

A Self-Determination Theory Approach to Understanding the Antecedents of Teachers' Motivational Strategies in Physical Education

Ian M. Taylor,¹ Nikos Ntoumanis,¹ and Martyn Standage²

¹University of Birmingham and ²University of Bath

Physical education teachers can influence students' self-determination through the motivational strategies that they use. The current study examined how teachers' reported use of three motivational strategies (providing a meaningful rationale, providing instrumental help and support, and gaining an understanding of the students) were predicted by perceived job pressure, perceptions of student self-determination, the teachers' autonomous orientation, psychological need satisfaction, and self-determination to teach. Structural equation modeling supported a model in which perceived job pressure, perceptions of student self-determination, and teacher autonomous orientation predicted teacher psychological need satisfaction, which, in turn positively influenced teacher self-determination. The last positively predicted the use of all three strategies. Direct positive effects of teachers' psychological need satisfaction on the strategies of gaining an understanding of students and instrumental help and support were also found. In summary, factors that influence teacher motivation may also indirectly affect their motivational strategies toward students.

Keywords: teacher motivation, causality orientation, teaching context

Enhancing students' motivation is an important objective in physical education as adaptive motivation has been linked to exercise participation outside of school hours (e.g., Theodosiou & Papaioannou, 2006) and future intentions to exercise (e.g., Standage, Duda, & Ntoumanis, 2003). Positive motivation-related experiences in physical education are often the outcome of adaptive motivational strategies used by the physical education teacher (Papaioannou, Marsh, & Theodorakis, 2004). The purpose of this study was to examine contextual and personal antecedents of some of these strategies in physical education classes.

A theoretical framework that has frequently been used to examine the motivational strategies that teachers use in their teaching is self-determination theory (SDT;

Taylor is now with the School of Life Sciences, Kingston University, Kingston Upon Thames, U.K.; Ntoumanis is with the School of Sport and Exercise Sciences, University of Birmingham, Birmingham, U.K.; and Standage is with the School for Health, University of Bath, Bath, U.K.

Deci & Ryan, 2000). Using SDT, Connell and Wellborn (1991) examined three broad types of teacher motivational teaching strategies in the classroom: autonomy support, structure, and involvement. *Autonomy support* refers to a variety of teaching strategies (e.g., providing students with a meaningful rationale and giving them responsibility) that enhance students' feelings of volition and promote an internal locus of causality (Reeve, Nix, & Hamm, 2003). *Structure* can be defined as the amount and quality of information given to students regarding the consequences of their behavior, and how they can achieve desired outcomes (e.g., providing instrumental support, clear expectations and guidelines; Connell & Wellborn, 1991; Skinner & Belmont, 1993). Children in well-structured environments have a clearer sense of what actions are needed to achieve these desired outcomes; therefore, they can better direct their efforts, compared with children in less structured environments (Grolnick & Ryan, 1989). Finally, *interpersonal involvement* refers to the extent to which teachers show interest and provide emotional support to students (e.g., building an understanding of students and maintaining close physical proximity; Connell & Wellborn, 1991). These three strategies have been shown to be important contextual factors in promoting adaptive student outcomes, including intrinsic motivation (Ntoumanis, 2005), self-esteem (Deci, Nezlek, & Sheinman, 1981), feelings of competence (Connell & Wellborn, 1991), and behavioral engagement (Skinner & Belmont, 1993). Moreover, they have also been supported as adaptive coaching strategies in the sport domain (Mageau & Vallerand, 2003) and in parenting (Grolnick & Ryan, 1989).

The current study examined three salient, specific examples of these broad teaching strategies. Firstly, as an example of autonomy support, we examined the degree to which teachers provide a meaningful rationale to students for undertaking an activity. Assor, Kaplan, and Roth (2002) investigated strategies hypothesized to augment feelings of autonomy in students. They found that providing a meaningful rationale was particularly important in promoting positive feeling and engagement in students by providing a link between students' personal goals and their schoolwork. Secondly, as an example of providing structure in classes, we examined the degree to which teachers provide students with instrumental help and support to complete or improve in physical education activities (e.g., instructing students how they can improve their technique). Research in the area of perceived control suggests that providing instrumental support increases the likelihood of successful outcomes in classrooms (see Skinner, 1991, for a review). Finally, we examined the extent to which teachers tried to gain an understanding of their students, as an example of providing interpersonal involvement. Fostering meaningful affiliations between teachers and students promotes a sense of student belonging within the class (Legault, Green-Demers, & Pelletier, 2006).

Despite the fact that these three motivational strategies have received empirical and theoretical support for their adaptive role, in reality they are not always employed by teachers. For example, observations have shown that teachers sometimes use controlling (i.e., autonomy thwarting) strategies, rather than autonomy supportive strategies as their primary motivational tools (Newby, 1991). Consequently, research is needed into the factors that influence teachers' use of motivational strategies. Some studies have focused on how contextual conditions affect teachers' use of certain motivational strategies. Indeed, in both laboratory and field experiments, teachers who were pressured into feeling responsible for

student performance standards used more maladaptive (controlling) strategies compared with teachers who were not pressured (Deci, Spiegel, Ryan, Koestner, & Kauffman, 1982; Flink, Boggiano, & Barrett, 1990). Additionally, Taylor and Ntoumanis (2007) interviewed physical education teachers about their reasons for choosing certain motivational strategies over others. The teachers indicated that school-related factors such as their own performance evaluations, time constraints in physical education lessons, and pressure from the school administration to conform to certain teaching methods affected their use of motivational teaching strategies. For example, the physical education teachers perceived that the more they felt pressured by time constraints in lessons, the less they used adaptive strategies (e.g., autonomy support) and the more they used maladaptive teaching strategies (e.g., promoting a normative-referenced environment). Similarly, some teachers reported that the more they felt pressured to conform to certain teaching methods the more controlling strategies they used.

Besides examining contextual factors, empirical research has also focused on teachers' perceptions of student motivation as a second determinant of their teaching strategies. Self-determination theory assumes that different motivational regulations exist, each reflecting varying levels of self-determination (Ryan & Deci, 2002). Beginning with the most self-determined, *intrinsic motivation* involves pursuing an activity out of interest and enjoyment and without external contingencies (Ryan & Deci, 2002). Secondly, *extrinsic motivation* refers to partaking in 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* (pursuing an activity because it is congruent with other aspects of the self), *identified* (undertaking an activity because one accepts the value of the activity), *introjected* (partaking in an activity because of internal pressures such as guilt or shame), and *external* (doing an activity because of external pressures or incentives) *regulations* (Ryan & Deci, 2002). Finally, *amotivation* refers to a perception that no worthwhile reasons for pursuing an activity exist and hence a complete absence of self-determination (Ryan & Deci, 2002).

To examine the influence of teacher perceptions of student motivation on their subsequent behavior toward students, Pelletier and Vallerand (1996) conducted an experiment on dyadic interactions between university students assigned the role of student or teacher. "Teachers" were told that the "student" was either intrinsically or extrinsically motivated, or no information was given. The authors found that "teachers" who believed their "students" to be intrinsically motivated were more autonomy supportive when teaching, compared with "teachers" who perceived their "students" as being extrinsically motivated. Moreover, "students" of these autonomy supportive "teachers" reported greater intrinsic interest and spent more free-choice time on the experimental task. Similarly, Skinner and Belmont (1993) found that students who were perceived as behaviorally engaged by their teachers received more autonomy support, structure, and involvement, compared with students who were perceived as less behaviorally engaged. These findings are consistent with evidence showing that an individual's beliefs about a target influence his or her interpersonal behavior toward the target (e.g., Snyder & Stukas, 1999). Taken together, the aforementioned empirical evidence implies that when teachers perceive their students as self-determined, they are more likely to use strategies that maintain or facilitate students' self-determination. In contrast, when teachers perceive their

students as low in self-determination, they may use less adaptive strategies toward their students, which may further undermine students' self-determination.

According to SDT, personal dispositions also have an important role in predicting teachers' use of motivational strategies, in particular autonomy support. Specifically, according to Deci and Ryan (1985), individuals have a disposition toward autonomy, called *autonomous causality orientation*, which varies between individuals. A high autonomous causality orientation reflects a generalized tendency toward pursuing opportunities for self-determination. Preservice teachers with a high autonomous causality orientation have been shown to be more autonomy supportive when compared with preservice teachers with a controlling disposition (i.e., a tendency toward pursuing controlling opportunities), as measured by independent observers (Reeve, Bolt, & Cai, 1999).

To summarize, based on the aforementioned research, our study examined three antecedents of teachers' use of motivational strategies (see Figure 1): perceived job pressure, teacher perceptions of student self-determination, and teachers' autonomous causality orientation. However, educational research indicates that the influence of contextual and personal factors on teachers' behavior, such as the degree they use adaptive motivational strategies, can be exerted via teachers' own motivation to teach. Within the SDT framework, Pelletier, Séguin-Lévesque, and Legault (2002) showed that teacher self-determination mediated the influence of teachers' perceptions of constraints at work (e.g., pressure associated with colleagues or school authorities), as well as teachers' perception of student self-determination toward school, on teacher provision of autonomy support. Further, as far as causality orientations are concerned, Williams and Deci (1996) found that autonomous orientation was positively related to self-determination in medical students.

However, according to SDT, the social context should not influence motivational regulations directly as in the Pelletier et al. (2002) study; rather, the influence should be indirect via the satisfaction of three innate psychological needs (Deci & Ryan, 2000; Vallerand, 2001). These are the needs for autonomy, competence,



Figure 1 — Hypothesized model of antecedents of teacher motivational strategies in physical education. *Note.* The relationship between perceived job pressure to need satisfaction is hypothesized to be negative.

and relatedness. *Autonomy* refers to the degree of volition one feels in pursuing the activity and the need to feel congruence between an activity and one's values (Deci & Ryan, 2000). *Competence* is the desire to interact effectively with the environment and to attain valued outcomes (White, 1959), and *relatedness* is the desire to feel connected to significant others (Deci & Ryan, 2000). In the current study, we sought to investigate the possible mediating effects of teachers' own psychological needs on the relationship between the three contextual/personal factors (i.e., perceived job pressure, autonomous causality orientation, and teachers' perceptions of student self-determination) and teacher self-determination (see Figure 1). Vallerand (2001) theorized a sequence wherein social factors → needs satisfaction → self-determination → motivational consequences (such as the degree of use of adaptive motivational strategies). Such social factors can include perceived job pressures teachers feel at work. Perceived job pressures can reduce teachers' autonomous feelings because they are pressured into teaching in certain ways. Similarly, if teachers are told how to teach by their colleagues, they may feel less competent or related to their colleagues. In terms of causality orientation, Baard, Deci, and Ryan (2004) found that employees' autonomous orientation positively influenced their need satisfaction because they were more oriented toward environments that satisfied their needs. Thirdly, it is plausible that when teachers perceive their students to be self-determined, they may feel competent in their teaching because they perceive that they are successful in their jobs. Identification of mediating variables can explain the mechanisms by which contextual and personal determinants impact upon teacher self-determination and, therefore, highlight possible avenues for intervention (Shrout & Bolger, 2002).

As shown so far, much of the existing research on antecedents of teacher-created motivational climate has been conducted in classrooms or in laboratory settings. This line of work offers a great deal of insight into classroom-based practice; however, it is unknown whether such findings can be transferred directly to the physical education context. Furthermore, most of the existing studies have (a) examined various determinants of teaching strategies in isolation, (b) focused predominantly on the teaching strategy of autonomy support, and (c) have not examined the mediating role of psychological need satisfaction. Our study aims to address all these limitations. Thus, considering other previous empirical and theoretical research (Baard et al., 2004; Deci & Ryan, 1985, 2000; Pelletier et al., 2002; Vallerand, 2001), a model was constructed and tested in this study (see Figure 1). Based on Vallerand (2001) and empirical evidence by Pelletier et al., we hypothesized that perceived job pressure would be negatively related to teacher self-determination, and perceptions of student self-determination would be positively related to teacher self-determination. Further, these relationships would be indirect, through teachers' need satisfaction. Similarly, extrapolating from Baard et al. (2004), we hypothesized that the teachers' autonomous orientation would be positively related to teachers' need satisfaction, which in turn would be related to teacher self-determination. Finally, extending Pelletier et al.'s findings, teachers' self-determination was expected to positively predict the teachers' reported use of the three motivational strategies under investigation (i.e., providing a meaningful rationale, offering instrumental help and support, and gaining an understanding of the students).

Method

Participants and Procedures

Two hundred and four physical education teachers (100 male, 95 female, 9 did not specify their gender; M age = 34.34 years; SD = 11.09 years; range = 22–60 years) who taught students between the ages of 11 and 18 years volunteered to participate in the study. The participating teachers had a mean of 10.84 years of teaching experience (SD = 11.18 years). The teachers were sampled from 82 schools situated throughout the United Kingdom; there was not a substantial number of teachers from one school or a small number of schools. Ninety percent of the participating schools were coeducational and state funded. The teachers reported their respective students as coming from a diverse socioeconomic background. Following approval by the ethics subcommittee of a U.K. university, a multisection questionnaire and an addressed envelope for the return of the inventory were given to each physical education teacher at the participating schools. Within the inventory it was emphasized that participation was voluntary and anonymity was guaranteed.

Measures

Perceived Job Pressure. Ten items were designed for the current study to assess three work-related types of pressure that physical education teachers have reported as affecting their choice of motivational teaching strategies (Taylor & Ntoumanis, 2007). The first subscale consisted of four items that measured perceived time constraints associated with physical education lessons (e.g., “I am sometimes rushing to complete my lessons”). Secondly, two items measured pressure associated with the school authorities (e.g., “My teaching methods are dictated by school policy”). Finally, a subscale consisting of four items assessed the amount of pressure felt from being evaluated based on their students’ performance (e.g., “If students don’t perform, it looks bad on my record”). Responses were reported on a 7-point scale ranging from 1 (*not at all true*) to 7 (*very true*); some of the items were negative statements and therefore were reverse-scored before data analysis. Scores for each subscale were averaged and used as indicators of perceived job pressure in the hypothesized structural model.

Autonomous Causality Orientation. Eight vignettes taken from the General Causality Orientations Scale (GCOS; Deci & Ryan, 1985) were used to assess autonomous causality orientation. The 8 vignettes were selected from the original 12 owing to the length of the inventory and were chosen to reflect both social and achievement scenarios. The original GCOS also measures individuals’ controlled and impersonal (i.e., the extent to which people experience their behavior as out of their control) causality orientation; however, for the purposes of this study, only the autonomous orientation items were used. An example vignette is, “When you and your friend are making plans for Saturday evening, it is likely that you would each make suggestions and then decide together on something that you both feel like doing.” Each vignette was followed by a scale in which participants rated how likely it was that they would endorse the autonomous oriented response on a 7-point scale anchored by 1 (*very unlikely*) and 7 (*very likely*). Deci and Ryan

(1985) reported a Cronbach coefficient of $\alpha = .74$ for a 12-vignette version of the autonomous orientation subscale.

Perceptions of Student Self-Determination. A questionnaire developed by Goudas, Biddle, and Fox (1994) was adapted to measure teachers' perceptions of students' motivational regulations. Each motivational regulation comprised four items that followed the stem "Students take part in physical education classes. . . ." Subscales in the questionnaire measured intrinsic motivation (e.g., "Because they think PE is fun"), identified regulation (e.g., "Because they want to learn sport skills"), introjected regulation (e.g., "Because they would feel bad if they didn't"), external regulation (e.g., "Because they'll get into trouble if they don't"), and amotivation (e.g., "But they think they are wasting their time"). Responses were reported on a 7-point scale ranging from 1 (*not at all true*) to 7 (*very true*). Following guidelines provided by Vallerand (2001), a self-determination index (SDI) was calculated to reflect the teachers' perceptions of student self-determination. Specifically, each subscale score was multiplied by an assigned weight according to its position on the self-determination continuum. When calculating 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). The product scores were then summed to form an index of self-determination.

Psychological Need Satisfaction. Satisfaction of the three psychological needs was assessed using the Basic Need Satisfaction at Work Scale (BNSAW; Deci et al., 2001). Autonomy was measured using seven items (e.g., "I feel like I can make a lot of inputs in deciding how my job gets done"), competence was measured using six items (e.g., "People at work tell me I am good at what I do"), and relatedness was assessed using eight items (e.g., "I get along with people at work"). Responses were reported on a 7-point scale ranging from 1 (*not at all true*) to 7 (*very true*); some of the items were negative statements and therefore were reverse-scored before data analysis. Deci et al. (2001) reported Cronbach coefficients for each subscale of between $\alpha = .73$ and $\alpha = .84$ for an English-speaking sample. Following the example of Baard et al. (2004) and recent work in a physical education context (e.g., Ntoumanis, 2005), scores for each subscale were used as indicators of teachers' overall need satisfaction factor in the hypothesized structural model.

Teacher Self-Determination. Teachers' self-determination toward work was measured using the Work Motivation Inventory (WMI; Blais, Lachance, Vallerand, Briere, & Riddle, 1993). The participant read the stem "Why do you do your work?" followed by 24 items (four items for each subscale) that measure the types of motivational regulation hypothesized by SDT. Example items are, "For the satisfaction I experience when I am successful at doing difficult tasks" (intrinsic motivation), "Because it has become a fundamental part of whom I am" (integrated regulation), "Because I chose this type of work to attain my career goals" (identified regulation), "Because I want to be very good at this work, otherwise I would be very disappointed" (introjected regulation), "Because it allows me to earn money" (external regulation), and "I don't know, too much is expected of us" (amotivation). Responses were reported on a 7-point scale ranging from 1 (*does not correspond at all*) to 7 (*corresponds exactly*). Blais et al. (1993) have demonstrated that the

scale possesses acceptable validity and reliability. Using a method similar to the one used for the calculation of teachers' perceptions of student self-determination, a SDI was computed to reflect teachers' self-determination. The assigned weights were 3 (intrinsic motivation), 2 (integrated regulation), 1 (identified regulation), -1 (introjected regulation), -2 (external regulation), and -3 (amotivation).

Use of the Three Motivational Strategies. Teachers were asked to evaluate the degree of their use of the three motivational strategies by responding to 10 items from the teacher version of the Teacher as Social Context Questionnaire (TASCQ; Wellborn, Connell, Skinner, & Pierson, 1988). Three items measured teachers' provision of instrumental help and support, three items assessed their provision of a meaningful rationale, and four items measured their attempts to gain an understanding of students. Examples of these items are, "I find it hard to teach students in ways they can understand" (reversed item for instrumental help and support), "I explain to students why we learn certain things in PE" (providing a rationale), and "I know a lot about what goes on with students" (gaining an understanding of students). Responses were reported on a 7-point scale ranging from 1 (*not at all true*) to 7 (*very true*); some of the items were negative statements and therefore were reverse-scored before data analysis.

Results

Preliminary Analyses

Confirmatory factor analyses with EQS software (Version 6.1; Bentler, 2003) using the robust maximum likelihood method were carried out to examine the factorial structure of all scales. Hu and Bentler (1999) propose that a comparative fit index (CFI) approaching .95, a standardized root-mean-square residual (SRMR) close to .08, and a root-mean-square error of approximation (RMSEA) close to .06 are indicative of satisfactory model fit. For reasons of brevity, the results of the confirmatory factor analyses are not presented here but are available from the first author on request. All scales were found to have acceptable model fit, except for the BNSAW, Satorra-Bentler $\chi^2(187) = 397.90$; CFI = .81; SRMR = .08; RMSEA = .08, and the WMI, Satorra-Bentler $\chi^2(264) = 624.33$; CFI = .75; SRMR = .11; RMSEA = .08. Inspection of the standardized loadings and modification indices for the BNSAW suggested the removal of some of the items. Specifically, three items from the autonomy subscale and two items from the competence subscale were removed. The revised BNSAW scale had an acceptable model fit: Satorra-Bentler $\chi^2(117) = 171.91$; CFI = .93; SRMR = .07; RMSEA = .05. Similarly, the standardized loadings and modification indices suggested the deletion of one item from each subscale of the WMI, with the exception of identified regulation, from which two items were deleted. The revised WMI had a satisfactory model fit: Satorra-Bentler $\chi^2(111) = 158.50$; CFI = .94; SRMR = .08; RMSEA = .05. The factorial structure of the scale measuring provision of a meaningful rationale could not be assessed using fit indices because the factorial model was just identified (i.e., it had 0 *df*). Nonetheless, examination of the three items measuring provision of a meaningful rationale revealed that the item "It is difficult to explain to students why what we do in PE is important" loaded poorly on the latent factor ($\beta = .15$). Consequently, this item was deleted from all further analyses.

Table 1 shows the means, standard deviations, range, and Cronbach's alpha coefficients of all variables. All subscales had an acceptable ($\alpha > .70$) or marginally acceptable ($\alpha > .60$) Cronbach coefficient, except for the subscale measuring provision of instrumental help and support ($\alpha = .54$). For that scale, none of the items would have substantially increased the alpha coefficient if it was deleted.¹ An inspection of the mean scores shows that the teachers perceived that they provided high levels of all three strategies. Additionally, they reported high levels of competence and relatedness need satisfaction, moderate levels of autonomy, and low-to-moderate levels of self-determined motivation. Teachers also perceived their students to be moderately self-determined. Moreover, teachers reported moderate-to-low levels of pressure resulting from time constraints, performance evaluation, and the school environment. Finally, teachers reported a high autonomous orientation.

The correlations between all variables can be seen in Table 2. As expected, pressures from the school authorities and performance evaluations were negatively correlated with the three psychological needs and teacher self-determined motivation. Time constraints were negatively correlated with autonomy. Also, teachers' autonomy orientation and their perceptions of student self-determined motivation positively correlated with teacher psychological need satisfaction and teacher self-determined motivation. Furthermore, teachers' perceptions of student self-determined motivation were positively correlated with the use of all three motivational strategies. Regarding the psychological needs, competence was the strongest correlate of teacher self-determined motivation, followed by autonomy, and then relatedness. Teacher self-determined motivation was moderately correlated with the three motivational strategies, and, lastly, the strategies were moderately correlated with each other.

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

Variable	α	Range	<i>M</i>	<i>SD</i>
Time constraints of the lesson	.73	1 to 7	4.27	1.38
Pressure from performance evaluation	.75	1 to 7	3.87	1.26
Pressure from the school environment	.60	1 to 7	3.19	1.29
Autonomous orientation	.69	1 to 7	5.51	0.69
Perceptions of student self-determined motivation	—	–18 to 18	5.73	3.87
Autonomy	.63	1 to 7	4.95	0.81
Competence	.62	1 to 7	5.40	0.85
Relatedness	.81	1 to 7	5.64	0.88
Teacher self-determined motivation	—	–36 to 36	8.62	6.80
Gaining an understanding of students	.66	1 to 7	5.34	0.76
Provision of instrumental support	.54	1 to 7	5.71	0.74
Providing a meaningful rationale	.71	1 to 7	5.68	0.90

Note. No alphas are reported for perceptions of student self-determined motivation and teacher self-determined motivation because these were single-item weighted composite scores.

Table 2 Correlations Among All Variables

Variable	1	2	3	4	5	6	7	8	9	10	11
1. Time constraints of the lesson	—										
2. Pressure from performance evaluation	.36	—									
3. Pressure from the school structure	.21	.30	—								
4. Autonomous orientation	.20	.07	.00	—							
5. Perceptions of student self-determination	-.12	.00	-.22	.03	—						
6. Autonomy	-.18	-.38	-.47	.14	.16	—					
7. Competence	-.08	-.18	-.28	.23	.39	.56	—				
8. Relatedness	-.10	-.21	-.19	.18	.26	.52	.45	—			
9. Teacher self-determined motivation	-.01	-.14	-.18	.27	.33	.41	.53	.28	—		
10. Gaining an understanding of students	-.11	.01	-.11	.14	.34	.19	.41	.29	.37	—	
11. Provision of instrumental support	-.13	-.14	-.12	.12	.36	.23	.45	.22	.51	.49	—
12. Providing a meaningful rationale	-.07	-.02	-.01	.13	.34	.14	.30	.16	.30	.56	.52

Note. All correlations $\pm .14$ and above are significant at $p < .05$. All correlations $\pm .18$ and above are significant at $p < .01$.

A Model of Antecedents of Motivational Strategies

Considering the relative complexity of the hypothesized structural equation model, we reduced the number of parameters. The eight responses from the GCOS were parceled into four indicators of a latent variable reflecting teachers' autonomous causality orientation. Additionally, two items measuring the strategy of providing instrumental help and support were parceled and used as an indicator of this strategy, along with the third item, which was used as the second indicator. Similarly, the four items measuring gaining an understanding of students were parceled to form two indicators of a latent factor. The strategy of providing a rationale consisted of two items only, thus each item was used as an indicator. All parcels were constructed using the mean score of the items. Standardized factor loadings and uniqueness terms of the indicators used in the measurement model are shown in Table 3.

The hypothesized structural equation model was tested using the robust maximum likelihood estimation method (Mardia's normalized estimate of multivariate kurtosis = 10.44). A covariance matrix was used as the input for all models. Indi-

Table 3 Standardized Factor Loadings and Uniqueness Terms of All Indicators of Latent Constructs in the Measurement Model

Latent factor and observed indicator	Loading	Uniqueness
Perceived job pressure		
Time constraints	.47	.88
Performance evaluation	.65	.76
School structure	.50	.87
Autonomous orientation		
Parcel 1	.68	.73
Parcel 2	.59	.81
Parcel 3	.50	.87
Parcel 4	.64	.77
Need satisfaction		
Autonomy	.74	.67
Competence	.76	.65
Relatedness	.60	.80
Provision of a rationale		
Indicator 1	.56	.83
Indicator 2	.98	.18
Gaining an understanding of students		
Indicator 1	.64	.77
Indicator 2	.78	.63
Provision of instrumental support		
Indicator 1	.54	.84
Indicator 2	.69	.72

Note. No factor loadings are available for teacher perceptions of student self-determination and teacher self-determination because each of these constructs were reflected by a single-item weighted composite score.

cators are omitted from Figure 1; their median loading was $\beta = .64$ (see Table 3). The statistical power of the model was estimated at .95 (null hypothesis RMSEA = .00, alternative hypothesis RMSEA = .05) using the software NIESEM (Dudgeon, 2003), which is based on the work of MacCallum, Browne, and Sugawara (1996). MacCallum et al.'s approach estimates the power of the chi-square test to reject a false model, as opposed to the power available for testing individual parameter estimates.

Model fit indices showed that the hypothesized model was weak: Satorra–Bentler $\chi^2(130) = 310.33$; CFI = .75; SRMR = .12; RMSEA = .08). However, examination of the modification indices suggested the addition of three direct paths. These paths were from (a) psychological need satisfaction to the strategies of gaining an understanding of students (b) psychological need satisfaction to provision of instrumental help and support, and (c) from autonomous orientation to teachers' self-determination. These modifications were implemented because they are conceptually defensible. Specifically, basic needs theory (Ryan & Deci, 2002) posits that the satisfaction of the three psychological needs can directly influence one's actions toward others, as one engages in behaviors with others in mind (e.g., see Gagné, 2003, on the link between psychological need satisfaction and prosocial behavior). Therefore, it is possible that teachers' need satisfaction can directly predict their use of adaptive behaviors (i.e., their motivational strategies toward students; see also the Discussion section). Additionally, although they did not examine psychological need satisfaction, Williams and Deci (1996) reported a direct relationship between medical students' autonomous orientation and their level of self-determination to participate in the course. The authors speculated that individuals with a high autonomous orientation are more likely to function in self-determined ways. Finally, based on the modification indices, covariance paths between the errors of the latent factors representing the three strategies were added. Such paths indicate shared variance between the strategies that is not accounted for by the predictors (Kline, 2005). From an applied perspective, it is likely that a physical education teacher's use of one motivational strategy is partly dependent on the use of the other motivational strategies. For example, physical education teachers can only provide a rationale that is meaningful to the students if they have an understanding of the students and what is meaningful to them. Because the motivational strategies in the structural model are dependent variables, their interrelationship can only be presented by correlating their errors. Bearing in mind that Hu and Bentler's (1999) criteria are too restrictive and difficult to achieve when testing complex models with multiple factors (Marsh, Hau, & Grayson, 2005; Marsh, Hau, & Wen, 2004), we deem the fit of this revised model (see Figure 2) satisfactory: Satorra–Bentler $\chi^2(124) = 183.37$; CFI = .92; SRMR = .08; RMSEA = .05).

The indirect effects in the model are shown in Table 4. As can be seen, pressure from the social context negatively predicted, whereas autonomous orientation and perceptions of student self-determined motivation positively predicted, teacher self-determined motivation through psychological need satisfaction. Additionally, pressure from the social context, teachers' autonomous orientation, and perceptions of student self-determined motivation predicted teachers' use of all three motivational strategies via psychological need satisfaction and teacher self-determined motivation. Lastly, need satisfaction predicted the three strategies via teacher self-determined motivation.²

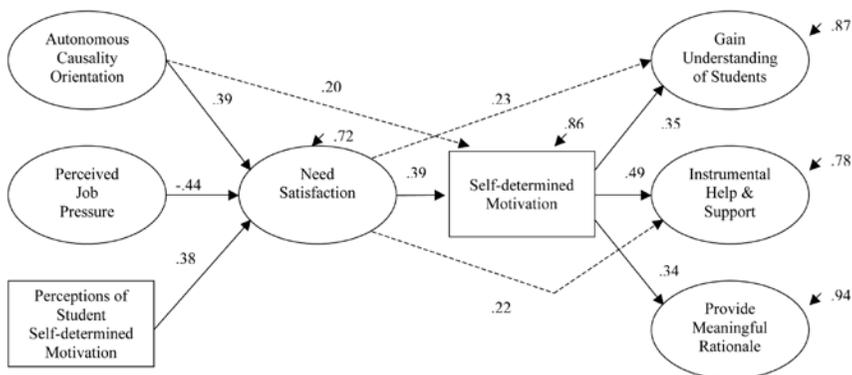


Figure 2 — Revised model of antecedents of teacher motivational strategies in physical education. *Note.* All parameters are significant. Factor indicators have been omitted for reasons of presentation simplicity. The correlations between the errors of providing a meaningful rationale and use of instrumental help and support ($r = .30$), between providing rationale and gaining an understanding of students ($r = .24$), and between instrumental help and support and gaining an understanding of students ($r = .17$) are not shown. Dashed lines indicate modifications to the original hypothesized model.

Table 4 Standardized Parameter Estimates of Indirect Effects

Parameter		β
Perceived job pressure	→ Teacher self-determined motivation	-.17*
Perceived job pressure	→ Gaining an understanding of students	-.16*
Perceived job pressure	→ Provision of instrumental support	-.18*
Perceived job pressure	→ Providing meaningful rationale	-.06*
Autonomous orientation	→ Teacher self-determined motivation	.15*
Autonomous orientation	→ Gaining an understanding of students	.21**
Autonomous orientation	→ Provision of instrumental support	.26**
Autonomous orientation	→ Providing meaningful rationale	.12**
Perceptions of student self-determination	→ Teacher self-determined motivation	.15**
Perceptions of student self-determination	→ Gaining an understanding of students	.14**
Perceptions of student self-determination	→ Provision of instrumental support	.15**
Perceptions of student self-determination	→ Providing meaningful rationale	.05**
Psychological need satisfaction	→ Gaining an understanding of students	.14**
Psychological need satisfaction	→ Provision of instrumental support	.19***
Psychological need satisfaction	→ Providing meaningful rationale	.13**

* $p < .05$, ** $p < .01$, *** $p < .001$.

As a subsidiary to the main analyses, we tested the equality of the model parameters across gender. Specifically, we compared the revised model unconstrained across gender with a nested model in which all factor loadings, factor variances and path coefficients, and the error covariances of the three motivational strategies were constrained to be invariant across gender. The fit indices of the constrained model, Satorra–Bentler $\chi^2(274) = 329.94$; CFI = .92; SRMR = .11; RMSEA = .05, were very similar to those of the unconstrained model, Satorra–Bentler $\chi^2(248) = 329.94$; CFI = .94; SRMR = .10; RMSEA = .04. Analysis of the univariate Lagrange multiplier tests indicated that only 2 of the 26 constraints differed across gender ($p < .05$): the path from psychological need satisfaction to provision of instrumental help and support (males $b = .82$; females $b = .06$), and the path from autonomous orientation to psychological need satisfaction (males $b = .22$; females $b = .56$).

Discussion

The purpose of the current study was to examine contextual and personal antecedents of three motivational strategies used by physical education teachers. The results indicated that perceived job pressure, the teachers' autonomous causality orientation, and their perceptions of student self-determined motivation impacted upon their psychological need satisfaction. In turn, need satisfaction and autonomous causality orientation positively predicted teacher self-determined motivation to teach. The more teachers' needs were satisfied and the more self-determined they reported to be, the more they tried to gain an understanding of their students and provide them with instrumental help and support. Teacher self-determination also predicted the provision of a meaningful rationale to students. A number of significant indirect effects were also found in predicting the three motivational strategies. In particular, perceived job pressure, autonomous orientation, and perceptions of student self-determined motivation predicted the degree to which teachers use the three motivational strategies indirectly through psychological need satisfaction and self-determined motivation.

As far as the effects of perceived job pressure on teacher motivation are concerned, Pelletier et al. (2002) found that perceived constraints at work negatively influenced teachers' self-determined motivation. The current study extends Pelletier and colleagues' findings by indicating that perceived job pressure influences teacher self-determination indirectly through the satisfaction of their psychological needs. Taken together, these findings imply that the school system has an important role to play in determining teachers' self-determined motivation. A school that does not allocate sufficient time for teachers to accomplish all the lesson objectives in their physical education lessons and that places emphasis on teachers being responsible for student performance standards and conforming to certain teaching styles may undermine teachers' psychological needs and may lead to low teacher self-determined motivation. In turn, a teacher low in self-determined motivation to teach is less likely to use motivationally adaptive teaching strategies toward students.

Congruent with previous research in work place settings (e.g. Baard et al., 2004), we found a link between the teachers' autonomous orientation and the level of psychological need satisfaction that they experience at school. Such a finding implies that teachers with a high autonomous orientation are more likely to feel

autonomous in deciding their actions, competent when teaching, and related to their colleagues and students because they have a greater tendency to seek out situations that promote active engagement (Baard et al., 2004). The direct positive relationship found between teachers' autonomous orientation and their self-determined motivation to teach is also in accordance with SDT because an individual with a high autonomous orientation has a greater propensity to function in self-determined ways (Williams & Deci, 1996). These two findings indicate that a teacher's orientation toward autonomy is an important individual difference variable to consider in future research examining teacher motivation. However, a global causality orientation is relatively resistant to change (Deci & Ryan, 1985). Consequently, research is needed using a more contextual measure of teacher autonomous orientation (e.g., Problems in Schools Questionnaire; Deci, Schwartz, Sheinman, & Ryan, 1981).

A third antecedent of teachers' need satisfaction was their perception of student self-determined motivation. In turn, the more teachers' needs were satisfied, the more self-determination they experienced in their work. Previous research (e.g., Pelletier et al., 2002) has indicated a direct link between perceptions of student self-determined motivation and teacher self-determined motivation; however, the significant indirect effect found in the current study indicates that this process is indirect through the satisfaction of teachers' psychological needs. This finding implies that teachers who hold negative perceptions of student self-determined motivation are less likely to be self-determined to teach because their psychological needs are frustrated.

The positive relationship between teachers' psychological need satisfaction and their self-determined motivation to teach is in accordance with SDT (Deci & Ryan, 2000). Moreover, the significant indirect effects of perceived job pressure and perceptions of student self-determined motivation on teacher self-determined motivation through teachers' psychological needs extends the model proposed by Pelletier et al. (2002) by including psychological need satisfaction as an intervening variable by which contextual and personal variables affect teacher self-determined motivation. Additionally, results from this study showed that teachers' self-determined motivation predicts their reported use of all three motivational strategies. Specifically, self-determined teachers try more to understand their students, provide them with more instrumental help and support, and offer them meaningful rationale, compared with low self-determined teachers. Reeve (1998) indicated that some teachers believe that autonomy supportive strategies require too much effort. Because the strategies we examined in this study require teachers to invest effort in their teaching, it is possible that teachers low in self-determined motivation put less effort into using these adaptive strategies. This argument is in line with previous research in a number of domains that has indicated a link between self-determined motivation and effort (e.g., Ntoumanis, 2001; Reeve, Jang, Hardre, & Omura, 2002; Vansteenkiste, Simons, Soenens, & Lens, 2004). Taken together, our results emphasize the importance of a greater understanding of the factors that affect teacher self-determined motivation. These factors will not only have important consequences for the teacher, but also for the students via the teachers' use of motivationally adaptive strategies. Such strategies have been found in various studies to predict many important student outcomes, including engagement, positive feeling, adaptive beliefs about effort, and increased feelings of relatedness (e.g., Assor et al., 2002; Connell & Wellborn, 1991; Skinner, 1991).

Our revised model included direct pathways from teachers' psychological need satisfaction to the strategies of gaining an understanding of students and providing instrumental help and support. Self-determination theory and, in particular, basic needs theory advocate direct effects of need satisfaction on outcomes such as one's psychological well-being (Ryan & Deci, 2002), and prosocial behaviors (Gagné, 2003). Specifically, when individuals' needs are unfulfilled they are more likely to exhibit behaviors that have themselves as the focus. In contrast, when their needs are satisfied they will be inclined to engage in adaptive behaviors with others in mind. Thus, it is likely that when the teachers' needs are satisfied they may be more likely to engage in adaptive behaviors that focus on maximizing student learning and positive psychological experiences in physical education. Building upon and extending the findings of Pelletier et al. (2002), our findings indicate that future research in this area should examine both psychological needs and self-determined motivation as important determinants of teacher motivational strategies.

We also tested for gender invariance in the revised model and found only 2 out of 26 relationships to differ significantly across the male and female samples. Firstly, the relationship between teachers' need satisfaction and their provision of instrumental help and support was stronger in males than in females. Second, the relationship between teachers' autonomous orientation and their psychological need satisfaction was stronger in females than in males. Empirical research has not previously indicated that these gender-specific relationships exist; therefore, it would be premature to speculate why these findings occurred until future research replicates them. Nonetheless, the fact that most of the relationships in the current study were found to be invariant across gender supports the argument that the psychological processes explained by SDT are equivalent across gender (Deci & Ryan, 2000).

Limitations and Additional Future Directions

Based upon theoretical arguments and previous empirical work, our study presented a number of antecedents of teacher motivational strategies in physical education. This said, our evidence is cross-sectional and causality cannot be inferred. As such, experimental research is required in the physical education context to examine the direction of these relationships between variables, which over time are likely to be nonrecursive. A limitation of the current study was that the teachers self-reported their use of the three motivational strategies. Alternative measures of teacher behavior (e.g., independent observers rating the frequency of each strategy) could be used in the future to establish the extent of potential bias in teacher self-reports.

The sample size in the current study might be perceived as somewhat small; however, it did not compromise the statistical power of the hypothesized model. Further, our sample was quite specific (i.e., secondary school physical education teachers) and not readily available in large numbers as other samples are (e.g., students, or teachers in general). We also acknowledge that the alpha coefficients of some scales were somewhat problematic. However, all hypothesized relationships in the model emerged significant and in the expected direction. Moreover, the factor loadings of all indicators onto their respective latent constructs were satisfactory (i.e., $>.40$; Ford, MacCallum, & Tait, 1986).

Although our model offers an important insight into reasons why teachers adopt adaptive motivational strategies, additional variables could be added to broaden it. For example, measures of student motivation would extend the proposed sequence by examining whether teacher motivational strategies are important predictors of student motivation. Measures of student motivation can also offer an insight into the compatibility of student and teacher perceptions of student motivation. Moreover, the addition of student motivational indices, combined with experimental methodology, may answer additional important research questions, such as whether teachers' perceptions of student motivation result in teachers employing strategies that lead students to eventually confirm the teachers' initial beliefs (i.e., behavioral confirmation; see Snyder and Stukas, 1999). Other additional measures that could be added include aspects of the school context that support, rather than frustrate, teachers' psychological needs. For example, teachers' perceptions of how much social support they experience at work could be an important facilitator of feelings of relatedness. Similarly, the extent to which teachers are involved in the planning process of the academic year may affect their feelings of autonomy. Indeed, our model examined antecedents of need satisfaction in general, whereas future research may wish to examine their impact on individual psychological needs. Finally, a limitation of the current study was that it did not examine maladaptive teaching strategies, such as the degree to which teachers attempt to control students or use strategies that promote normative comparisons. Antecedents of these strategies may be somewhat different compared with antecedents of adaptive strategies.

Conclusions

The findings from the current study support a physical education–based model that explains how perceived job pressure, teachers' autonomous orientation, and teachers' perceptions of student self-determined motivation predict teacher psychological need satisfaction and self-determined motivation. In turn, need satisfaction and self-determination predict the degree to which physical education teachers use three important motivational strategies. School authorities need to minimize pressurizing climates for physical education teachers, so as not to undermine their psychological needs. This is important because increased teacher self-determined motivation, as a result of psychological need satisfaction, positively relates to the adaptive motivational strategies physical education teachers employ in their classes.

Notes

1. We retained the scales with Cronbach alphas below .70 in the analyses because the factor loadings of the observed indicators on their respective factors were satisfactory (i.e., $>.40$; Ford, MacCallum, & Tait, 1986).
2. To examine the strength of the three indirect effects from the contextual and personal antecedents to teacher self-determination, and from psychological need satisfaction to the motivational strategies, an anonymous reviewer suggested that (a) models should be tested with the direct effects added and (b) the indirect effects should be presented as a percentage of the total effects (i.e., the sum of the direct and indirect effects). A model with all three direct paths included simultaneously resulted in nonconvergence of the model. Consequently, we ran models with each direct path

included separately. The direct paths from perceptions of student self-determination to teacher self-determination, and from psychological needs to provision of a rationale were significant ($\beta = .14$ and $\beta = .35$, respectively). The direct path from perceived job pressure to teacher self-determination was nonsignificant ($\beta = .01$). In addition the indirect effects as percentages of the total effects were as follows: autonomous orientation to self-determination: 27%, job pressure to self-determination: 65%, perceptions of student self-determination to teacher self-determination: 36%, psychological needs to gaining an understanding of students: 23%, psychological needs to instrumental help and support: 30%, and psychological needs to provision of a rationale: 17%.

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