drawn from this study, the results are useful because they are in line with findings of previous studies on dropout (e.g., Vallerand & Bissonnette, 1992; Vallerand et al., 1997; Pelletier et al., 2001; Sarrazin et al., 2002). Besides the non-causal nature of the presented evidence, a further limitation of this study is that the analysis did not take into consideration the nested structure of the data (i.e., students are nested within classes which are nested within

schools). Unfortunately, no information on student classes was obtained. Although schools could have been used as a contextual variable, such analysis would have produced an inaccurate estimate of the variation at the contextual level due to the very small number of schools (see Heck & Thomas, 2000). Future research with larger number of contextual units should employ multilevel structural equation modeling to examine the drop out model at both the between and within group levels. Future research should also examine the contextual factors that determine the extent to which PE teachers will provide need support (see Pelletier, Séguin-Lévesque, & Legault, 2002, on predictors of autonomy support in the classroom). Furthermore, the reciprocal effects of teacher motivation on student motivation (see Skinner & Belmont, 1993) should be investigated in the context of PE. Also, in addition to teachers, the influence of peers on student motivation should be examined. Research looking at how peer interactions affect children's motivation in youth sport and PE is limited. Lastly, in line with Reis, Sheldon, Gable, Roscoe, and Ryan's (2000) work, longitudinal studies are needed to capture fluctuations in need satisfaction and their effects on student motivation across the school year.

In conclusion, the findings of this study underline the importance of need support by PE teachers, student need satisfaction and self-determined motivation for the experience of positive motivational outcomes in compulsory PE. Furthermore, the findings show that self-determined motivation can predict intentions to participate in optional PE and actual participation status. 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.

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Footnotes

1. A comparison between the 302 students for whom participation status information was obtained in the fall and the 158 students for whom such information could not be obtained, showed that the latter were more amotivated and had lower teacher ratings of effort. There were no significant mean differences in any of the other variables reported in Table 1.

2. A hierarchical confirmatory factor analysis with three first-order factors (autonomy, relatedness, and competence) underpinning a second-order factor (need satisfaction) achieved a good model fit: Sattora-Bentler χ^2 (51) = 133.23, p < .001; SRMR= .06; CFI= .94; RMSEA= .06.

3. A hierarchical confirmatory factor analysis with three first-order factors (autonomy support, cooperative learning and improvement) underpinning a second-order factor (need support) achieved a good model fit: Sattora-Bentler χ^2 (62) = 133.32, p < .001; SRMR= .05; CFI= .94; RMSEA= .05.

4. An anonymous reviewer suggested that a model without need satisfaction should be tested because he/she considered this variable as somewhat redundant in the presence of need support. However, the fit of this model was not satisfactory, as evidenced by the poor SRMR and CFI values: Sattora-Bentler χ^2 (145) = 286.49, p < .001; SRMR= .15; CFI= .92; RMSEA= .06. More importantly, from a SDT viewpoint both need support and need satisfaction are critical variables in the model. Need satisfaction describes innate personal characteristics through which contextual variables predict one's self-determination. A model without need satisfaction would not be a SDT-based model.

5. The same reviewer suggested examining whether self-determined motivation mediated the effect from need satisfaction on participation status. To this respect, a

model was tested in which need satisfaction (independent variable) predicted self-determined motivation (mediator) and participation status (outcome). Furthermore, a path between self-determined motivation and participation status was also added. The mediation was evaluated following Brown's (1997) recommendation for testing mediation effects in SEM. The results showed a significant path between need satisfaction and self-determined motivation (β = .68; p <. 01) and between self-determined motivation and participation status (β = .29; p <. 01). Furthermore, the path between need satisfaction and participation status was not significant (β = .04; p >.05). In fact, a decomposition analysis showed that most of this effect was indirect through self-determined motivation (total effect: β = .24; p <. 05, indirect effect: β = .20, p <. 05). These results indicate that self-determined motivation mediated the effect from need satisfaction to participation status.

6. Due to the results of the chi-square and MANOVA analyses showing some significant gender differences, the analysis was repeated controlling for gender. The path coefficients as well as the fit indices were largely the same: Sattora-Bentler χ^2 (216) = 323.49, p < .001; SRMR= .07; CFI= .94; RMSEA= .05. A multisample analysis was not carried out due to the small number of females (n = 91) for whom data were available at both time points.

7. Parceling item indicators did not result in substantial improvement in model fit.

Table 1

Means, Standard Deviations, and Cronbach's Alphas for All Variables

	α	*M*	*SD*
Autonomy Support	.81	3.10	0.70
Cooperative Learning	.70	3.32	0.69
Improvement	.70	3.54	0.68
Competence Need Satisfaction	.66	4.34	1.13
Autonomy Need Satisfaction	.70	4.12	1.08
Relatedness Need Satisfaction	.84	4.74	1.06
Amotivation	.83	2.95	1.48
External Regulation	.82	3.40	1.50
Introjected Regulation	.64	3.44	1.17
Identified Regulation	.83	4.62	1.36
Intrinsic Motivation	.86	4.86	1.34
Negative Affect	.80	2.51	1.19
Future Intentions	.70	4.18	1.79
Concentration	.72	4.75	1.03
Teacher Ratings of Student Effort	-	4.92	1.40

Note. The Teacher Ratings variable has no alpha coefficient because it is a single-item variable. All variables were measured using 7-point scales with the exception of the three need support variables which were measured on 5-point scales.

Table 2

Correlations Among the Study Variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Autonomy Support														
2. Cooperative Learning	.47													
3. Improvement	.60	.47												
4. Competence Need Sat.	.58	.52	.55											
5. Autonomy Need Sat.	.64	.40	.51	.58										
6. Relatedness Need Sat.	.37	.56	.38	.57	.52									
7. Amotivation	-.26	-.18	-.24	-.36	-.32	-.22								
8. External Regulation	-.26	-.06	-.17	-.28	-.25	-.12	.64							
9. Introjected Regulation	.22	.19	.21	.31	.22	.16	.20	.35						
10. Identified Regulation	.51	.40	.53	.69	.50	.38	-.43	-.32	.40					
11. Intrinsic Motivation	.51	.43	.49	.66	.49	.37	-.52	-.39	.28	.82				
12. Negative Affect	-.23	-.16	-.21	-.28	-.31	-.28	.40	.43	.11	-.30	-.32			
13. Future Intentions	.26	.18	.26	.34	.25	.10	-.45	-.36	.10	.47	.50	-.26		
14. Concentration	.43	.36	.37	.52	.41	.30	-.28	-.19	.25	.48	.49	-.15	.20	
15. Participation Status	.09	.11	.20	.25	.09	.19	-.26	-.08	.03	.27	.30	-.15	.28	.10

Note. r 's ≥11 are significant at the $\alpha = .05$ level.

Table 3

Participation Status and Gender Differences in the Study Variables

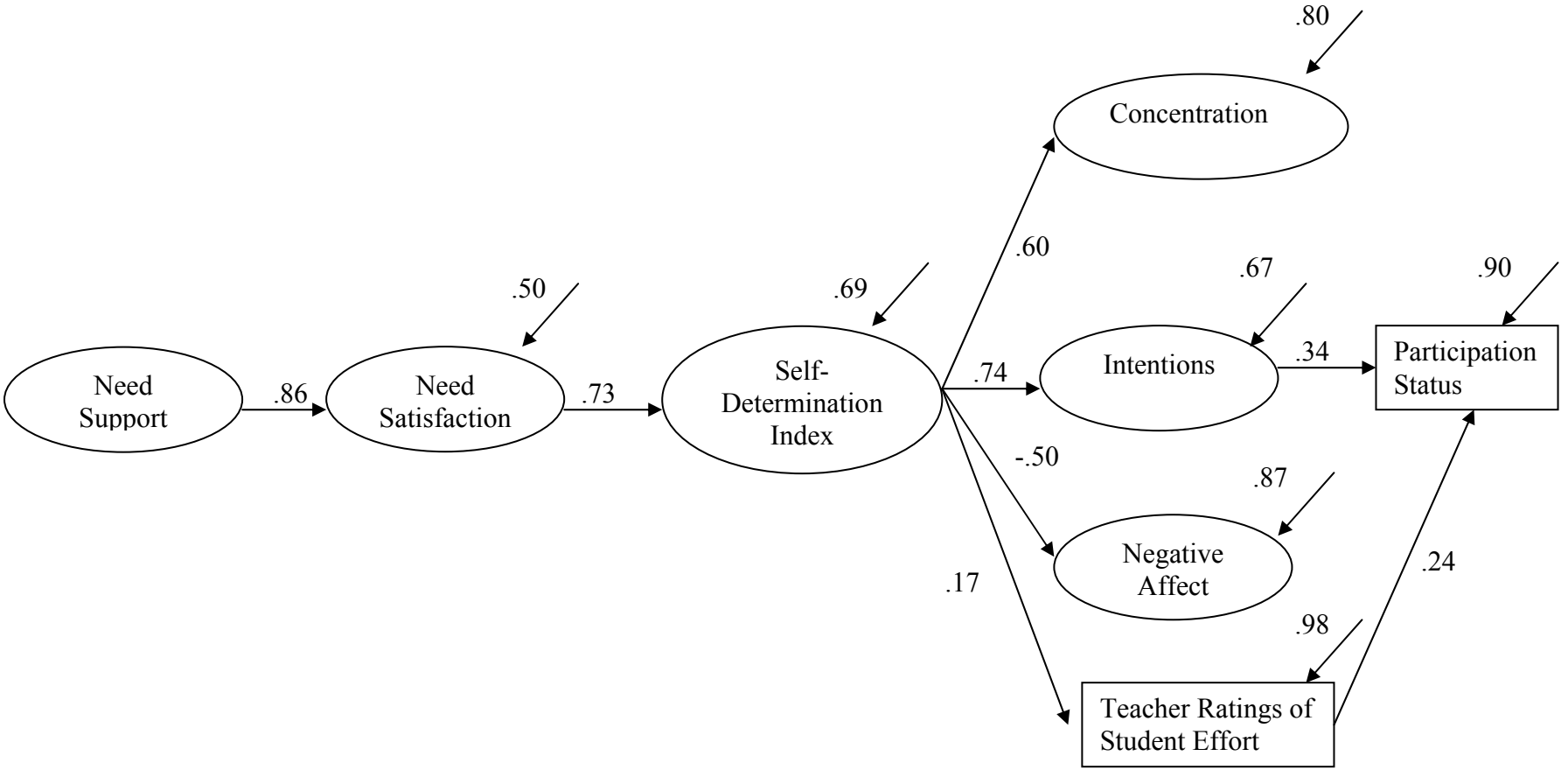
	Participants		Non-participants					Males		Females				
	M	*SD*	*M*	*SD*	*F*	*p*	Partial η^2	*M*	*SD*	*M*	*SD*	*F*	*p*	Partial η^2
Autonomy Support	3.19	.06	3.00	.06	4.68	.031	.02	3.12	.06	3.06	.05	.45	.502	.00
Cooperative Learning	3.41	.06	3.24	.06	3.94	.048	.01	3.26	.06	3.39	.05	2.26	.134	.01
Improvement	3.67	.06	3.37	.06	12.79*	.000	.04	3.55	.06	3.49	.05	.46	.499	.00
Competence Need Sat.	4.63	.10	3.99	.09	20.72*	.000	.07	4.34	.10	4.28	.08	.23	.635	.00
Autonomy Need Sat.	4.34	.10	3.98	.09	6.85*	.009	.02	4.10	.10	4.21	.08	.69	.406	.00
Relatedness Need Sat.	5.05	.09	4.53	.09	15.18*	.000	.05	4.61	.09	4.98	.08	7.89*	.005	.03
Amotivation	2.53	.13	3.41	.13	21.91*	.000	.07	3.02	.13	2.91	.10	.41	.525	.00
External Regulation	3.28	.14	3.55	.13	1.91	.168	.01	3.37	.14	3.45	.11	.21	.648	.00
Introjected Regulation	3.39	.11	3.34	.11	.08	.773	.00	3.54	.11	3.21	.08	4.82	.029	.02
Identified Regulation	4.98	.12	4.15	.12	24.53*	.000	.08	4.61	.09	4.52	.09	.26	.610	.00

Intrinsic Motivation	5.20	.12	4.32	.11	29.12*	.000	.09	4.97	.09	4.56	.09	6.43*	.012	.02
Negative Affect	2.37	.11	2.70	.11	4.83	.029	.02	2.52	.09	2.55	.09	.04	.842	.00
Future Intentions	4.60	.16	3.59	.16	20.00*	.000	.07	4.15	.13	4.05	.13	.22	.641	.00
Concentration	4.78	.10	4.61	.10	1.69	.195	.01	4.81	.08	4.57	.08	3.30	.070	.01
Teacher Ratings	5.39	.12	4.39	.12	31.31*	.000	.10	4.89	.10	4.90	.10	.00	.949	.00

Note: * = Significant *F* at the Bonferroni-adjusted alpha level. For the need support and need satisfaction variables the Bonferroni-adjusted alpha is .017 (.05/3) , whereas for the motivational regulations and motivational consequences variables the Bonferroni-adjusted alpha is .013 (.05/4).

Figure Caption

Figure 1. A motivational model of participation in optional school PE based on SDT.



Note: Factor indicators are not represented for presentation simplicity reasons. Furthermore, the correlations between the errors of the indicators of autonomy support and autonomy (r = .38) and cooperative learning and relatedness (r = .39) are not shown.