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Abstract

Physical Education teachers can influence students' self-determination through the motivational strategies they use. This study examined the relationship between teachers' perceptions of class average self-determination, the teachers' self-determination, and their reported use of three motivational strategies: Autonomy support, structure, and involvement. Furthermore, the relationship between the three motivational strategies, students' perceptions of psychological need satisfaction and students' self-determination was examined. Also, the relationship between teachers' and students' self-determination was investigated. Multilevel and standard regression analyses revealed that teachers' perceptions of class average self-determination predicted their reported use of the motivational strategies, and this relationship was mediated by their own self-determination. Also, student perceptions of the three strategies impacted positively upon their own self-determination, and this relationship was mediated by their reported satisfaction of autonomy and competence. Finally, teachers' self-determination did not predict students' self-determination. The importance of promoting an adaptive motivational context for both teachers and students is discussed with reference to self-determination theory.

Introduction

Low levels of physical activity in the youth population are of great concern. In the U.K. over one third of children report activity levels that may compromise their health (Department of Health, 2004). Similarly, in the U.S. nearly a quarter of nine to thirteen year olds reported that they do not engage in any free-time physical activity (Centers for Disease Control & Prevention, 2003). Low levels of physical activity in the youth population have been linked to numerous consequences, such as increased risk of childhood obesity and type II diabetes (Department of Health, 2004). Thus, it is imperative that children and adolescents are encouraged to adopt a physically active lifestyle.

A logical context to promote physically active lifestyles in children and adolescents is the Physical Education (PE) class. Of particular importance is how motivating PE classes are for the students, as motivation has been empirically and theoretically linked to a number of important outcomes, such as participation in optional PE (Ntoumanis, 2005) and after school sport participation (Goudas, Dermitzaki, & Bagiatis, 2001). Within PE, a motivational theory that has received empirical support is self-determination theory (SDT; Ryan & Deci, 2002). SDT theorizes that a continuum of different types of motivation exists depending upon the level of self-determination that an individual possesses. The most self-determined regulation is *intrinsic motivation* which involves pursuing an activity for its own sake, because it is interesting and enjoyable. Second, *extrinsic motivation* refers to the pursuit of an activity to attain an outcome separate from the activity itself. Extrinsic motivation can be further divided, in a descending order of self-determination, into *integrated* (e.g., “I participate in PE because it is part of who I am”), *identified* (e.g., “I participate in PE because I value the health benefits”), *introjected* (e.g., “I participate in PE because I would feel guilty otherwise”), and *external* (e.g., “I participate in PE because I am forced to”) regulations. Integrated reasons for undertaking an activity have not been

reported by adolescents in the empirical literature, possibly due to an under developed sense of the self (Vallerand, 2001). Consequently, integrated regulation has rarely been investigated in PE contexts. Finally, *amotivation* refers to a lack of either intrinsic or extrinsic motivation to partake in an activity. An amotivated individual perceives no worthwhile reasons for pursuing an activity and hence is completely lacking in self-determination.

SDT further posits that one's level of self-determination is determined by the satisfaction of three innate psychological needs, those of *autonomy*, *competence* and *relatedness*. Autonomy refers to being the source of one's own behavior and achieving congruence between the activity and one's integrated sense of self. Competence refers to the need to have an effect on the environment and to achieve desired outcomes, and relatedness is the desire to feel connected to valued others (Ryan & Deci, 2002). The more these needs are satisfied, the greater the level of one's self-determination. For example, individuals often transform externally regulated behaviors into behaviors that are self-determined (i.e., the process of internalization), because the behaviors are modeled or valued by significant others to whom these individuals feel related (Ryan & Deci, 2000). Individuals are also more likely to pursue an activity for self-determined reasons if they feel competent because they can identify a link between their behavior and desired outcomes (Ryan & Deci, 2000). Third, one cannot function in a fully self-determined manner without a sense of volition and a feeling that the activity is concordant with one's integrated sense of self (Ryan & Deci, 2000).

It is important to promote self-determination in PE classes as empirical research has linked self-determination to adaptive consequences, such as higher concentration in the class (Standage, Duda, & Ntoumanis, 2005) and effort (Ntoumanis, 2001). Perhaps the factor with the largest impact upon students' self-determination in PE is the teacher and

his/her teaching style. Much of the research concerning teaching style and SDT has examined the teaching style of *autonomy support*, which can be considered as a variety of teacher behaviors (e.g. acknowledging students' perspective, providing a rationale for an activity) that enhance students' feelings of volition and promote a perceived internal locus of causality (Reeve, Nix, & Hamm, 2003). In PE, an autonomy-supportive environment has been found to enhance student intrinsic motivation (e.g., Ntoumanis, 2005).

SDT theorists also suggest a pivotal role for *structure* in the promotion of competence need satisfaction (Connell & Wellborn, 1991). Structure refers to the amount and quality of information given to the students regarding teacher expectations, consequences of the students' behavior, and how students can achieve desired outcomes (Connell & Wellborn, 1991; Skinner & Belmont, 1993). Adjusting the goals set for students depending on the students' ability is an example of the provision of structure. It is important that structure is provided in an autonomy-supportive and not a controlling way. A well-structured environment has been shown to promote behavioral engagement in classrooms (Skinner & Belmont, 1993); yet, no research has considered structure in PE.

SDT research has also examined the teaching strategies that promote feelings of relatedness. For example, Connell and Wellborn (1991) suggest feelings of relatedness can be facilitated through the use of *involvement* strategies, which they define as the degree of interest and emotional support shown by the teacher to the student. Gaining an understanding of a student's family background would be an example of involvement. Within PE little attention has been given to the promotion of relatedness despite its important role in the internalization process (Ryan & Deci, 2002).

The present study aims to investigate the relationship between the three motivational teaching strategies (i.e., autonomy support, structure, and involvement) and student self-determination, and whether these relationships are mediated by student

perceptions of psychological need satisfaction. Deci and Ryan (1987) argued that it is the functional significance of the social context (i.e., the meaning that the student gives to the social environment) that is of importance when predicting student self-determination. Therefore, to test this argument, the study aims to examine the proposed motivational sequence using both teacher and student reports of the teachers' use of the three motivational strategies.

The degree to which autonomy support, structure, and involvement are used by PE teachers may be partly influenced by the teachers' perception of the students' self-determined motivation. Socio-psychological research hypothesizes that a perceiver's beliefs about a target influence his/her interactions with the target (e.g., Snyder, 1984). In addition, Skinner and Belmont (1993) reported similar processes in the teacher-student relationship. Given the importance of promoting autonomy support, structure, and involvement, it is necessary to understand the relationship between teachers' perceptions of their students' self-determination and their use of the three motivational strategies. In an experimental setting, Pelletier and Vallerand (1996) randomly allocated university students the role of student or teacher. Teachers were then led to believe that the students were either intrinsically or extrinsically motivated, or no information was given to the teachers. Students who were believed by the teacher to be intrinsically motivated perceived their teachers as being more autonomy supportive compared to perceived extrinsically motivated students, who reported their teachers as being more controlling. Further, the perceived intrinsically motivated students reported greater intrinsic interest and spent more free-choice time on the task.

The degree to which the findings from Pelletier and Vallerand (1996) apply to a school environment is not known, because the teachers' perception of students' motivation were based on potentially inaccurate information and also the teacher-student relationship

was newly formed. Subsequently, in a naturalistic setting, Pelletier, Seguin-Levesque, and Legault (2002) found that the more teachers perceived students to be self-determined, the higher their self-determination towards teaching, and in turn the more autonomy supportive they perceived themselves to be. It is clear from Pelletier and colleagues' findings that a relationship exists between teachers' perceptions of their students' self-determination and their use of autonomy support, and this relationship may be mediated by the teachers' self-determination. The present study aims to extend these findings to PE and to examine the relationships between two other strategies (i.e., structure and involvement) and teachers' perceptions of their class' self-determination, as well as teachers' own self-determination.

Besides examining the relationship between teacher perceptions of class self-determination and teacher self-determination, it is of interest to investigate the association between students' and teachers' self-reported self-determination. Limited research has examined the relationship between the actual motivation of the two parties. An exception is a study by Atkinson (2000) which asked students in design and technology classes to report how much they agreed with 14 motivation-related statements (e.g., "I have been motivated to complete my design and technology project"). Results indicated that students who were taught by motivated teachers (as rated by three university lecturers who had significant knowledge of the teachers) reported higher motivation, compared to those taught by less motivated teachers. However, the small number of teachers used in the study (i.e., four) means that the results should be interpreted with caution. Also, Atkinson's (2000) study did not assess teachers' self-reports of their own motivation. To address some of these limitations, the present study also aimed to examine the relationship between teacher and student self-reported self-determination.

From an applied perspective, it is also interesting to examine how related PE teacher and student perceptions of autonomy support, structure, and involvement are. Previous research in the academic domain has indicated that student and teacher perceptions of motivational teaching strategies may be somewhat related. For example, Skinner and Belmont (1993), using self-report measures of teachers and third to fifth grade students late in the academic year, found that teacher perceptions of involvement and autonomy support were modestly correlated with student perceptions of the corresponding strategy ($r = .23$ and $r = .20$, respectively). There is a need to investigate whether a similar relationship exists between teacher and student perceptions in PE because of the obvious differences in physical environments between PE and classroom-based lessons. It is also of particular importance to ascertain how accurate teachers are at assessing students' self-determination because teacher perceptions are central to this investigation, as well as in many important psychological processes, such as behavioral confirmation (see Snyder, 1984). If teachers' perception of student self-determination partly determines the motivational strategies they use, then the accuracy of the teachers' perceptions is important when choosing the most appropriate motivational strategies to employ with their class. Using proxy indicators of motivation, Skinner and Belmont (1993) found that teacher and student reports of behavioral engagement were moderately correlated early ($r = .31$) and later ($r = .35$) in the academic year.

To summarize, the present study aimed primarily to investigate three types of relationships involving motivational variables. First, based on and extending Pelletier et al.'s (2002) findings, it was hypothesized that teacher perceptions of their class' self-determination would positively predict the teachers' reports of their use of autonomy support, structure, and involvement. Additionally, these relationships would be mediated by the teachers' self-determination to teach the class (hypothesis 1). Second, based on

previous SDT research in PE and in classrooms (e.g., Ntoumanis, 2005; Skinner & Belmont, 1993), it was expected that student reports of teacher autonomy support, structure, and involvement would positively predict student self-determination in the PE class. Furthermore, in agreement with Connell and Wellborn (1991), it was hypothesized that each strategy's relationship with student self-determination would be mediated by the corresponding psychological need (i.e., student perceptions of autonomy need satisfaction would mediate the prediction made by autonomy support, student perceptions of competence would mediate the effect of structure, and student perceptions of relatedness would mediate the prediction made by involvement, hypothesis 2a). Conversely, given that teacher behavior as perceived by the students is of greater importance, compared to corresponding teacher reports, when predicting student self-determination (Deci & Ryan, 1987), it was expected that teachers' reports of their motivational strategies would not significantly predict student perceptions of need satisfaction or student self-determination (hypothesis 2b). Third, extrapolating from the findings by Atkinson (2000), it was hypothesized that teacher self-determination would be positively related to student self-determination (hypothesis 3). No previous research has examined the relationship between teacher and student individual motivational regulations, therefore, no *a priori* hypotheses were formed.

A secondary purpose of the study was to examine the relationships between teacher and student reports of teacher use of motivational strategies and student self-determination, respectively. Based on the second wave of findings by Skinner and Belmont (1993), it was hypothesized that teacher perceptions of their use of autonomy support would predict student perceptions of teacher autonomy support. It was predicted that the same would hold for teacher and student perceptions of structure and involvement, respectively (hypothesis 4). Also, extrapolating from the findings by Skinner and Belmont (1993), the

teachers' perceptions of student individual motivational regulations and overall self-determination were expected to predict the students' reports of the corresponding motivational regulation and overall self-determination, respectively (hypothesis 5). It is important to note that we asked PE teachers to consider their teaching strategies towards one particular class and their motivation to teach that class, as opposed to thinking about their teaching strategies and motivation to teach in general.

Method

Participants

The initial student sample comprised of 1083 British PE students. However, students who did not complete the entire questionnaire were excluded from the analyses, as were those students whom we were not able to match with their teacher's ratings of student motivation. Hence, all analyses were based on a final sample of 787 PE students (399 boys, 371 girls, and 17 unspecified; age: $M = 12.81$, $SD = 1.42$, range = 11-16 years), taught by 51 different PE teachers (25 male, 26 female; age: $M = 29.60$, $SD = 7.56$, range = 22-57 years) from 13 schools in England.

Measures

All questionnaire items were answered using a 7-point scale, anchored by 1 (*not at all true*) and 7 (*very true*), except the questionnaire assessing teachers' self-determination to teach the class, which was anchored by 1 (*does not correspond at all*) and 7 (*corresponds exactly*).

Teacher Perceptions of Autonomy Support, Structure, and Involvement. Teachers were asked to evaluate their use of the three strategies in their PE class using a short teacher version of the Teacher as Social Context Questionnaire (TASCQ; Wellborn, Connell, Skinner, & Pierson, 1988). Each subscale comprised of eight items, examples of which are, "I talk to the students about how we can use things we learn in PE" (autonomy

support), “I always tell the students what I expect of them in PE” (structure), and “I know the students well” (involvement). Previous research (e.g., Skinner & Belmont, 1993) using a longer version of this questionnaire has demonstrated acceptable internal consistency for the three subscales. In the present study, Cronbach’s alpha coefficients were $\alpha = .76$ (autonomy support), $\alpha = .64$ (structure), and $\alpha = .74$ (involvement). After further examination of the structure subscale, the item “I’m always acting differently when the students do something wrong” was deleted and this increased the Cronbach’s alpha coefficient to $\alpha = .70$.

Student Perceptions of Teacher Autonomy Support, Structure, and Involvement.

Students were asked to evaluate their teachers’ use of the above three strategies using the short student version of the TASCQ (Belmont, Skinner, Wellborn & Connell, 1988). The 24 items paralleled the teacher version as much as possible. Skinner and Belmont (1993) demonstrated the internal consistency of a longer version of the questionnaire. In the present study Cronbach’s alpha coefficients were $\alpha = .75$ (autonomy support), $\alpha = .69$ (structure), and $\alpha = .78$ (involvement).

Teacher Self-determination to Teach the Class. Teachers’ self-determination to teach their class was measured using the Situational Motivation Scale (SIMS; Guay, Vallerand, & Blanchard, 2000) with the items adapted to reflect reasons for teaching the class¹. Four additional items adapted to teaching from a motivational regulation questionnaire devised by Goudas, Biddle, and Fox (1994) were included in the present study to reflect teachers’ introjected regulation. Teachers responded to the question “Why do you teach this class, in general?” followed by four items for each subscale measuring intrinsic motivation (e.g., “Because teaching this class is fun”), identified regulation (e.g., “Because I think teaching this class is good for myself”), introjected regulation (e.g., “Because I want my colleagues to think I am a good teacher”), external regulation (e.g.,

“Because I don’t have the choice”), and amotivation (e.g., “I don’t know, I don’t see what teaching this class gives me”). Acceptable reliabilities for the four subscales of the SIMS have been previously reported by Guay et al. (2000). Cronbach’s alpha coefficients in the present study were $\alpha = .91$ (intrinsic motivation), $\alpha = .73$ (identified regulation), $\alpha = .59$ (introjected regulation), $\alpha = .70$ (external regulation), and $\alpha = .70$ (amotivation). After further examination, the item “Because it would bother me if I asked not to teach the class” was deleted from the introjections subscale, which increased the Cronbach’s alpha coefficient to $\alpha = .70$. Replicating previous SDT-based research (e.g., Ntoumanis, 2005), and following guidelines provided by Vallerand (2001), a self-determination index (SDI) was calculated to reflect the teachers’ degree of self-determination. Specifically, each subscale score was multiplied by an assigned weight according to its position on the self-determination continuum. The product scores were then summed to form an index of self-determination. The weights used were 3 (intrinsic motivation), 2 (integrated regulation), 1 (identified regulation), -1 (introjected regulation), -2 (external regulation), and -3 (amotivation).

Teacher Perceptions of Student Self-determination. Teachers were asked to evaluate each individual student’s self-determination in their class by responding to the stem “Student X takes part in PE classes...”. One item was used for each regulation: “Because student X thinks PE is enjoyable” (intrinsic motivation), “Because student X thinks it is important to do well in PE” (identified regulation), “Because student X wants other students to think he/she is skilful in PE” (introjected regulation), “Because student X thinks he/she will get into trouble if he/she doesn’t” (external regulation), and “*But* student X doesn’t know what he/she gets out of PE” (amotivation). Using a similar procedure as the one used for the calculation of teachers’ self-determination, a SDI was calculated to reflect teacher perceptions of student self-determination. When computing a SDI without

an integrated regulation subscale, Vallerand (2001) recommends weights of 2 (intrinsic motivation), 1 (identified regulation), -1 (average of introjected and external regulation), and -2 (amotivation). Further, in order to test the first hypothesis, a class average SDI was computed by averaging the individual SDI scores.

Student Perceptions of Need Satisfaction. Students were asked to report the degree of satisfaction of their three psychological needs in the specified PE class by responding to 16 items. Satisfaction of autonomy was measured using six items previously employed by Standage et al. (2005) that followed the stem “When I am in this PE class...”. An example item is “I can decide what activities I want to practice”. Competence in the specified PE class was measured using the five items that comprise the perceived competence subscale of the Intrinsic Motivation Inventory (IMI; McAuley, Duncan, & Tammen, 1989), adapted to the PE domain. An example item is “I am pretty skilled in this PE class”. Relatedness was measured using five items from the acceptance subscale of the Need for Relatedness Scale (Richer & Vallerand, 1998). These five items were modified to reflect the PE context. An example item is “In this PE class I feel supported”. The three subscales have demonstrated acceptable internal reliability in previous PE-based studies (e.g., Ntoumanis, 2001; Standage et al., 2005). In the present study the Cronbach’s alpha coefficients were $\alpha = .75$ (autonomy), $\alpha = .79$ (competence), and $\alpha = .87$ (relatedness).

Student Self-determination. Students reported their motivational regulations using a questionnaire developed by Goudas et al. (1994). Each motivational regulation comprised of four items which followed the stem “I take part in this PE class...”. Subscales in the questionnaire were intrinsic motivation (e.g., “Because I enjoy learning new skills”), identified regulation (e.g., “Because I want to improve in sport”), introjected regulation (e.g., “Because I would feel bad if I didn’t”), external regulation (e.g., “So that the teacher doesn’t shout at me”), and amotivation (e.g., “But I think I am wasting my time”). Again,

previous PE-based research has demonstrated the internal consistency of the five subscales (e.g., Ntoumanis, 2001; Standage et al., 2005). In the present study, the five subscales had Cronbach's alpha coefficients of $\alpha = .87$ (intrinsic), $\alpha = .83$ (identified), $\alpha = .70$ (introjected), $\alpha = .76$ (external), and $\alpha = .80$ (amotivation). A SDI was calculated to reflect the degree of student self-determination using the same weights as those used for the computation of teacher perceptions of student SDI.

Procedures

Consent forms were obtained from the participating schools, the teachers acting in *loco parentis*, and the students who participated in the study. The students completed the questionnaires anonymously and individually at the beginning of a timetabled PE class under the supervision of research assistants. For ethical reasons, their respective PE teacher was also present in the room; however, he/she remained distal to the students to avoid biasing the students' responses. The study was introduced and explained to the teacher prior to the lesson, and to the students at the beginning of the lesson. Students and teachers were asked to answer honestly and were told that there was no right or wrong answers. To keep responses anonymous, student and teacher responses were matched by a coding system that was based on the class register.

Data Analyses

An assumption of many traditional statistical methods is that the data for each individual are independent, an assumption that is violated when students are nested within classes. This is because students in the same class are more likely to be similar to each other than to students from different classes. Using traditional least squares regression analysis with nested data results in an underestimation of the standard errors of regression coefficients and, subsequently, an overestimation of statistical significance (Hox, 2002). Additionally, when variables from teachers and students are examined using conventional,

single-level regression models, the teacher variables are disaggregated across all students in their class (i.e. students in the same class have the same teacher value). As a result, the sample size for the analysis is the higher number of disaggregated cases. This is likely to increase the likelihood for Type I error (Hox, 2002). To account for these statistical issues, multilevel modeling using MLwin software (version 2.02; Rashbash, Steele, Browne, & Prosser, 2005) was employed in the present study when examining hypotheses referring to student level variables (i.e., hypotheses 2-5). Teacher and student gender were dummy coded (males = 0 and females = 1) and controlled for in all analyses. All other variables were transformed into *z*-scores (i.e., all variables had $M = 0$ and $SD = 1$) to aid interpretation of the results (Hox, 2002) and to avoid high correlations between the intercept and slopes of the predictor variables (Kreft & DeLeeuw, 1998). In all multilevel analyses individual level predictor variables (i.e., all student variables and teacher perceptions of student self-determination) were entered into multilevel models as random coefficients².

A primary purpose of the study was to test the hypothesis that the teachers' perceptions of class average self-determination predict the teachers' reported level of use of the three motivational strategies. Three standard regression models were constructed with a class average of teachers' perceptions of student self-determination as the independent variable and each motivational strategy as the dependent variable. Next, if the models were significant, possible mediation effects of teachers' self-determination were tested by following four steps described by Baron and Kenny (1986). Multilevel modeling was not needed for this purpose of the study, as all variables were at the class level and there were no student level variables (all classes had a different teacher, therefore, the teacher and the class is the same level in this study).

Second, the hypothesis that student perceptions of the motivational strategies would predict student self-determination was tested by constructing a multilevel regression

model with student perceptions of autonomy support, structure and involvement as the predictor variables and student SDI as the dependent variable. If these relationships were significant, the procedures described by Baron and Kenny (1986), as applied to testing lower level mediation (i.e., both the predictor and mediator are level one variables) in multilevel analysis by Krull and MacKinnon (2001) were followed to examine the mediating role of student perceptions of autonomy, competence, and relatedness. To test a similar motivational sequence with teacher reports of the motivational strategies instead of student perceptions as the predictor variables, this procedure was repeated using Krull and MacKinnon's (2001) guidelines concerning multilevel mediation analysis with level two variables as the predictors.

Third, the relationship between teacher and student self-determination was examined by constructing a multilevel regression model with teacher reports of self-determination (level 2 variable) predicting student self-determination (level 1 variable). Similar multilevel regression models were constructed with teacher reports of each motivational regulation predicting student reports of the corresponding regulation.

Fourth, the relationship between teachers' and students' perceptions of teacher motivational strategies was assessed. To this effect, three multilevel regression models predicting students' perception of each of the motivational strategies (level 1 variable) were constructed with teacher perceptions of the corresponding motivational strategy (level 2 variable) as the independent variable.

Finally, the relationship between student and teacher perceptions of student self-determination was examined using a similar method. A multilevel regression model was constructed with teacher perceptions of student self-determination predicting student reports of their own self-determination. Also, five multilevel regression models predicting

each student regulation were constructed with teacher perceptions of the corresponding student motivational regulation as the independent variable.

Results

Descriptive statistics and correlation coefficients

Table 4.1 reports means, standard deviations and Pearson's bivariate correlations for all student level variables. In general, students reported higher levels of intrinsic and identified regulation than introjected and external regulation, with amotivation scores being the lowest. The teachers gave relatively similar ratings of student self-determination; however, they perceived their students to have lower levels of introjected and external regulation than what the students actually reported. In relation to perceived psychological need satisfaction, students reported high levels of competence and moderate levels of autonomy and relatedness. The students also perceived their teachers to provide reasonably high levels of structure and involvement, and moderate levels of autonomy support. Theoretically expected patterns can be seen in the correlations between the three psychological needs, the three strategies and the different types of regulation (i.e. positive correlations between the needs/strategies and self-determined regulations, and negative correlations between the needs/strategies and external regulation/amotivation). Teachers' perceived they provided moderate levels of autonomy support ($M = 4.94$, $SD = 0.85$), and high levels of involvement ($M = 5.51$, $SD = 0.78$) and structure ($M = 5.59$, $SD = 0.73$). Moreover, teachers were moderately self-determined ($M = 5.65$, $SD = 4.62$, range = -18 to 18).

Variance Components

Intraclass correlation coefficients ranged from .19 to .23 for student perceptions of motivational strategies, .21 to .71 for teacher perceptions of student individual motivational regulations and overall self-determination, and .11 to .19 for student

Table 4.1

Descriptive Statistics and Correlations among Individual Level Variables

Variable	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. Student Perceptions of (SP) autonomy support	4.58	1.11	-	.64	.72	.52	.32	.58	.38	.34	.08	-.35	-.43	.47	.18	.19	.09	-.03	-.14	.21
2. SP structure	4.97	0.97		-	.67	.42	.34	.56	.42	.40	.13	-.24	-.40	.47	.14	.17	.06	-.05	-.19	.19
3. SP involvement	4.81	1.12			-	.50	.39	.66	.44	.39	.16	-.35	-.44	.51	.18	.21	.06	-.04	-.20	.22
4. SP Autonomy	3.99	1.30				-	.54	.69	.61	.54	.33	-.29	-.40	.57	.26	.23	.15	-.09	-.18	.25
5. SP Competence	4.99	1.30					-	.60	.68	.64	.38	-.24	-.49	.65	.36	.29	.20	-.12	-.20	.34
6. SP Relatedness	4.67	1.46						-	.64	.59	.36	-.24	-.44	.61	.29	.27	.15	-.06	-.22	.30
7. SP Intrinsic motivation	5.20	1.59							-	.83	.47	-.33	-.55	.88	.39	.34	.23	-.10	-.21	.37
8. SP Identified regulation	5.38	1.47								-	.51	-.19	-.51	.79	.35	.33	.20	-.07	-.20	.33
9. SP Introjected regulation	3.76	1.51									-	.25	-.07	.22	.25	.22	.09	-.06	-.11	.25
10.SP External regulation	3.40	1.65										-	.53	-.58	-.16	-.17	-.13	.07	.14	-.17
11.SP Amotivation	2.35	1.48											-	-.86	-.25	-.26	-.17	.10	.23	-.26
12. Student Self-determination Index	7.51	6.81												-	.36	.34	.23	-.11	-.25	.35
13. Teacher perceptions of student (TPS) intrinsic motivation	5.49	1.29													-	.78	.55	-.01	-.52	.85
14. TPS identified regulation	5.41	1.33														-	.48	.06	-.52	.77
15. TPS introjected regulation	4.31	1.58															-	.18	-.27	.26
16. TPS external regulation	4.03	1.97																-	.10	-.32
17. TPS amotivation	2.79	1.48																	-	-.52
18. TPS Self-determination Index	9.38	3.87																		-

Note. $N = 787$. All correlations above +/- .06 are significant at $p < .05$. All correlations above +/- .09 are significant at $p < .01$.

SP: Student perceptions of TPS: Teacher perceptions of student

Table 4.2

Standardized Beta Coefficients, Standard Errors and Sobel z Scores for the Hypothesized Mediation Models of Teacher Perceptions of Class Average Self-Determination (Predictor), Teacher SDI (Mediator), and Teacher Perceptions of Autonomy Support, Structure, and Involvement (Outcomes).

Mediation Process	Step	Predictor	Outcome	β (SE)
Perceptions of Class Average Self-determination → Teacher SDI → Autonomy Support	1	Perceptions of Class Self-determination	Autonomy Support	.39 (.03)***
	2	Perceptions of Class Self-determination	Teacher SDI	.66 (.03)***
	3	Teacher SDI	Autonomy Support	.11 (.04)*
	4	Perceptions of Class Self-determination	Autonomy Support	.32 (.04)***
	Sobel z score			2.49*
Perceptions of Class Average Self-determination → Teacher SDI → Structure	1	Perceptions of Class Self-determination	Structure	.07 (.04)*
	2	Perceptions of Class Self-determination	Teacher SDI	.66 (.03)***
	3	Teacher SDI	Structure	-.06 (.05)
	4	Perceptions of Class Self-determination	Structure	.12 (.05)*
Perceptions of Class Average Self-determination → Teacher SDI → Involvement	1	Perceptions of Class Self-determination	Involvement	.46 (.03)***
	2	Perceptions of Class Self-determination	Teacher SDI	.66 (.03)***
	3	Teacher SDI	Involvement	.13 (.04)**
	4	Perceptions of Class Self-determination	Involvement	.38 (.04)***
	Sobel z score			2.96**

Note. $N = 51$. * $p < .05$. ** $p < .01$. *** $p < .001$

perceptions of need satisfaction, individual motivational regulations and overall self-determination. These coefficients indicate that between 11% and 71% of the variance in the individual variables was at the class level, suggesting the need to use multilevel analyses with the present data.

Teacher perceptions of class average self-determination and teacher self-determination as predictors of teacher reported use of the motivational strategies

Teacher perceptions of class average self-determination significantly predicted their reported use of autonomy support ($\beta = .39, p < .001$), involvement ($\beta = .46, p < .001$), and structure ($\beta = .07, p < .05$). We were then interested to examine whether these relationships are mediated by the teachers' self-determination. The first step of Baron and Kenny's (1986) guidelines for establishing mediation is that the independent variable must significantly predict the dependent variable. In view of the results above, all three strategies met this criterion. The second step proposed by Baron and Kenny (1986) stipulates that the independent variable must significantly predict the mediator (teacher SDI). Third, the mediator must significantly predict the outcome variable after controlling for the independent variable. If the beta coefficient of the independent variable is less when both the independent variable and mediator are included as predictors, compared to when only the independent variable is included, then mediation can be inferred. In such cases, the statistical significance of the indirect effect is examined with the Sobel z statistic (Sobel, 1982). The results of the hypothesized mediation models with teacher perceptions of class average self-determination as the predictor, teacher self-determination as the mediator, and autonomy support, structure, and involvement as outcomes are presented in Table 4.2. Teacher SDI did not predict provision of structure after controlling for teacher perceptions of class average self-determination (step 3); hence mediation effects were not

found. However, for both autonomy support and involvement all the paths prescribed by the mediation steps were significant, confirming the hypothesized mediation.

Students' and teachers' perceptions of motivational strategies and student perceptions of need satisfaction as predictors of student self-determination

Results of multilevel analyses showed that student SDI was significantly predicted by student perceptions of autonomy support ($\beta = .19, p < .001$), structure ($\beta = .22, p < .001$), and involvement ($\beta = .22, p < .001$). Consequently, to test the hypothesis that each of the above relationships is mediated by student perceptions of autonomy, competence, and relatedness, the guidelines offered by Krull and MacKinnon (2001) were followed. The authors argued that Baron and Kenny's (1986) suggestion to calculate the reduction in the beta coefficient of the independent variable from the first to the final step might not be very informative in models with multiple mediators such as the one tested here, because the effects of each mediator cannot be differentiated. Thus, Krull and MacKinnon (2001) suggested that the interpretation of mediation in multiple mediator models should be based on the examination of the indirect effects through each mediator (i.e., the Sobel z score of each mediation pathway). Table 4.3 shows the standardized beta coefficients and standard errors of all paths in the mediation model, as well as the specific indirect effects through each mediator (note that step 4 is not reported in this table). As shown, student perceptions of relatedness did not significantly predict student SDI (in step 3), hence, relatedness was not found to mediate relationships between the three strategies and student SDI. Nonetheless, autonomy support's relationship with student SDI was found to be mediated by student perceptions of autonomy. Also, the relationship between structure and student SDI was found to be mediated by student perceptions of competence. Third, the relationship between involvement and student SDI was found to be mediated by student perceptions of autonomy and competence.

Table 4.3

Standardized Beta Coefficients and Standard Errors of the Hypothesized Multiple Mediation Model of Student Perceptions of Motivational Strategies (Predictors), Psychological Need Satisfaction (Mediators), and Student SDI (Outcome)

Mediation Process	Step	Predictor	Outcome	β (SE)
Autonomy Support→ Autonomy→ Student SDI	1	Autonomy Support	Student SDI	.19 (.04)***
	2	Autonomy Support	Autonomy	.30 (.05)***
	3	Autonomy	Student SDI	.14 (.04)***
	Indirect Effect			.04 (.01)***
Autonomy Support→ Competence→ Student SDI	1	Autonomy Support	Student SDI	.19 (.04)***
	2	Autonomy Support	Competence	.06 (.05) ^a
	3	Competence	Student SDI	^a
	Indirect Effect			^a
Autonomy Support→ Relatedness→ Student SDI	1	Autonomy Support	Student SDI	.19 (.04)***
	2	Autonomy Support	Relatedness	.16 (.04)***
	3	Relatedness	Student SDI	.08 (.04) ^a
	Indirect Effect			^a
Structure→ Autonomy→ Student SDI	1	Structure	Student SDI	.22 (.05)***
	2	Structure	Autonomy	.05 (.04) ^a
	3	Autonomy	Student SDI	^a
	Indirect Effect			^a
Structure→ Competence→ Student SDI	1	Structure	Student SDI	.22 (.05)***
	2	Structure	Competence	.14 (.05)**
	3	Competence	Student SDI	.42 (.03)***
	Indirect Effect			.05 (.02)**
Structure→ Relatedness→ Student SDI	1	Structure	Student SDI	.22 (.05)***
	2	Structure	Relatedness	.16 (.04)***
	3	Relatedness	Student SDI	.08 (.04) ^a
	Indirect Effect			^a
Involvement→ Autonomy→ Student SDI	1	Involvement	Student SDI	.22 (.06)***
	2	Involvement	Autonomy	.25 (.05)***
	3	Autonomy	Student SDI	.14 (.04)***
	Indirect Effect			.03 (.01)**
Involvement→ Competence→ Student SDI	1	Involvement	Student SDI	.22 (.06)***
	2	Involvement	Competence	.28 (.06)***
	3	Competence	Student SDI	.42 (.03)***
	Indirect Effect			.09 (.02)***
Involvement→ Relatedness→ Student SDI	1	Involvement	Student SDI	.22 (.06)***
	2	Involvement	Relatedness	.43 (.04)***
	3	Relatedness	Student SDI	.08 (.04) ^a
	Indirect Effect			^a

Note. $N = 787$. * $p < .05$. ** $p < .01$. *** $p < .001$. ^a Indicates that the preceding step in the mediation process was not significant, therefore this step was not carried out.

Table 4.4

Standardized Beta Coefficients and Standard Errors of the Hypothesized Multiple Mediation Model of Teacher Perceptions of Motivational Strategies (Predictors), Psychological Need Satisfaction (Mediators), and Student SDI (Outcome)

Mediation Process	Step	Predictor	Outcome	β (SE)
Autonomy Support→ Autonomy→ Student SDI	1	Autonomy Support	Student SDI	-.13 (.06)*
	2	Autonomy Support	Autonomy	.02 (.07)
	3	Autonomy	Student SDI	^a
Indirect Effect				
Autonomy Support→ Competence→ Student SDI	1	Autonomy Support	Student SDI	-.13 (.06)*
	2	Autonomy Support	Competence	-.05 (.07)
	3	Competence	Student SDI	^a
Indirect Effect				
Autonomy Support→ Relatedness→ Student SDI	1	Autonomy Support	Student SDI	-.13 (.06)*
	2	Autonomy Support	Relatedness	-.10 (.07)
	3	Relatedness	Student SDI	^a
Indirect Effect				
Structure→ Autonomy→ Student SDI	1	Structure	Student SDI	.02 (.06)
	2	Structure	Autonomy	^a
	3	Autonomy	Student SDI	^a
Indirect Effect				
Structure→ Competence→ Student SDI	1	Structure	Student SDI	.02 (.06)
	2	Structure	Competence	^a
	3	Competence	Student SDI	^a
Indirect Effect				
Structure→ Relatedness→ Student SDI	1	Structure	Student SDI	.02 (.06)
	2	Structure	Relatedness	^a
	3	Relatedness	Student SDI	^a
Indirect Effect				
Involvement→ Autonomy→ Student SDI	1	Involvement	Student SDI	.23 (.07)***
	2	Involvement	Autonomy	.11 (.08)
	3	Autonomy	Student SDI	^a
Indirect Effect				
Involvement→ Competence→ Student SDI	1	Involvement	Student SDI	.23 (.07)***
	2	Involvement	Competence	.12 (.07)
	3	Competence	Student SDI	^a
Indirect Effect				
Involvement→ Relatedness→ Student SDI	1	Involvement	Student SDI	.23 (.07)***
	2	Involvement	Relatedness	.23 (.07)**
	3	Relatedness	Student SDI	.20 (.05)***
Indirect Effect				
				.04 (.02)*

Note. $N = 51$ teachers and 787 students * $p < .05$. ** $p < .01$. *** $p < .001$. ^a Indicates that the preceding step in the mediation process was not significant, therefore this step was not carried out.

A different pattern of results occurred when we examined teachers' reports of the three strategies. Teacher reports of involvement positively predicted student SDI ($\beta = .23$, $p < .001$), autonomy support negatively predicted student SDI ($\beta = -.13$, $p < .05$), however, structure did not predict student SDI ($\beta = .02$, $p > .05$). Consequently, mediation analysis was not conducted with provision of structure as the predictor variable because this non-significant relationship indicated that the first step of mediation was not met. The results of the hypothesized multiple mediation model of teacher perceptions of involvement and autonomy support predicting student SDI via student perceptions of the three psychological needs are presented in Table 4.4. As shown, teacher reports of involvement did not significantly predict student perceptions of either autonomy or competence, hence, no mediation effects were found. However, with student perceptions of relatedness as the mediator, all mediation steps were significant indicating that relatedness mediated the involvement-student SDI relationship. Teacher perceptions of autonomy support did not predict any student perceptions of the three psychological needs, hence no mediation effects were found in the autonomy support-student SDI relationship.

The relationship between teachers' and students' self-determination

Results of multilevel analyses showed that teachers' self-determination did not predict individual students' self-determination ($\beta = .08$, $p > .05$). Furthermore, non-significant relationships were also found between teacher and student self-reports of intrinsic motivation ($\beta = .09$, $p > .05$), identified regulation ($\beta = .04$, $p > .05$), introjected regulation ($\beta = .05$, $p > .05$), external regulation ($\beta = -.11$, $p > .05$), and amotivation ($\beta = .05$, $p > .05$).

The relationship between teachers' and students' perceptions of teacher motivational strategies

Multilevel analyses revealed that teachers' reports of their use of involvement strategies predicted student perceptions of teacher involvement ($\beta = .24, p < .001$). Interestingly, teacher perceptions of autonomy support and structure were not related with student perceptions of the corresponding strategy ($\beta = .12, p > .05$ and $\beta = -.04, p > .05$, respectively).

The relationship between the teachers' and students' perceptions of student self-determination and motivational regulations

Multilevel analyses showed that teacher perceptions of student SDI significantly predicted student reports of their own SDI ($\beta = .19, p < .001$). Furthermore, teacher perceptions of student intrinsic motivation ($\beta = .35, p < .001$), identified regulation ($\beta = .29, p < .001$), introjected regulation ($\beta = .12, p < .01$), and amotivation ($\beta = .20, p < .001$) were significant predictors of student reports of the corresponding motivational regulation. Teacher perceptions of student external regulation ($\beta = -.08, p > .05$) did not significantly predict the corresponding student report.

Discussion

The primary purpose of the study was to test three types of relationships involving motivational variables. First, we investigated whether teachers' perceptions of class average self-determination predicted the teachers' reported use of three motivational strategies (i.e., autonomy support, structure, and involvement), and whether this relationship was mediated by the teachers' self-determination to teach the class. Second, we examined the relationship between the three strategies (from both the students' and teachers' perspective) and student self-determination, and whether this relationship was mediated by student perceptions of psychological need satisfaction. Third, we examined the relationship between teachers' and students' self-determination. A secondary purpose of the study was to examine the relationship between teachers' and students' perceptions

of the degree to which teachers use the three motivational strategies, as well as the relationship between teachers' and students' reports of student self-determination and motivational regulations.

Teachers' perceptions of class average self-determination and teachers' self-determination as predictors of the three motivational strategies

Our hypothesis that teachers' perceptions of class average self-determination would predict their reported use of the three motivational strategies was supported for all three strategies. Previous research (Pelletier et al., 2002; Pelletier & Vallerand, 1996) has indicated a link between teacher perceptions of student self-determination and autonomy support. The present study extends these findings to the PE context and suggests a positive relationship between teacher perceptions of class average self-determination and the use of not only autonomy support, but also involvement and structure. These findings imply that classes perceived by the teacher as low in self-determination may receive less adaptive motivational strategies which may further diminish their self-determination (see hypothesis two). In contrast, classes high in self-determination may receive higher levels of autonomy support, structure, and involvement which could sustain or further facilitate class self-determination. Consequently, these processes may potentially lead to large inter-class differences in self-determination.

The mediation models for autonomy support and involvement give some insight into the processes by which teachers' perceptions of class self-determination are associated with teachers' use of these two motivational strategies. Teachers' perception of class self-determination positively predicted their own self-determination to teach that class. In turn, the more self-determined the teachers were, the higher the level of autonomy support and involvement they provided. The mediating effect of teachers' self-determination is congruent with the finding by Pelletier et al. (2002), although these authors measured self-

determination to teach in general, as opposed to teaching a specific class. The finding that teacher self-determination predicted the teachers' use of involvement and autonomy support but not structure (step 3 in the mediation analyses) is explainable. If a teacher is high in self-determination to teach a class, then he or she may put more effort into gaining an understanding of the students (i.e., more involvement). Also, a teacher low in self-determination may perceive autonomy-supportive strategies as requiring too much effort, whereas controlling strategies may seem easier (Reeve, 1998). In contrast, structure refers to giving guidelines and highlighting expectations to the PE class with less emphasis being given on building a relationship with the students. Therefore, this strategy may be perceived as requiring less effort by the teachers. Thus, variations in teacher self-determination may not predict provision of structure.

The relationship between teacher self-determination and use of autonomy support and involvement has implications for future research. In a similar manner to teachers creating an environment that is controlling to students, the school education authorities (e.g., governmental policies, head teachers) can create pressurizing environments for teachers, which may diminish teachers' self-determination and which, in turn, may lead the teachers to use less adaptive motivational strategies with their students. Therefore, future research is required that focuses on contextual factors that determine teacher self-determination.

Perceptions of motivational strategies and student perceptions of need satisfaction as predictors of student self-determination

In support of SDT, the results of the present study revealed that students' perceptions of the level of autonomy support, structure, and involvement provided by their teachers' positively predicted their degree of self-determination. Further, these relationships were found to be mediated by student perceptions of autonomy and

competence. More specifically, the prediction by autonomy support was mediated by student perceptions of autonomy, the prediction by structure was mediated by student perceptions of competence, and the effect of involvement was mediated by student perceptions of autonomy and competence. The positive effects of teacher autonomy support on student perceptions of need satisfaction and self-determination are well documented in PE-based research (e.g., Ntoumanis, 2005; Standage et al., 2005).

However, our findings also highlight the potential importance of promoting involvement and structure, as these strategies were related to the satisfaction of students' psychological needs and self-determination. The relationship between structure and student self-determination, and the mediation of this relationship by student perceptions of competence need satisfaction has been argued for in classroom contexts (e.g., Connell & Wellborn, 1991), however, the present study offers the first empirical testing of this hypothesis in the PE context. The significant relationship between involvement and self-determination, and the mediation effects of student perceptions of autonomy and competence indicate that teachers, who provide emotional support and show interest to their students, may potentially enhance student perceptions of competence and autonomy independently of providing autonomy support and structure. Such increases, in turn may relate to adaptive student motivation. Similarly, Grolnick, Deci, and Ryan (1997) argue that if reasons for activity participation are to be valued by children (i.e., to be fully internalized), they have to be introduced by a socializing agent who is interpersonally involved with the child.

The finding that all three types of motivational strategies predicted students' perceptions of relatedness is not surprising. For example, acknowledging students' negative feeling during a task (an autonomy-supportive behavior), giving them feedback on how to complete a task (an example of structure) and asking them about whether they are enjoying the task (an example of involvement) are all likely to promote in the students

a feeling of connectedness with their PE teacher. However, in contrast to our hypothesis, student perceptions of relatedness did not mediate the involvement-student SDI relationship. Despite this finding, the satisfaction of relatedness still has a role to play in facilitating student self-determined motivation. It is possible that the high bivariate correlation between student perceptions of satisfaction of relatedness and student perceptions of teacher involvement ($r = .66$) resulted in relatedness being a non-significant predictor of student self-determination when involvement was also included in the regression model. Moreover, as discussed below, teachers' reports of involvement (as opposed to student perceptions of this strategy) predicted student self-determination via student perceptions of relatedness.

SDT theorizes that it is the functional significance of the social environment as perceived by the individuals that is the most important variable when predicting the effects of the social context on individuals' self-determination (Deci & Ryan, 1987). In agreement with this argument, we found that teacher perceptions of the three motivational strategies did not predict student self-determination and student perceptions of need satisfaction as strongly as student perceptions of these strategies did. Student self-determination was only predicted by teacher reports of their use of involvement, and this relationship was mediated by student perceptions of relatedness. This implies that teachers should make a conscious effort to spend time gaining an understanding of their students in order to potentially facilitate a sense of belonging and connectedness in their students. This, in turn, may foster more self-determined regulations in the students.

Contrary to our expectations, teacher perceptions of autonomy support negatively predicted student self-determination. Teachers are largely unfamiliar with the concept of autonomy support (Reeve, 1998). Therefore, it is possible that teachers confuse autonomy support with a maladaptive *laissez-faire* interpersonal style (i.e., teachers have very little

input in how the class run). For example, a questionnaire item reflecting the level of responsibility given to students (autonomy support) may be perceived by some teachers as reflecting the degree to which they let students do whatever they want (*laissez-faire*). Consequently, teachers' high in a *laissez-faire* interpersonal style may report high levels of autonomy support, thus, a negative relationship will occur between teachers' autonomy support and student self-determination.

The relationship between teachers' and students' self-determination

In contrast to our hypothesis, teachers' self-determination was not related to student self-determination. Similarly, teachers' individual motivational regulations did not predict the corresponding student regulation. It is possible that student self-determination is better predicted by student perceptions of their teachers' self-determination, rather than the teachers' actual self-determination to teach. For example, Ntoumanis, Pensgaard, Martin, and Pipe (2004) found that amotivated students in PE perceived their teachers to "show apathy" and "give little attention to anybody". Future research examining this possibility is warranted. On a positive note, these non-significant relationships imply that students can still be high in self-determination despite having a PE teacher low in self-determination to teach. Equally, teachers can still be self-determined in their work despite working with students low in self-determination to engage in PE.

The relationship between teachers' and students' perceptions of autonomy support, structure and involvement

Disconfirming our hypothesis, teachers' perceptions of autonomy support and structure were not related to student perceptions of the corresponding motivational strategy. In contrast, teachers' perceptions of their use of involvement strategies predicted student perceptions of teacher involvement, although the strength of the standardized regression coefficient was relatively small ($\beta = .24$). It is encouraging to see that when a

teacher perceives they provide a high degree of emotional support and interest, this will somewhat communicate to the students, especially as student perceptions of involvement were found to be positively associated with feelings of autonomy, competence, and self-determination. Nonetheless, the lack of congruence between teacher and student perceptions of autonomy support and structure is problematic. Often interventions are aimed at teachers (i.e., teaching training programs), whereas the outcomes of interest are student-based (e.g., student achievement and engagement). However, an increase in the use of motivational strategies from the teachers' perspective may not always communicate to students and the effectiveness of such training may be limited. Consequently, interventions should not only aim to increase levels of autonomy support, structure and involvement, but also focus on how these strategies are interpreted by students. Future qualitative work is needed to investigate why there is limited correspondence between teacher and student reports of all three strategies. It is possible that teachers are overly positive about the degree to which they use adaptive motivational strategies. Thus, objective measures (e.g., the use of independent observers) might be useful in corroborating teacher reports. Also, it is possible that teacher and student perceptions are less congruent for students with lower self-determination. For example, for such students lower ratings of teacher motivational strategies might reflect a more generalized dissatisfaction toward PE or their school.

The relationship between teachers' and students' perceptions of student self-determination and motivational regulations

With the exception of external regulation, our findings showed that teacher and student perceptions of student individual motivational regulations and overall self-determination are somewhat congruent with each other, although the beta coefficients were small to moderate. It is possible that the significant relationships may be a result of

teachers being able to observe and assess the behavioral indicators associated with the various motivational regulations in PE. For example, self-determined regulations have been associated with positive affect (Standage et al., 2005) and effort (Ntoumanis, 2001), both of which result in identifiable behaviors (e.g., smiling, persistence at a task). Contrastingly, low self-determined regulations or amotivation have been linked to boredom (Ntoumanis, 2001) and unhappiness (Standage et al., 2005), resulting in very different negative behaviors, yet also identifiable by teachers.

Based on these findings, we expected that teacher and student perceptions of student external regulation would be somewhat related. A possible explanation for the non-significant relationship we found lies in the intraclass correlation of teacher perceptions of student external regulation. Seventy-one percent of the variance in teacher perceptions of student external regulation was at the class level (i.e., indicating that variations in external regulation were more substantial across classes than within classes). In contrast, the intraclass correlations were much lower for teacher perceptions of the other student regulations (21-33% of the variance lied at the class level), or student reports of external regulation (14% of the variance lied at the class level). This implies that teachers may have generalized beliefs about the extent to which students within a class are externally motivated, and that they may not sufficiently consider variations among individual students. Alternatively, the fact that the teacher is often the source of the external pressure may make teachers report the level of external pressure in PE as somewhat constant within a class because it is ethically desirable to treat all students in a similar manner. In contrast to external regulation, the remaining regulations reflect internal reasons for participation or non-participation (e.g., enjoyment, guilt, perceived lack of value in PE), and thus are less likely to be affected by teacher report bias.

Limitations and Additional Future Directions

Our results showed a relationship between teachers' perceptions of class self-determination and their interpersonal behavior in terms of the use of three motivational strategies. Also, we examined the relationship between teacher employment of motivational strategies and student self-determination. According to the behavioral confirmation paradigm (Snyder, 1984), beliefs about students' motivation can lead the teachers to behave in ways that reinforce such beliefs. The students then respond to the teachers' behaviors in a manner that makes the teachers confirm their initial beliefs. Unfortunately, the cross-sectional nature of our study prevented us from exploring the potential bi-directionality of the relationship between teacher motivational strategies and student self-determination over time. However, we showed that when teachers perceive classes to be low in self-determination they are less likely to employ adaptive motivational strategies. In addition, we demonstrated that teacher motivational strategies are related to student self-determination.

Our results also revealed a low correspondence between teacher and student reports of the three motivational strategies. This could be due to the possibility that these strategies are not only class-specific, but to some extent they are also student-specific, particularly as far as involvement and autonomy support are concerned. To examine this possibility, future studies should measure teachers' use of these strategies with respect to each student, as well as to the whole class. It is also likely that the degree of correspondence is influenced by factors such as teacher experience, class size, and how long the teachers have known the students. Future research in this area is needed to examine such possibilities. In addition, future research should also consider teachers' use of maladaptive controlling strategies as the present study examined only adaptive motivational strategies. For example, it is conceivable that sometimes teachers feel they must use controlling strategies because of perceived inappropriate student motivation or behavior. Finally, due

to practical constraints, the teachers rated each student's motivation with one item per regulation. Consequently, the findings concerning the relationships between teacher and student reports of student motivational regulations should be replicated using multi-item subscales. Nonetheless, other SDT-based research has similarly used single items to examine motivational regulations (e.g., Sheldon & Elliot, 1999). Further, the results from the single-item scales provide interesting additional findings which add to the findings that emerged from the comparison of aggregated teacher and student reports of student SDI.

Conclusions

The present study tested and extended previous findings in PE and in the classroom by showing that student perceptions of autonomy support, structure, and involvement can predict student self-determination. Also, the present study extended the literature on motivation in PE by looking at the relationship between students' and teachers' perceptions of student motivation and teacher motivational strategies, as well as the impact of teacher perceptions of class self-determination and their own self-determination on the degree of use of these strategies. From an applied perspective the results highlight the potential importance of promoting an autonomy supportive, well-structured and involved PE context for enhanced student self-determination. In particular, our findings indicate that teachers who invest time and energy into understanding and showing affection towards the students (i.e., promote involvement), are likely to foster student self-determination. However, it should be noted that the relationships between student and teacher perceptions of teacher motivational strategies, as well as student motivation were relatively small. Lastly, our findings indicate that PE classes perceived by teachers to be high in self-determination may contribute to enhanced teacher self-determined motivation.

Footnotes

¹The difference between the SIMS and other contextual measures of motivation (e.g., Goudas, Biddle, & Fox, 1994) is mainly in the stem and not in the item content. We modified the stem to be more contextual as opposed to situation-specific. We decided against using contextual measures of motivation because they included additional items which could not be adapted to measure self-determination for teaching PE classes.

²Preliminary analyses were conducted with all student level predictor variables entered as fixed coefficients. The deviance statistics ($-2 \log L$) from these models were compared to the deviance statistics of similar models with individual level predictor variables set as random coefficients. Due to the significant reduction of deviance statistics in all models, student level variables were entered in the main analyses as random coefficients.