



A prospective study of participation in optional school physical education using a self-determination theory framework.

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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, multivariate analysis of variance tests showed that those who opted for PE (n =171), compared with 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.

Background

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 (Centers for Disease Control and Prevention, 1997) of the U.S. Department of Health and Human Services, and the National Audit Office (2001) in the United Kingdom 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 important, appropriately motivated to participate in PE lessons. Although 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.

Literature Review

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 motivation. 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 that offer the opportunity for learning (Vallerand et al., 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, interjected 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 that 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. Interjected 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. Last, 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 motivation. Whereas both intrinsic motivation and extrinsic motivation represent different degrees of volition, motivation represents the absence of motivation. A motivation 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 4,537 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 (.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 2-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. Last, mean comparisons between persistent and drop-out swimmers showed that the former, compared with the latter, had higher intrinsic motivation and identified regulation and lower external regulation and amotivation. No differences in introjected regulation were found. Pelletier et al. (2001) did not assess the three psychological needs 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., Ames, 1992; Nicholls, 1989). Sarrazin et al. 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 with 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 ($.55$). 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 motivation 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 with "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 dropping out of or participating in optional PE programs. More specifically, although 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). Last, 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 nonparticipants of optional PE courses in a number of motivational indices tapping experiences in compulsory PE in the previous school year.

An SDT-based motivational model was tested that 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. Last, it was expected that behavioral intentions would positively predict actual behavioral choices. In terms of mean differences between participants and nonparticipants, 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 with the teachers of the nonparticipants. Furthermore, the participants were expected to report greater need satisfaction, more self-determined motivation, and less controlling motivation and motivation compared with, the nonparticipants. Last, the participants were predicted to report more adaptive affective, cognitive and behavioral experiences in compulsory PE.

Materials and Methods

Participants

The participants were 460 (girls n 145; boys 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 that used the full sample, all other analyses reported in the Results section used the subsample 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 5-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 that 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 the teachers 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 5-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 (BNSS; Deci et al., 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. 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 that 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 7-point scales (1 not at all true; 7 very true). Deci et al. (2001) reported adequate alpha coefficients for the three factors with a U.S. sample; however, with a Bulgarian sample, the alphas for relatedness and autonomy were low (.57 and a .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. 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 did not” (introjected regulation), “so that the teachers will not yell at me” (external regulation), and “but I cannot 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 that 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 5-point scale ranging from 1 (never) to 7 (always). Participants responded to the stem “In this PE class I feel . . .” Ebbeck and Weiss have provided psychometric evidence for the use of these items in youth sport.

Concentration in the PE classes. 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 7-point scale (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 7-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 7-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 and 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 on the basis of their dates of birth, gender, and school identification. It was possible to obtain information for 302 students (girls n 91; boys n 211), of whom 171 (girls n 39; boys n 132) chose to enroll in an optional PE program. There are various reasons that it was not possible to obtain information for the remaining 158 students¹ (girls n 54; boys n 104): (a) Some students dropped out of school altogether; (b) others relocated to a different part of the country; and (c) some 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 found that, among all fit indices, the SRMR (a) is the most sensitive to misspecification in both simple and complex models and (b) is less sensitive to sample size and violations of distributional assumptions. According to Hu and Bentler, 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), is indicative of good model fit.

For brevity reasons, the results of the confirmatory factor analyses are not presented here but are available on request. All scales were found to have satisfactory fit indices with the exception of the Need Satisfaction scale whose fit indices were very poor: SattoraBentler 2 (186, N 460) 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 BNSC subscale) were excluded from any further analyses. The revised Need Satisfaction scale had a satisfactory model fit: SattoraBentler 2 (186, N 460) 838.60, p .001; SRMR .06; CFI .93; RMSEA .06.

Descriptive statistics and internal reliability coefficients (Cronbach's alpha) 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, interjected 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 inter-correlations (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 correlated positively 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 on the basis of 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 Gagne' (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 to 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. A comparison of 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 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 2 (62) 133.32, p .001; SRMR .05; CFI .94; RMSEA .05 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 2 (204, N 460) 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 2 (201, N 460) 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; it included autonomy support; cooperative learning; improvement; and 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 (3.25:1). 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 2 (768, N 460) 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 (see Footnote 4).

Table 1
Cronbach's Alphas, Means, and Standard Deviations for All Variables

Variable	α	<i>M</i>	<i>SD</i>
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

Motivational Differences Between Participants and Nonparticipants

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 significantly more boys opted for PE ($\chi^2(2) = 10.05$; $p = .01$), participation status was examined in conjunction with gender. Four two-way multivariate analyses of variance (MANOVAs) were carried out to examine 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 analyses of variance is the protection against inflated Type I error stemming from 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 $t(3, 295) = 4.28$, $p = .004$. An anonymous reviewer suggested that a model without need satisfaction should be tested because he or 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 $\chi^2(145) = 286.49$, $p = .001$; SRMR .15; CFI .92; RMSEA .06. More important, from an 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 an SDT-based model.

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 ($.68$, $p .01$) and between self-determined motivation and participation status ($.29$, $p .01$). Furthermore, the path between need satisfaction and participation status was not significant ($.04$, $p .05$). In fact, a decomposition analysis showed that most of this effect was indirect through self-determined motivation (total effect: $.24$, $p .05$; indirect effect: $.20$, $p .05$). These results indicate that self-determined motivation mediated the effect from need satisfaction to participation status.

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

Table 2
Correlations Among the Study Variables

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
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. $r_s \geq .11$ are significant at the $\alpha = .05$ level; sat. = satisfaction.

Follow-up analysis (see Table 3) showed that the participants, compared with the nonparticipants, reported significantly higher perceptions of teacher emphasis on student individual improvement criteria. No differences in autonomy support or cooperative learning were found. In relation to need satisfaction, there were significant effects for participation status: Hotelling's $t = 0.08$; $F(3, 293) = 7.83$, $p .001$; partial $\eta^2 = .07$; gender: Hotelling's $t = 0.05$; $F(3, 293) = 4.64$, $p .01$; partial $\eta^2 = .01$.

2 .05; as well as for the interaction between age and gender: Hotelling's $t = 0.03$; $F(3, 293) = 2.85$, $p = .05$; partial _____

2 .03. Follow-up analysis (see Table 3) showed that the participants, compared with the nonparticipants, reported significantly greater competence, relatedness, and autonomy need satisfaction. The only significant gender difference in need satisfaction was found with regard to relatedness with the girls scoring higher than the boys. An interesting interaction also emerged between gender and participation status predicting autonomy need satisfaction. Whereas male participants and male nonparticipants had very similar scores in autonomy need satisfaction ($M = 4.08$ and $M = 4.12$, respectively), female participants had substantially higher scores than female nonparticipants ($M = 4.59$ and $M = 3.84$, respectively).

The MANOVA for motivational regulations showed significant main effects for participation status: Hotelling's $t = 0.16$; $F(5, 290) = 8.99$, $p = .001$; partial _____ $2 = .13$, and gender: Hotelling's $t = 0.09$; $F(5, 290) = 5.02$, $p = .001$; partial _____ $2 = .08$, but the interaction effect was not significant. More specifically, the participants were less motivated and more self-determined compared with the nonparticipants. Surprisingly, no differences in controlling motivation were found. Furthermore, the boys scored significantly higher on intrinsic motivation than did the girls. Last, with regard to the motivational outcomes assessed in this study, the MANOVA revealed a significant main effect for participation status only: Hotelling's $t = 0.17$; $F(4, 281) = 11.96$, $p = .001$; partial _____ $2 = .15$. 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 than were the efforts of the nonparticipants. No differences in negative affect or concentration levels were found.

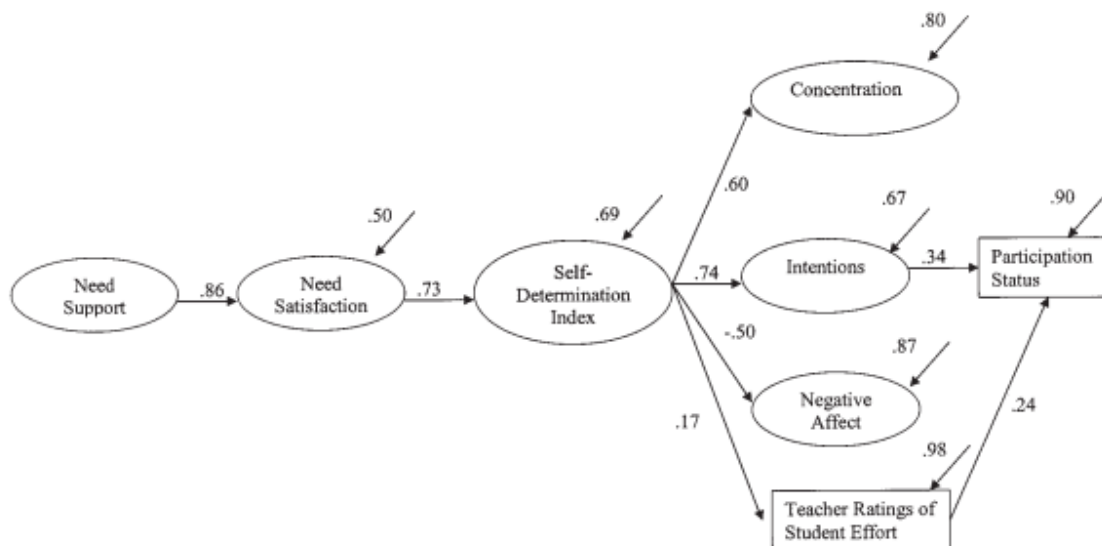


Figure 1. Motivational model of participation in optional physical education classes. Factor indicators are not

Table 3
Participation Status and Gender Differences in the Study Variables

Variable	Participants		Nonparticipants		F	p	Partial η^2	Boys		Girls		F	p	Partial η^2
	M	SD	M	SD				M	SD	M	SD			
Autonomy support	3.19	0.06	3.00	0.06	4.68	.031	.02	3.12	.06	3.06	0.05	0.45	.502	.00
Cooperative learning	3.41	0.06	3.24	0.06	3.94	.048	.01	3.26	.06	3.39	0.05	2.26	.134	.01
Improvement	3.67	0.06	3.37	0.06	12.79*	.000	.04	3.55	.06	3.49	0.05	0.46	.499	.00
Competence need sat.	4.63	0.10	3.99	0.09	20.72*	.000	.07	4.34	.10	4.28	0.08	0.23	.635	.00
Autonomy need sat.	4.34	0.10	3.98	0.09	6.85*	.009	.02	4.10	.10	4.21	0.08	0.69	.406	.00
Relatedness need sat.	5.05	0.09	4.53	0.09	15.18*	.000	.05	4.61	.09	4.98	0.08	7.89*	.005	.03
Amotivation	2.53	0.13	3.41	0.13	21.91*	.000	.07	3.02	.13	2.91	0.10	0.41	.525	.00
External regulation	3.28	0.14	3.55	0.13	1.91	.168	.01	3.37	.14	3.45	0.11	0.21	.648	.00
Introjected regulation	3.39	0.11	3.34	0.11	0.08	.773	.00	3.54	.11	3.21	0.08	4.82	.029	.02
Identified regulation	4.98	0.12	4.15	0.12	24.53*	.000	.08	4.61	.09	4.52	0.09	0.26	.610	.00
Intrinsic motivation	5.20	0.12	4.32	0.11	29.12*	.000	.09	4.97	.09	4.56	0.09	6.43*	.012	.02
Negative affect	2.37	0.11	2.70	0.11	4.83	.029	.02	2.52	.09	2.55	0.09	0.04	.842	.00
Future intentions	4.60	0.16	3.59	0.16	20.00*	.000	.07	4.15	.13	4.05	0.13	0.22	.641	.00
Concentration	4.78	0.10	4.61	0.10	1.69	.195	.01	4.81	.08	4.57	0.08	3.30	.070	.01
Teacher ratings	5.39	0.12	4.39	0.12	31.31*	.000	.10	4.89	.10	4.90	0.10	0.00	.949	.00

Conclusion

The findings of this study underscore 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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