Human Kinetics

ORIGINAL RESEARCH

Student (Dis)Engagement and Need-Supportive Teaching Behavior: A Multi-Informant and Multilevel Approach

**Lynn Van den Berghe, Isabel B. Tallir, Greet Cardon,
Nathalie Aelterman, and Leen Haerens**

Ghent University

Starting from self-determination theory, we explored whether student engagement/disengagement relates to teachers' need support and whether this relationship is moderated by teachers' causality orientations. A sample of 2004 students situated in 127 classes taught by 33 physical education teachers participated in the study. Both teachers and students reported on students' (dis)engagement, allowing investigation of the proposed relationships both at the student and teacher level. Most of the variance in need support was at the student level, but there was also between-teacher and between-class variance in need support. Engagement related to more need support, but only at the student level. In total, few moderation effects were found. Teachers with a relatively low controlled orientation were more need supportive when perceiving their students as emotionally and behaviorally engaged. By making teachers aware of these dynamics, automatic responses to student engagement can be better thought out. Recommendations for future research are discussed.

Keywords: motivational dynamics, physical education, self-determination theory, engagement, disengagement

Student Engagement and Disengagement

General academic student engagement is defined as "the quality of a students' involvement with the endeavor of schooling and with the people, activities, goals, values, and places that compose it" (Skinner, Kindermann, & Furrer, 2009). Engagement is a multifaceted concept, reflecting behavioral and emotional dimensions. *Behavioral engagement* refers to the active participation and involvement in activities (Fredricks, Blumenfeld, & Paris, 2004) and contains parameters such as paying attention, showing effort, being persistent, and verbally participating (Aelterman et al., 2012; Reeve, Jang, Carrell, Jeon, & Barch, 2004; Skinner, Marchand, Furrer, & Kindermann, 2008). Emotional engagement draws on emotions toward teachers, classmates, activities, or the school and is expected to influence the willingness to engage in an activity (Fredricks et al., 2004). Emotional

components of engagement are expressions of happiness and interest (Skinner & Belmont, 1993). Both in the context of physical education (PE; e.g., Cox & Williams, 2008; Tessier, Sarrazin, & Ntoumanis, 2008, 2010) and in the context of general education (Furrer & Skinner, 2003; Reeve et al., 2004; Skinner & Belmont, 1993), student engagement is seen as a correlate or outcome of the students' quality of motivation. It is an important topic of interest, with several studies illustrating that active and enthusiastic participation relates to positive academic outcomes (e.g., Skinner et al., 2009; Skinner, Wellborn, & Connell, 1990).

Unfortunately, not all students are positively engaged in the lessons. In an academic context, the school and teachers commonly prohibit students to be disengaged since students are not allowed to quit activities or exit the classroom. Therefore, students' negative feelings or emotions toward the subject, activities, or teacher might not result in dropout from the lesson, but rather in a diminished effort or persistence during the lesson. These negative behaviors and related emotions are often defined as *disengagement* (Major, Spencer, Schmader, Wolfe, & Crocker, 1998) or *disaffection* (Skinner et al., 2009; Skinner et al., 2008). *Disengagement* (this term will be used for the purpose of the current study) includes behavioral components, such as not listening, giving up, or lacking effort and persistence, and emotional components, such

---

Lynn Van den Berghe, Isabel B. Tallir, Greet Cardon, and Leen Haerens are with the Department of Movement and Sports Sciences, Ghent University, Ghent, Belgium. Nathalie Aelterman is with the Department of Movement and Sports Sciences and with the Department of Developmental, Personality and Social Psychology, Ghent University, Ghent, Belgium. Address author correspondence to Lynn Van den Berghe at L.vandenberghe@ugent.be.

as feeling bored or discouraged. When teachers want their students to be engaged, they can motivate them by being need supportive (i.e., motivating) in the lesson.

Need-Supportive Teaching Behavior

A substantial number of researchers (e.g., Haerens et al., 2013; Koka & Hagger, 2010; Reeve, 2013; Taylor & Ntoumanis, 2007; Van den Berghe et al., 2013) investigated need-supportive teaching behavior from the perspective of self-determination theory, a psychological theory on human motivation that allows definition of hypothesized need-supportive teaching behaviors (Deci & Ryan, 2000, 2002). According to the theory, the quality of students' motivation can be developed by satisfying the three basic psychological needs for autonomy (i.e., a sense of volition and freedom; e.g., a student who feels he has a say in choosing exercises), competence (i.e., feelings of effectiveness; e.g., a student who feels confident in doing even the most challenging exercises), and relatedness (i.e., having meaningful relationships with others; e.g., a student who feels attached to classmates). Consequently, in any teaching context, teachers can satisfy students' basic needs for autonomy, competence, and relatedness by being autonomy supportive, by providing structure, and by creating a warm environment, respectively. Teachers are autonomy supportive when they identify, develop, and nurture students' interests, preferences, and goals (Reeve, 2009). Identifying students' interests, preferences, and goals includes displaying interest in students' problems and wishes and asking for their opinion and aspirations (Haerens et al., 2013; Jang, Reeve, & Deci, 2010). Nurturing the students' interests refers to acknowledging their perspective (Deci, Egharri, Patrick, & Leone, 1994) and providing fun and interesting activities (Vansteenkiste, Simons, Soenens, & Lens, 2004). Developing the students' interests refers to providing challenging activities (Vansteenkiste et al., 2004) and giving a meaningful rationale to explain the personal relevance of the learning activities (Jang, 2008). The provision of structure nurtures the feeling for competence and involves the communication of guidelines or expectations, the provision of help, and positive feedback (Grolnick & Pomerantz, 2009; Haerens et al., 2013; Jang et al., 2010; Mouratidis, Vansteenkiste, Lens, & Sideridis, 2008). Teachers are supportive for students' need for relatedness when they dedicate time and resources to them, express affection, and enjoy interactions (Skinner & Belmont, 1993).

In educational research, it was shown that need support leads to optimal educational outcomes such as academic achievement, retention, resilience, and learning (e.g., Connell, Spencer, & Aber, 1994; Skinner et al., 1990). In addition, in the specific context of physical education, studies revealed that when teachers are more need supportive, students will be more likely to be optimally motivated and engaged for PE (e.g., Cox & Williams, 2008; Ferrer-Caja & Weiss, 2000, 2002; Ntoumanis, 2005; Tessier et al., 2008, 2010).

Relationships Between Student Engagement, Disengagement, and Need-Supportive Teaching Behavior

When conducting cross-sectional research, researchers have interpreted relationships between teachers' behavior and student motivation and student engagement from one perspective, and this is how teachers might elicit optimal motivation and engagement in students through their way of behaving in the classroom (e.g., in the studies of Chatzisarantis & Hagger, 2009; Cox & Williams, 2008; Tessier et al., 2008, 2010). However, several authors pointed out that this relationship can also be interpreted in the opposite direction; student motivation (Pelletier, Seguin-Levesque, & Legault, 2002; Pelletier & Vallerand, 1996; Taylor & Ntoumanis, 2007; Taylor, Ntoumanis, & Standage, 2008) and student engagement (Reeve, 2013) are suggested to determine the teachers' behavior. For example, it was found that teachers were more need supportive when they perceived a better quality of motivation in their students (Pelletier et al., 2002). The results from the cross-sectional studies were confirmed in experimental and longitudinal work in general education (Pelletier & Vallerand, 1996; Reeve, 2013; Skinner & Belmont, 1993) and in the context of PE (Koka, 2013; Sarrazin, Tessier, Pelletier, Trouilloud, & Chanal, 2006). Teachers who initially perceived their students to be optimally motivated in the lesson reported more need support in their lessons after a period of time (e.g., more positive nonverbal feedback; Koka, 2013). This illustrates that teachers not only elicit outcomes, such as optimal motivation and engagement in students (e.g., Chatzisarantis & Hagger, 2009; Cox & Williams, 2008; Tessier et al., 2008, 2010), but also that their teaching behavior can also be influenced by students' expression of motivation and engagement.

Building on this line of research, the current study aimed at analyzing the relationships between student (dis)engagement and need-supportive teaching in the context of PE by questioning several students in classes taught by the same teacher. Not only can individual students exert an important influence on a teacher's behavior, but it is also possible that teachers adapt their way of teaching to the class, depending on how engaged they consider the class to be. However, throughout previous studies, possible differences in engagement between different classes of the same teacher were not explored. Through a multilevel approach, we aimed at investigating whether need-supportive behaviors differ between teachers, whether the same teachers teach differently in different classes, and whether students in the same class perceive need-supportive teaching behaviors of the same teacher differently. Similarly, the study aimed at investigating whether relationships between student (dis)engagement and teachers' need support existed at the student and class level.

To our knowledge, few studies explored relationships between need-supportive teaching behavior and disengagement. Two exceptions are the studies of Ntoumanis

(2001, 2005), who showed that need support from the PE teacher related indirectly to less boredom and negative affect in samples of British adolescent students. Whereas in previous research, disengagement was only occasionally examined as an outcome, we included disengagement as a possible predictor of teachers' need support in class in the current study. Generally, it was expected that engagement would positively predict teachers' need support, whereas negative relationships were expected for disengagement. In the current study, both teachers' and student reports of (dis)engagement and teaching behavior were gathered (also see Taylor and Ntoumanis, 2007). Furthermore, we investigated whether teachers' reports of (dis)engagement would explain additional variance in students' reported need support, in addition to the variance explained by students' reports.

Teacher's General Causality Orientation as an Antecedent of Teaching Behavior

The relationship between perceptions of engagement and need-supportive teaching behavior might not be equally strong in all teachers or situations. According to Reeve (2009), teachers' beliefs, values, and personality disposition are likely to be closely associated with the teacher's functioning in class. As such, some teachers might be more sensitive to student disengagement, so that they are more likely to feel pressured by it (which would be illustrated by a stronger negative association between disengagement and need support). Other teachers might interpret student disengagement as a sign that their own actions are not need supportive. In this way, students' behavior might be seen as a source of information to regulate their own chosen behavior rather than experience it as a pressure, which would be illustrated by a less strong association between disengagement and need support. Such between-teacher differences in the interpretation of student behavior reflect their general causality orientations. General causality orientations are motivational orientations reflecting a global understanding of the source of initiation and regulation of behavior (Deci & Ryan, 1985, 2002). Individuals who endorse an autonomous causality orientation have the tendency to take actions based on personally valued standards and interests and typically experience a sense of volition or freedom in their actions and behaviors. A highly autonomy-oriented person typically seeks activities that are challenging, and takes responsibility for his or her behavior. Individuals with a controlled causality orientation are more likely to experience their own actions and behaviors as influenced by external or internal pressures or controls, such as demanding expectations or offered rewards (Deci & Ryan, 1985; Olesen, 2011). A highly control-oriented person is more sensitive for what others like or demand, or for external rewards or other forms of control. Finally, the impersonal causality orientation refers to feelings of helplessness and not being in control, being ineffective and passive (Deci & Ryan, 1985; Vansteenkiste, Niemiec, & Soenens, 2010), or to the feeling that achievement is

especially a matter of having luck. This orientation was not measured in this study and might be investigated in future research.

Autonomous and controlled causality orientations can also be reflected in teachers' need-supportive teaching behaviors toward the students (Taylor et al., 2008; Van den Berghe et al., 2013). Taylor et al. (2008) illustrated that autonomy-oriented PE teachers reported to be more need supportive toward their students. These findings were also tending in the same direction in the study of Van den Berghe et al. (2013), whereas control-oriented teachers were observed to make less use of a need-supportive teaching style (Van den Berghe et al., 2013). For the purpose of the current study, we hypothesized that, besides other potential factors, the causality orientation of teachers might moderate or determine the strength of the relationship between perceptions of student (dis) engagement and need support.

The Present Study

In sum, the current study aimed at investigating several research questions. First, it was investigated whether teachers differ in provided need support toward individual students and toward different classes. In addition, it was investigated whether teachers differ from each other in provided need support. Second, it was explored whether students' expression of engagement and disengagement predicted teachers' need-supportive behavior, and whether these relationships exist both at the student and at the class level. In addition, it was investigated whether teacher-reported student (dis)engagement would explain additional variance in students' reported need support, in addition to the variance explained by students' reports. Third, we investigated whether personal characteristics (i.e., general causality orientations) of teachers moderated the relationship between student (dis)engagement and reports of need-supportive teaching behavior. We expected that engagement in students would positively predict need support and that student disengagement would negatively predict need support. According to the notion of sensitization (Moller, Deci, & Elliot, 2010), strongly autonomy-oriented teachers would be more susceptible to notice student engagement and would therefore display a stronger positive relationship between student engagement and need support. In addition, because autonomy-oriented people typically focus on their personal interests and experience a sense of freedom in their actions, they are hypothesized to be less susceptible to external pressures. Hence, the negative relationship between student disengagement and teachers' need support is assumed to be less strong among teachers with an autonomous orientation. Further, as control-oriented teachers would be less open to positive events, the positive relationship between engagement and need support would become less strong when teachers are more controlled oriented because they would be less receptive to their students' engagement in class. In addition, because teachers with a controlled orientation might attach more

importance to pressures and external influences when regulating their own need support in class, we expected that the hypothesized negative relationships between student disengagement and teachers' need support would be stronger among strongly control-oriented teachers. These teachers might be more sensitive to student disengagement in class, and perceive this as pressuring, which might be reflected in their own behavior by being less need-supportive toward their students.

Method

Procedure

Thirty-nine randomly chosen Flemish PE teachers were contacted by telephone or e-mail to participate in the study with preferably three of their classes. Six teachers chose not to participate, which resulted in 33 teachers cooperating in the study. Before the start of the study, all teachers, students, and their parents were informed about the purpose of the study by means of informed consent forms, which were handed out to the teachers. The teachers also filled out a single questionnaire with regard to their general causality orientations at the first contact with the researcher. No students returned the opt-out form, thus indicating that they had permission from their parents to fill out the required questionnaires. The Ethical Committee of Ghent University approved the study protocol.

The PE teachers were asked to give their PE lesson as planned. The topics of the randomly chosen lessons were grouped into four categories: 43.50% were on interactive games (e.g., soccer and volleyball), 20% were on individual sports (e.g., track and field and wall climbing), 24.7% were on artistic sports (e.g., gymnastics and dance), and 11.8% consisted of a combination of different sports (e.g., soccer and gymnastics). The student and teacher questionnaires on student engagement, disengagement, and teaching behavior were assessed immediately at the end of the PE lesson. Seven percent ($n = 157$ out of 2240) of the students did not fill out the questionnaire because they were ill or injured during the lesson and an additional 3.52% ($n = 79$ out of 2240) of the students did not answer large portions of the questionnaires. Ultimately, this led to the inclusion of data from 2004 students situated in 127 classes taught by 33 different PE teachers (2–4 classes per teacher).

Participants

The PE teachers had on average 16.47 years (± 10.61 years) of teaching experience and 23 (69.70%) of the teachers were male. Fifteen (45.45%) PE teachers indicated having obtained a master's degree in Physical Education and Movement Sciences, while 18 teachers (54.55%) indicated having obtained a professional bachelor's degree in Physical Education.[1] The included classes were 70.08% coeducational, 21.26% single-sex boys, and 8.66% single-sex girls and were situated in the first and second year (i.e., first grade, 32.28%), the third and fourth year (i.e., second grade, 32.28%), and the fifth and sixth year (i.e., third grade, 35.43%) of secondary school. Ten percent of the classes were in a vocational track (practical education preparing students for labor market immediately after secondary school), 11.00% in a technical track (general education with a technical and practical approach), and 79.00% were in an academic track (general education preparing students for higher education). Of the participating students, 28.60% were in first grade, 31.80% in second grade, and 39.60% in third grade, and 54.60% of them were boys.

Measures

Student and Teacher Report of Student Engagement and Disengagement. Student engagement and disengagement were assessed using a Dutch version of the student and teacher report of the Engagement Versus Disaffection With Learning Scale, developed by Skinner, Kindermann, and Furrer (2009). Both the teacher and student questionnaires were slightly adapted to the context of PE by consistently replacing the reference to classwork by the term *exercises* (e.g., "When I'm working on my classwork, I feel mad" was changed into "When I was doing the exercises, I felt mad"). In the student report of the questionnaire, the stem "During the past PE lesson . . ." was followed by five items tapping into behavioral engagement ($\alpha = .70$; e.g., "I worked as hard as I could"), five items assessing emotional engagement ($\alpha = .90$; e.g., "I enjoyed learning new things"), five items measuring behavioral disaffection ($\alpha = .68$; e.g., "I thought about other things"), and twelve items tapping into emotional disaffection in students ($\alpha = .85$; e.g., "I felt bored when my teacher explained new exercises").

In the teacher report of the questionnaire, the teacher was asked to report on the (dis)engagement of the class as a whole rather than on the (dis)engagement of all the individual students, as was the case in the study by Skinner, Kindermann, and Furrer (2009). The stem "During the past PE lesson . . ." was used, also followed by ten items measuring students' engagement with five items tapping into students' behavioral engagement ($\alpha = .78$; e.g., "The students worked as hard as they could") and five items assessing students' emotional engagement ($\alpha = .90$; e.g., "The students were interested when we started on something new"). Fifteen items assessed students' disengagement, with five items measuring students' behavioral disaffection ($\alpha = .32$; e.g., "The students didn't pay attention when starting on something new") and ten items tapping into students' emotional disaffection ($\alpha = .79$; e.g., "The students appeared to be bored when we worked on something"). All items in the teacher report of the questionnaire were rated on a 4-point Likert scale, ranging from 1 (*applies for almost none of the students*) to 2 (*applies for about a third of the students*) to 3 (*applies for about two thirds of the students*), and 4 (*applies for all of the students*).

When performing a confirmatory factor analysis (CFA; with maximum likelihood estimation) and bringing into account the multilevel character of the data in R (R Core Team, 2014), the four-factor solution (behavioral and emotional engagement and behavioral and emotional disaffection) was not a good solution as it did not show an acceptable fit for both the student ($\chi^2 = 4263.23$ (318), CFI/TLI = .75/.72, RMSEA = .09, SRMR = .08) and teacher measures ($\chi^2 = 612.80$ (269), CFI/TLI = .74/.71, RMSEA = .11, SRMR = .09). After inspection of the loadings of the items, it appeared that especially the emotional disengagement scale was troublesome in the CFA. In addition to items reflecting students being bored, this scale included items reflecting students feeling irritated, depressed, and frustrated, which might have another connotation in relation to disengagement than items reflecting boredom. When leaving out the emotional disengagement scale in the CFA, better and reasonable fit indices were found for the student ($\chi^2 = 804.01$ (87), CFI/TLI = .90/.88, RMSEA = .07, SRMR = .04) and teacher measures ($\chi^2 = 149.68$ (87), CFI/TLI = .91/.89, RMSEA = .08, SRMR = .07). Further, because of the weak internal consistency of the behavioral disengagement scale ($\alpha = .32$), it was decided not to include this scale in the analyses. Fair fit indices were found for the teacher measures of behavioral and emotional engagement ($\chi^2 = 75.65$ (34), CFI/TLI = .94/.92, RMSEA = .10, SRMR = .06). Therefore, only teachers' measures of behavioral engagement and emotional engagement were retained.

Student and Teacher Report of Need-Supportive Teaching Behavior. Similar to previous studies (Haerens et al., 2013; Van den Berghe et al., 2014), need-supportive teaching behavior was measured by means of a validated and reliable Dutch version of the student and teacher report of the Teacher as Social Context Questionnaire (Belmont, Skinner, Wellborn, & Connell, 1988). This version was slightly adapted to the context of PE by replacing the more general academic terms with PE-related terminology (e.g., the term *schoolwork* was changed to *exercises*). The student report of need-supportive teaching behavior measured the three dimensions of need-supportive teaching behavior ($\alpha = .88$), namely, autonomy support (12 items, $\alpha = .69$; e.g., "My teacher gave me a lot of choices about how I do the exercises"), structure (15 items, $\alpha = .66$; e.g., "My teacher made it clear what he/she expects of me"), and involvement (14 items, $\alpha = .79$; e.g., "My teacher knows a lot about me"). All items in the questionnaire were rated on a 5-point Likert scale, ranging from 1 (*completely disagree*) to 5 (*completely agree*).

The teacher report consisted the three need-supportive dimensions ($\alpha = .86$) of autonomy support (8 items, $\alpha = .66$; e.g., "I try to give my students a lot of choices about exercises"), structure (8 items, $\alpha = .83$; e.g., "I try to be clear with my students about what I expect of them in class"), and involvement (8 items, $\alpha = .84$; e.g., "I know a lot about what goes on for my students"). All items in the questionnaire were rated on a 5-point

Likert scale, ranging from 1 (*completely disagree*) to 5 (*completely agree*).

Teachers' General Causality Orientations. A validated Dutch version (Soenens, Berzonsky, Vansteenkiste, Beyers, & Goossens, 2005) of the short General Causality Orientations Scale (Deci & Ryan, 1985) was used to measure teachers' degree of autonomous and controlled motivational orientation. The questionnaire consists of 12 vignettes, each representing a situation in daily life (e.g., "You are asked to plan a picnic for yourself and your fellow employees. Your style for approaching this project could most likely be characterized as: . . ."), followed by responses that reflect the respondent's degree of autonomous (e.g., ". . . Seek participation: get inputs from others before you make the final plans.") and controlled motivational orientation (e.g., ". . . Take charge: that is, you would make most of the major decisions yourself."). The participants were asked to indicate on a 5-point scale, ranging between 1 (*completely disagree*) and 5 (*completely agree*), to what extent they would feel or act in the way that the autonomy and control-oriented responses describe. Cronbach's alpha was .61 for the autonomous orientation and .73 for the controlled orientation.

Data Analysis

Pearson correlation coefficients were retrieved for teacher and student measures of need support, student engagement, and student disengagement in SPSS version 20 (IBM, Released 2011). Multilevel correlations and regression analyses were conducted using MLWiN version 2.29, which takes occasional missing values automatically into account through listwise deletion (Rasbash, Steele, Browne, & Goldstein, 2009).

Aim 1. Variance in Need Support. A three-level intercept-only model was composed for the student reports (Model 1, student, class, and teacher level) and a two-level intercept-only model was composed for the teacher reports (Model 2, class and teacher level) on need support, to identify the variance situated at each of the levels (Hox, 2010). Before the main analyses, several possible covariates (experience of teacher, grade, gender of teachers and students, lesson content, and educational track) were separately added to the intercept-only model in single-predictor models. Only significant covariates were retained for further analyses to assure parsimoniousness of the models.

Aim 2. Relationships Between Student Engagement, Disengagement, and Need-Supportive Teaching Behavior. The intercept-only models served as a reference for the more complex multiple predictor models in the second step of the analyses. All explanatory variables (except for the categorical variables gender and grade) were group-mean centered to facilitate the interpretation of the intervals and slopes (Hox, 2010). Student-reported need support was the dependent variable in the first regression model. In a first step of the analyses, the

student-level (Level-1) predictors of behavioral engagement, emotional engagement, and behavioral disengagement (as reported by the students) were added to the model (see Model 1a), together with significant covariates at the student level (student gender). In the second step, the class-level (Level-2) predictors behavioral engagement and emotional engagement (as reported by the teacher) were added (see Model 1b). Finally, in a third step of the analyses, the teacher-level (Level-3) predictors (gender of the teacher and their causality orientation) were added to the regression model (see Model 1c).

We then examined a second model with the teacher reports on need support as dependent variable. In this two-level model, the class-level (Level-1) predictors behavioral engagement and emotional engagement (as reported by the teacher) were added in a first step (see Model 2a). In the second step, the teacher-level (Level-2) predictors (gender of the teacher and causality orientations) were added (see Model 2b).

Aim 3. General Causality Orientations as Moderators in the Relationships Between Student Engagement, Disengagement, and Need Support. Next, possible moderation effects of the autonomous and controlled causality orientation were investigated. To do so, interaction terms of autonomous and controlled orientation with behavioral engagement, emotional engagement, and behavioral disengagement (student reports) were added one by one to the predictor Models 1c (see Table 2, Model 1d; student reports of need support) and interaction terms of autonomous and controlled orientation with behavioral engagement and emotional engagement (teacher reports) were added to Model 2b (see Table 3, Models 2c and 2d; teacher reports of need support). When significant interaction terms between (dis)engagement and causality orientation (continuous variable) were found, to enable interpretations of the interaction effect, the regression coefficients of the relationship between (dis)engagement and need support were estimated for an average controlled

(or autonomous) orientation ± 1 *SD* (see Table 4; Aiken & West, 1991).

Results

Descriptives

The descriptives and (cross-level) correlations of student and teacher reports of behavioral engagement, emotional engagement, and need support are presented in Table 1.

Aim 1. Variance in Need Support

The significant variance partition coefficients of need support (as reported by students) indicated that need support significantly differed between students, classes, and teachers. The variance in need support was mainly situated at the student level (82.57%, $p < .001$), whereas 6.21% of the variance ($p < .001$) was situated at the class level and 11.22% of the variance ($p < .01$) was situated at the teacher level. In the teacher report of need support, 26.81% of the variance was situated at the class level ($p < .001$) and 73.19% at the teacher level ($p < .001$).

Aim 2. Relationships Between Student Engagement, Disengagement, and Need-Supportive Teaching Behavior

First, possible covariates were one by one added to the intercept-only models. Three covariates (grade of the students and gender of the teacher and students) were retained and the other (nonsignificant) covariates such as lesson content, age of the teacher, and the educational track of the students were left out to assure parsimoniousness of the models.

With respect to student-reported data, in a first step (see Table 2, Model 1a), student reports of behavioral and emotional engagement and behavioral disengagement

Table 1   Descriptives and (Cross-Level) Correlations of Teacher and Student Reports of Behavioral and Emotional (Dis)Engagement and Need Support

	M (SD)	1	2	3	4	5	6	7
1 Behavioral engagement student report	3.16 (.51)	1						
2 Emotional engagement student report	3.24 (.54)	.63***	1					
3 Behavioral disengagement student report	1.84 (.61)	−.51***	−.47***	1				
4 Need support student report	3.53 (.64)	.38***	.42***	42***	1			
5 Behavioral engagement teacher report	2.87 (.54)	.09***	.11***	−.16***	−.02	1		
6 Emotional engagement teacher report	3.26 (.57)	.07***	.08**	−.10***	−.04	.73***	1	
7 Need support teacher report	3.70 (.36)	.02	.02	−.08**	.03	.50***	.45***	1

Note. N (teachers) = 33; *N* (classes) = 127; *N* (students) = 2004. **$p < .01$; ***$p < .001$.

(Level-1 predictors) and the gender of the student were added to the multiple regression models in the prediction of need support as reported by the students. This resulted in a significantly ameliorated model ($\Delta\chi^2$ (4) = 480.44, $p < .001$). Behavioral and emotional engagement were significantly positively associated with need support, whereas behavioral disengagement showed a negative association with need support. In the second step (see Table 2, Model 1b), the Level-2 predictors behavioral and emotional engagement as reported by the teacher and the grade of the class were added to the regression model. This resulted in a significantly ameliorated model ($\Delta\chi^2$ (5) = 96.33, $p < .001$). No significant relationships were found between the Level-2 predictors and need support. Finally, in the third step, the Level-3 predictors gender of the teacher and their causality orientation were added to the regression model (see Table 2, Model 1c). This resulted in a significantly ameliorated model ($\Delta\chi^2$ (3)

Table 2   Summary of the Standardized Model Estimates for the Multilevel Regression Analyses of Need Support (Student Reports)

| | | Student-Reported Need Support | | | |
| | | Model 1a | Model 1b | Model 1c | Model 1d |
		β (*SE*)	β (*SE*)	β (*SE*)	β (*SE*)
Fixed Effects					
Level 1	Intercept	3.54 (.05)***	3.53 (.07)***	3.53 (.08)***	3.53 (.08)***
	Female student[a]	.00 (.03)	.01 (.03)	.01 (.03)	.01 (.03)
	Behavioral engagement (student)	.17 (.03)***	.17 (.04)***	.16 (.04)***	.16 (.04)***
	Emotional engagement (student)	.29 (.03)***	.29 (.03)***	.29 (.03)***	.29 (.03)***
	Behavioral disengagement (student)	−.10 (.03)***	−.10 (.03)***	−.10 (.03)***	−.10 (.03)***
Level 2	Second grade[b]		−.03 (.08)	−.03 (.08)	−.05 (.08)
	Third grade[b]		.04 (.09)	.02 (.09)	.00 (.09)
	Behavioral engagement (class)		−.01 (.08)	.06 (.09)	.11 (.10)
	Emotional engagement (class)		.07 (.08)	.05 (.08)	.00 (.08)
Level 3	Female teacher[b]			.05 (.10)	.05 (.10)
	Autonomous orientation			−.10 (.10)	−.10 (.10)
	Controlled orientation			.01 (.09)	.01 (.09)
Interaction terms	Controlled orientation (Level 3) × Behavioral engagement (Level 2)				−.19 (.08)*
Random Effects—intercept-only model		σ² (*SE*)	σ² (*SE*)	σ² (*SE*)	σ² (*SE*)
	Teacher-level variance	.05 (.02)**	.05 (.02)**	.05 (.02)**	.05 (.02)**
	Class-level variance	.03 (.01)***	.03 (.01)***	.03 (.01)***	.03 (.01)***
	Student-level variance	.34 (.01)***	.34 (.01)***	.34 (.01)***	.34 (.01)***
Random Effects—multiple predictor model		σ² (*SE*)	σ² (*SE*)	σ² (*SE*)	σ² (*SE*)
	Teacher-level variance	.05 (.02)**	.05 (.02)**	.04 (.02)**	.05 (.02)**
	Class-level variance	.03 (.01)***	.03 (.01)***	.03 (.01)***	.03 (.01)***
	Student-level variance	.28 (.01)***	.28 (.01)***	.28 (.01)***	.28 (.01)***
Test of Significance					
	−2 log likelihood reference model	3589.62	3109.18	3012.85	2958.49
	−2 log likelihood test model	3109.18	3012.85	2958.56	2953.62
	χ^2 (*df*)	480.44 (4)***	96.33 (5)***	54.29 (3)***	4.88 (1)*

[a]Reference category = male student/teacher. [b]Reference category = first grade.

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

= 54.29, $p < .001$), but no significant relationships with need support were found.

In a first step of analyses with the teacher reports on need support (see Table 3, Model 2a), behavioral and emotional engagement and behavioral disengagement (Level-2 predictors) and the grade of the class were added to the multiple regression models in the prediction of need support as reported by the teacher. This resulted in a significantly ameliorated model ($\Delta\chi^2$ (5) = 232.35, $p < .001$). Behavioral, but not emotional, engagement was significantly positively associated with need support. Teachers reported less need support in the second than first grade, and more need support in the third than the first grade. In the second step (see Table 3, Model 2b), the Level-3 predictors gender of the teacher and their causality orientation were added to the regression model. This did not result in an ameliorated model ($\Delta\chi^2$ (3) = –39.74, *ns*).

Aim 3. General Causality Orientations as a Moderator in the Relationship Between Student Engagement, Disengagement, and Need Support

To explore the possible moderating role of autonomous and controlled causality orientation in the prediction of need support, possible interaction terms between

Table 3   Summary of the Standardized Model Estimates for the Multilevel Regression Analyses of Need Support (Teacher Reports)

		Teacher-Reported Need Support			
		Model 2a β (*SE*)	Model 2b β (*SE*)	Model 2c β (*SE*)	Model 2d β (*SE*)
Fixed Effects					
Level 1	Intercept	3.70 (.06)***	3.71 (.07)***	3.71 (.07)***	3.71 (.07)***
	Second grade[a]	–.04 (.02)*	–.04 (.02)*	–.04 (.02)*	–.04 (.02)**
	Third grade[a]	.06 (.03)*	.06 (.03)*	.05 (.03)	.08 (.03)*
	Behavioral engagement (teacher report, class)	.15 (.02)***	.16 (.02)***	.16 (.02)***	.11 (.02)***
	Emotional engagement (teacher report, class)	.02 (.02)	.02 (.02)	.02 (.02)	.01 (.02)
Level 2	Female teacher[b]		.03 (.12)	.03 (.12)	.03 (.12)
	Autonomous orientation		.11 (.12)	.11 (.12)	.12 (.12)
	Controlled orientation		–.10 (.10)	–.10 (.10)	–.10 (.10)
Interaction terms	Autonomous orientation (Level 3) × Emotional engagement (Level 2)			–.05 (.01)***	
	Controlled orientation (Level 3) × Emotional engagement (Level 2)				–.05 (.01)***
Random Effects—intercept-only model		σ² (*SE*)	σ² (*SE*)	σ² (*SE*)	σ² (*SE*)
	Teacher-level variance	.09 (.02)***	.09 (.02)***	.09 (.02)***	.09 (.02)***
	Class-level variance	.03 (.00)***	.03 (.00)***	.03 (.00)***	.03 (.00)***
Random Effects—multiple predictor model		σ² (*SE*)	σ² (*SE*)	σ² (*SE*)	σ² (*SE*)
	Teacher-level variance	.09 (.02)***	.08 (.02)***	.08 (.02)***	.08 (.02)***
	Class-level variance	.03 (.00)***	.03 (.00)***	.03 (.00)***	.03 (.00)***
Test of significance					
	–2 log likelihood reference model	–1021.96	–1254.31	–1214.57	–1214.57
	–2 log likelihood test model	–1254.31	–1214.57	–1224.60	–1226.83
	χ² (*df*)	232.35 (5)***	–39.74 (3)	10.03 (1)**	12.26 (1)***

[a]Reference category = first grade. [b]Reference category = male teacher.

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

causality orientations and (dis)engagement were added one by one to the multiple regression Models 1c (Table 2) and 2b (Table 3).

In the student reports of need support (Table 2), no significant cross-level interaction effects between teachers' causality orientations (Level 3) and student reports of student engagement and disengagement (Level 1) were found. However, one significant cross-level interaction was found between teachers' causality orientations (Level 3) and teachers' reports of student engagement (Level 2) in the prediction of student-reported need support. Specifically, the interaction term between teachers' controlled orientation and behavioral engagement (see Model 1d; β = −.19 (.08), χ^2 (1) = 5.06, $p < .05$) was significant. The positive association between behavioral engagement and

need support was no longer significant when teachers were (more than) averagely control oriented.

Further, in the teacher reports of need support (Table 3), four interaction terms were added each separately to regression Model 2b. Two significant interaction terms were found. The interaction terms between autonomous orientation and emotional engagement (see Model 2c; β = −.05 (.01), χ^2 (1) = 15.15, $p < .001$) and between controlled orientation and emotional engagement (see Model 2d; β = −.05 (.01), χ^2 (1) = 12.30, $p < .001$) were significant. The interaction effects were interpreted in Table 4. The regression coefficients between emotional engagement and need support became less strong when teachers were more autonomy oriented. Specifically, only among low autonomy-oriented teachers (for teachers with

Table 4   Interpretation of Significant Interaction Effects of the Causality Orientations and (Dis)Engagement in the Prediction of Need Support (Student and Teacher Reports)

	Student-Reported Need Support
	β (*SE*)
Fixed Effects[a]	
Controlled orientation (level 3) × Behavioral engagement (level 2)	−.19 (.08)*
Controlled orientation	.01 (.09)
Behavioral engagement (level 2) (for teachers with a controlled orientation equaling the mean of the total sample minus 1 standard deviation; $M − 1\ SD = 3.69$)	.25 (.12)*
Behavioral engagement (level 2) (for teachers with a controlled orientation with a mean controlled orientation; $M = 4.48$)	.10 (.09)
Behavioral engagement (level 2) (for teachers with a controlled orientation equaling the mean of the total sample plus 1 standard deviation; $M + 1\ SD = 5.27$)	−.05 (.10)

	Teacher-Reported Need Support
	β (*SE*)
Fixed Effects	
Autonomous orientation (Level 3) × Emotional engagement (level 2)	−.05 (.01)***
Autonomous orientation	.11 (.12)
Emotional engagement (level 2) (for teachers with an autonomous orientation equaling the mean of the total sample minus 1 standard deviation; $M − 1\ SD = 4.22$)	.05 (.02)**
Emotional engagement (level 2) (for teachers with an autonomous orientation with a mean controlled orientation; $M = 4.91$)	.02 (.02)
Emotional engagement (level 2) (for teachers with an autonomous orientation equaling the mean of the total sample plus 1 standard deviation; $M + 1\ SD = 5.60$)	−.01 (.02)
Controlled orientation (level 3) × Emotional engagement (level 2)	−.05 (.01)***
Controlled orientation	−.10 (.10)
Emotional engagement (level 2) (for teachers with a controlled orientation equaling the mean of the total sample minus 1 standard deviation; $M − 1\ SD = 3.69$)	.05 (.02)**
Emotional engagement (level 2) (for teachers with a controlled orientation with a mean controlled orientation; $M = 4.48$)	.01 (.02)
Emotional engagement (level 2) (for teachers with a controlled orientation equaling the mean of the total sample plus 1 standard deviation; $M + 1\ SD = 5.27$)	−.03 (.02)

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

[a]None of the interaction effects with student reports of (dis)engagement were significant.

an autonomous orientation equaling the mean of the total sample minus 1 *SD*) there was a significant and positive association; in both of the other groups, relationships were insignificant. Second, while low control-oriented teachers (for teachers with a controlled orientation equaling the mean of the total sample minus 1 *SD*) showed a positive association between emotional engagement and need support, the same relationships were insignificant among averagely or more than averagely control-oriented teachers.

Discussion

The goal of the current study was to advance previous research by investigating how student engagement and disengagement are related to PE teachers' need-supportive teaching behavior. We added to previous research by relying on a multilevel (student, class, and teacher level) and multi-informant approach (student and teacher reports). Further, it was explored whether there is a moderating effect of teachers' general causality orientation in the association between teachers' perceptions of student engagement and their need-supportive teaching behavior.

Need-Supportive Teaching Behavior From a Multilevel Perspective

By measuring several classes of the same teacher, we were able to examine whether the degree of need support that teachers provide differs according to the classes they are teaching. The results indicated that teachers are indeed adapting their behaviors to the classes they are teaching. The difference in behavior between classes suggests that although teachers possibly develop a personal and relatively stable teaching style throughout their career, they are still able to adapt their behavior to some degree to the class they are teaching in, partly depending on their own perceptions of student (dis)engagement between classes.

Most of the variance in the students' reports of need support was due to differences between students. This implies that not all students in the same class necessarily perceive the behavior from the teachers in an equal way. This could mean that teachers not always behave in the same need-supportive way when dealing with individual students (also see Haerens et al., 2013). It is also possible that when teachers are need supportive in class (e.g., Reeve et al., 2004; Tessier et al., 2010), not all students equally perceive these interactions as need supportive, and these differences in students' perceptions of the same behavior might depend on students' personal characteristics.

The Relationship Between Student (Dis) Engagement and Need Support

The second aim of the current study was to investigate relationships between student engagement and disengagement with need support. Results confirmed findings from previous studies (e.g., Ferrer-Caja & Weiss, 2000; Ntoumanis, 2005) indicating that engagement was positively

related to need support. Because few studies explored the association between need support and disengagement, a measure of disengagement was also included in the current study. Next to confirming the positive relationship between behavioral and emotional engagement and need support, the results also suggested that there is an independent and strong negative association between behavioral disengagement and need support. Although no cause-and-effect claims can be made with these data, they might suggest that when students in a classroom are disengaged to the extent that they are bored or distracted, teachers would start to provide less need support toward these students instead of being extra need supportive. Alternatively, it might also implicate that less need support from the teacher would lead to more disengagement in the lesson.

In the regression models with the student reports of need support, only student and no class effects were found for engagement, suggesting that it is rather the individual variance in engagement across students that relates to need support, rather than the average impression a teacher has of the engagement of the class as a whole. However, when teacher reports of need support were analyzed instead of student reports, class effects did appear. So, when a teacher rated a class as being more engaged, teachers indicated that they had been more need supportive in that class.

The fact that there were no class effects in the prediction of student-reported need support was not expected because weak-but-significant correlations were found in earlier work (Skinner & Belmont, 1993). The discrepancy between this study and the findings of Skinner and Belmont (1993) can be explained by the nature of the measurement. Specifically, in the teacher report of the questionnaire, the teacher was asked to report on the engagement of the class as a whole rather than on the engagement and disengagement of individual students, as was the case in the study by Skinner and Belmont (1993). The reason for this is that we wanted to explore the importance of a teacher's general impression of the engagement shown by a class, since the general perception of a class might cause teachers to adapt their overall teaching style toward all students in that specific class.

Based on the findings of the current study, it seems that teachers and students do not perceive their own behavior in the same way, which might lead to incomprehension from both sides. Teachers might have missed out on what students really need or students might have misunderstood what behavior teachers really expect from them. Possibly, students perceive the teachers in a more personally colored way, based on personal one-on-one interactions, whereas teachers might have a more general view on how they interact with all students in class. A more methodological explanation for these inconsistencies might lie with the various items used to build the dimensions of behavioral and emotional engagement and behavioral disengagement.

Also covariates were taken into account in the regression models. The gender of teachers and students was not a significant predictor for need support or (dis)

engagement. Results further showed that in the second grade of secondary school (14- to 15-year-olds), teachers reported to provide less need support than in the first or third grade. Nevertheless, the student reports did not confirm such differences in need support between different grades. Some inconsistencies were also found across previous studies with regard to the effect of grade. In the study of De Meyer et al. (2014) students from higher grades perceived less autonomy support. In the current study, teachers, but not students, reported to provide the most need support to the eldest students (third grade, 16- to 18-year-olds). Also according to the teachers, students were most engaged in the first grade, followed by the second and third grades. This reflects a possible tendency of students losing interest or engagement for PE throughout secondary school, and this is also reflected in a decline in enrollment in optional PE throughout secondary school in other countries (Hardman, 2008; Lodewyk & Pybus, 2013; United States Census Bureau, 2012). However, again, this tendency was not reflected in the reports of the students, possibly because students of all ages do think they are sufficiently engaged in the lesson.

A large part of the variance in need-supportive teaching behavior could be attributed to factors other than student engagement and disengagement, situated at teacher, class, or student level. Teachers can be need supportive toward students for a variety of reasons. Studies exploring the roots of teachers' motivational teaching behaviors situate these antecedents at different levels: from above, within, and below (e.g., Pelletier et al., 2002; Reeve, 2009; Taylor et al., 2008; Van den Berghe et al., 2013). Antecedents from above are interactions with or decisions from higher authorities, such as school administrators or governing bodies (Pelletier et al., 2002). Antecedents from within encompass personal characteristics of teachers, such as teachers' quality of motivation or general causality orientations (Taylor et al., 2008; Van den Berghe et al., 2013). Antecedents from below are defined as characteristics or behavior of students, such as the students' expression of motivation and engagement during class (Pelletier et al., 2002; Reeve, 2009). So even though student engagement and disengagement might be interrelated with need-supportive teaching behavior, it is advised to keep in mind the broader pedagogical, professional, and personal context of teachers when examining their teaching behaviors in class.

General Causality Orientations as a Moderator in the Relationships Between Student Engagement, Disengagement, and Need Support

For the third aim of the study, it was hypothesized that teachers' general causality orientations, or the way teachers generally perceive the origin of their actions and behaviors, would moderate the relationships between engagement and need support. In total, few moderation effects were found. Strongly autonomy-oriented people typically perceive their own behavior and actions as volitional and personally valued (Deci & Ryan, 1985;

Olesen, 2011). The sensitization hypothesis suggesting that a positive motivational state in students would evoke more need support in teachers when they are more autonomously oriented was not confirmed. The results indicated that when students are more emotionally engaged, lowly autonomy-oriented teachers provided more need support, so the relationship between emotional engagement and need support was moderated by teachers' autonomous orientation. These findings illustrate the need for further examination of the autonomous orientation in relation to teaching behavior in future studies.

Individuals with a controlled causality orientation are likely to experience their own actions and behavior as influenced by external or internal pressures or controls, such as demanding expectations or offered rewards (Deci & Ryan, 1985; Olesen, 2011). As control-oriented teachers would be less open to positive events, we expected that the positive relationship between engagement and need support would become less strong (or more negative) when teachers are more control oriented. Results of the current study indeed confirmed that relationships between engagement and need support were less strong or nonsignificant when teachers were more control oriented, and these findings were found across informants. As such, a stronger controlled orientation seems to diminish the effect of students' engagement on teachers' behavior.

Strengths and Shortcomings

The two most important strengths of the current study are the nested structure of the data, with 2004 students out of 127 classes from 33 teachers and the multi-informant character of the measures. The group sizes were large enough to accurately estimate regression coefficients and their standard errors, and variance components at the teacher, class, and student levels (Maas & Hox, 2005). However, given that standard errors of the variance components are generally underestimated when numbers of groups are lower than 100 (Maas & Hox, 2005), and we only had 33 teachers at the highest level, the standard errors of the second (teacher reports) or third level (student reports) variance might have been underestimated in the current study. This would mean that we could perhaps have incorrectly concluded that there was significant between-teacher variance, while this was not the case. Also given that we had only two, three, or four classes per teacher, the group size was smaller than is the case in most existing simulation studies (e.g., Maas & Hox, 2005). Although group size is considered less important for estimating accurate parameters, we do not have any knowledge about the statistical implications of this limited number of classes per teacher.

A second limitation of the current study is that the measures of engagement, disengagement, and need-supportive teaching behavior are based only on subjective self-reports of teaching behavior and engagement. Integrating objective measures, such as ratings from external observers, could strengthen the findings of the current study. For example, in the study of Haerens et al. (2013), need support in PE was both reported by students

and observed by external raters, and in the study of Aelterman et al. (2012), student engagement was objectively measured by observers' ratings of videotaped PE lessons. Nevertheless, subjective perceptions of engagement and need-supportive teaching behavior provide the opportunity to have a closer look at the way teachers and students perceive each other's behavior.

Another limitation is that the measure of behavioral disengagement in the teacher reports had a low internal consistency and had a poor fit in the confirmatory factor analyses. This made us decide to exclude this measure from the analyses. Further adaptations are needed if this scale would be used in future research. Moreover, although the engagement and disengagement scale has proven factorial validity in the current study and previous research (Skinner et al., 2009), the moderate-to-high negative correlation between engagement and disengagement in the current study suggests that the two constructs might to a certain degree be perceived as opposite poles. Further, there is a possibility that the cross-level interactions that were entered in the regression models might cancel out each other when they would be entered together in one model. Even though we examined the interaction effects separately in this study, it might be interesting to examine this potential issue in future studies. In addition, the current study had a cross-sectional design, making it impossible to illustrate the longitudinal effects of student (dis) engagement on need-supportive teaching behavior that was possible in the study of Skinner and Belmont (1993). So, future research with longitudinal designs is needed to provide support for the proposed causal associations.

Next to behavioral and emotional engagement, other components of engagement are identified in literature, such as cognitive engagement (Fredricks et al., 2004) and agentic engagement, which is student-initiated engagement for greater achievement and motivational support (Reeve, 2013; Reeve & Tseng, 2011). These dimensions of engagement were not included in the current study. Further, the inclusion of a measure of need-thwarting teaching behavior could provide new insights in how students' (dis)engagement possibly affects teachers' behavior. Need-thwarting behaviors include controlling, chaotic, and cold interactions with students that lead to the frustration of students' needs (Deci & Ryan, 2000; Soenens, Sierens, Vansteenkiste, Dochy, & Goossens, 2012; Van den Berghe et al., 2013). Several studies (e.g., Bartholomew, Ntoumanis, Ryan, Bosch, & Thogersen-Ntoumani, 2011; De Meyer et al., 2014; Haerens, Aelterman, Vansteenkiste, Soenens, & Van Petegem, 2015) suggested that need-thwarting teaching behaviors would relate more closely to maladaptive outcomes in students, such as disengagement.

Conclusion

This study pointed out that students' behavioral and emotional engagement are related to more, and behavioral disengagement is related to less, need support in a PE lesson. Teachers differ in how they behave in different

classes in terms of need support. Teachers' causality orientations were not related to the need support they provided in class, but they did moderate some of the relationships between student (dis)engagement and teachers' need support. Teachers with a relatively low controlled orientation were more need supportive when perceiving their students as emotionally and behaviorally engaged. Overall, the results of the current study suggest that teacher–student interactions are predominantly related to individual differences in student engagement and disengagement in the classroom rather than to class or teacher characteristics. By making (control-oriented) teachers aware of these dynamics, sometimes automatic responses to student (dis)engagement can be better thought out and changed to more suitable and need-supportive personal interactions with students.

Note

1. In Belgium, a professional bachelor's degree in PE can be obtained at a university college (study duration = 3 years). This degree allows teachers to teach children between the ages of 2.5 and 14 years old, but also 15- to 18-year-old students in vocational education. A master's degree in PE is an academic degree that can be obtained at a university (study duration = 5 years). This degree in combination with a PE teacher education degree allows teachers to teach students over the age of 15 (younger is also possible, but not common) in any academic track.

References

Aelterman, N., Vansteenkiste, M., Van Keer, H., Van den Berghe, L., De Meyer, J., & Haerens, L. (2012). Students' objectively measured physical activity levels and engagement as a function of between-class and between-student differences in motivation toward physical education. *Journal of Sport & Exercise Psychology, 34*(4), 457–480. PubMed

Aiken, L.S., & West, S.G. (1991). Multiple regression: Testing and interpreting interactions. Sage (Atlanta, Ga.).

Bartholomew, K.J., Ntoumanis, N., Ryan, R.M., Bosch, J.A., & Thogersen-Ntoumani, C. (2011). Self-Determination Theory and diminished functioning: The role of interpersonal control and psychological need thwarting. *Personality and Social Psychology Bulletin, 37*(11), 1459–1473. PubMed doi:10.1177/0146167211413125

Belmont, M.J., Skinner, E., Wellborn, J., & Connell, J. (1988). Teacher as social context: A measure of student perceptions of teacher provision of involvement, structure, and autonomy support (Vol. Tech. Rep. No. 102). Rochester, NY: University of Rochester.

Chatzisarantis, N.L., & Hagger, M.S. (2009). Effects of an intervention based on self-determination theory on self-reported leisure-time physical activity participation. *Psychology & Health, 24*(1), 29–48. PubMed doi:10.1080/08870440701809533

Connell, J.P., Spencer, M.B., & Aber, J.L. (1994). Educational risk and resilience in African-American youth: Context,

self, action, and outcomes in school. *Child Development, 65*(2), 493–506. doi:10.1111/j.1467-8624.1994.tb00765.x

Cox, A.E., & Williams, L. (2008). The roles of perceived teacher support, motivational climate, and psychological need satisfaction in students' physical education motivation. *Journal of Sport & Exercise Psychology, 30*(2), 222–239. PubMed

De Meyer, J., Tallir, I.B., Soenens, B., Vansteenkiste, M., Aelterman, N., Van den Berghe, L., . . . Haerens, L. (2014). Does observed controlling teaching behavior relate to students' motivation in physical education? *Journal of Educational Psychology, 106*(2), 541–554. doi:10.1037/a0034399

Deci, E.L., Egharri, H., Patrick, B.C., & Leone, D.R. (1994). Facilitating internalization, The self-determination theory perspective. *Journal of Personality, 62*(1), 119–142. PubMed doi:10.1111/j.1467-6494.1994.tb00797.x

Deci, E.L., & Ryan, R.M. (1985). The general causality orientations scale: Self-determination in personality. *Journal of Research in Personality, 19*(2), 109–134. doi:10.1016/0092-6566(85)90023-6

Deci, E.L., & Ryan, R.M. (2000). The "what" and "why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry, 11*(4), 227–268. doi:10.1207/S15327965PLI1104_01

Deci, E.L., & Ryan, R.M. (2002). *Handbook of self-determination research*. Rochester, New York: The University of Rochester Press.

Ferrer-Caja, E., & Weiss, M.R. (2000). Predictors of intrinsic motivation among adolescent students in physical education. *Research Quarterly for Exercise and Sport, 71*(3), 267–279. PubMed doi:10.1080/02701367.2000.10608907

Ferrer-Caja, E., & Weiss, M.R. (2002). Cross-validation of a model of intrinsic motivation with students enrolled in high school elective courses. *Journal of Experimental Education, 71*(1), 41–65. doi:10.1080/00220970209602056

Fredricks, J.A., Blumenfeld, P.C., & Paris, A.H. (2004). School engagement: Potential of the concept, state of the evidence. *Review of Educational Research, 74*(1), 59–109. doi:10.3102/00346543074001059

Furrer, C., & Skinner, E. (2003). Sense of relatedness as a factor in children's academic engagement and performance. *Journal of Educational Psychology, 95*(1), 148–162. doi:10.1037/0022-0663.95.1.148

Grolnick, W.S., & Pomerantz, E.M. (2009). Issues and challenges in studying parental control: Toward a new conceptualization. *Child Development Perspectives, 3*(3), 165–170. PubMed doi:10.1111/j.1750-8606.2009.00099.x

Haerens, L., Aelterman, N., Van den Berghe, L., De Meyer, J., Soenens, B., & Vansteenkiste, M. (2013). Observing physical education teachers' need-supportive interactions in classroom settings. *Journal of Sport & Exercise Psychology, 35*(1), 3–17. PubMed

Haerens, L., Aelterman, N., Vansteenkiste, M., Soenens, B., & Van Petegem, S. (2015). Do perceived autonomy-supportive and controlling teaching relate to physical education students' motivational experiences through unique pathways? Distinguishing between the bright and dark side of motivation. *Psychology of Sport and Exercise, 16*(Part 3), 26–36. doi:10.1016/j.psychsport.2014.08.013

Hardman, K. (2008). Physical education in schools: A global perspective. *Kinesiology, 40*(1), 5–28.

Hox, J.J. (2010). *Multilevel analysis: techniques and applications* (2nd ed.). New York: Routledge.

IBM, C. (Released 2011). IBM SPSS Statistics for Windows (Version Version 20.0): Armonk, NY: IBM Corp.

Jang, H. (2008). Supporting students' motivation, engagement, and learning during an uninteresting activity. *Journal of Educational Psychology, 100*(4), 798–811. doi:10.1037/a0012841

Jang, H., Reeve, J., & Deci, E.L. (2010). Engaging students in learning activities: It is not autonomy support or structure but autonomy support and structure. *Journal of Educational Psychology, 102*(3), 588–600. doi:10.1037/a0019682

Koka, A. (2013). The relationships between perceived teaching behaviors and motivation in physical education: A one-year longitudinal study. *Scandinavian Journal of Educational Research, 57*(1), 33–53. doi:10.1080/00313831.2011.621213

Koka, A., & Hagger, M.S. (2010). Perceived teaching behaviors and self-determined motivation in physical education: A test of Self-Determination Theory. *Research Quarterly for Exercise and Sport, 81*(1), 74–86. PubMed doi:10.1080/02701367.2010.10599630

Lodewyk, K.R., & Pybus, C.M. (2013). Investigating factors in the retention of students in high school physical education. *Journal of Teaching in Physical Education, 32*(1), 61–77.

Maas, C.J.M., & Hox, J.J. (2005). Sufficient sample sizes for multilevel modeling. *Methodology: European Journal of Research Methods for the Behavior and Social Sciences, 1,* 85–91. doi:10.1027/1614-1881.1.3.86

Major, B., Spencer, S., Schmader, T., Wolfe, C., & Crocker, J. (1998). Coping with negative stereotypes about intellectual performance: The role of psychological disengagement. *Personality and Social Psychology Bulletin, 24*(1), 34–50. doi:10.1177/0146167298241003

Moller, A.C., Deci, E.L., & Elliot, A.J. (2010). Person-Level Relatedness and the Incremental Value of Relating. *Personality and Social Psychology Bulletin, 36*(6), 754–767. PubMed doi:10.1177/0146167210371622

Mouratidis, A., Vansteenkiste, M., Lens, W., & Sideridis, G. (2008). The motivating role of positive feedback in sport and physical education: Evidence for a motivational model. *Journal of Sport & Exercise Psychology, 30*(2), 240–268. PubMed

Ntoumanis, N. (2001). A self-determination approach to the understanding of motivation in physical education. *The British Journal of Educational Psychology, 71*(2), 225–242. PubMed doi:10.1348/000709901158497

Ntoumanis, N. (2005). A prospective study of participation in optional school physical education using a self-determination theory framework. *Journal of Educational Psychology, 97*(3), 444–453. doi:10.1037/0022-0663.97.3.444

Olesen, M.H. (2011). General causality orientations are distinct from but related to dispositional traits. *Personality and Individual Differences, 51*(4), 460–465. doi:10.1016/j.paid.2011.04.015

Pelletier, L.G., Seguin-Levesque, C., & Legault, L. (2002). Pressure from above and pressure from below as determinants of teachers' motivation and teaching behaviors. *Journal of Educational Psychology, 94*(1), 186–196. doi:10.1037/0022-0663.94.1.186

Pelletier, L.G., & Vallerand, R.J. (1996). Supervisors' beliefs and subordinates' intrinsic motivation: A behavioral confirmation analysis. *Journal of Personality and Social Psychology, 71*(2), 331–340. doi:10.1037/0022-3514.71.2.331

R Core Team. (2014). R: A language and environment for statistical computing. Vienna, Austria. Retrieved from http://www.R-project.org/

Rasbash, J., Steele, F., Browne, W.J., & Goldstein, H. (2009). *A User's Guide to MLwiN, v2.10.* Centre for Multilevel Modelling, University of Bristol.

Reeve, J. (2009). Why teachers adopt a controlling motivating style toward students and how they can become more autonomy supportive. *Educational Psychologist, 44*(3), 159–175. doi:10.1080/00461520903028990

Reeve, J. (2013). How students create motivationally supportive learning environments for themselves: The concept of agentic engagement. *Journal of Educational Psychology, 105*(3), 579–595. doi:10.1037/a0032690

Reeve, J., Jang, H., Carrell, D., Jeon, S., & Barch, J. (2004). Enhancing students' engagement by increasing teachers' autonomy support. *Motivation and Emotion, 28*(2), 147–169. doi:10.1023/B:MOEM.0000032312.95499.6f

Reeve, J., & Tseng, C. (2011). Agency as a fourth aspect of students' engagement during learning activities. *Contemporary Educational Psychology, 36*(4), 257–267. doi:10.1016/j.cedpsych.2011.05.002

Sarrazin, P.G., Tessier, D.P., Pelletier, L.G., Trouilloud, D.O., & Chanal, J.P. (2006). The effects of teachers' expectations about students' motivation on teachers' autonomy-supportive and controlling behaviors. *International Journal of Sport and Exercise Psychology, 4*(3), 283–301.

Skinner, E.A., & Belmont, M.J. (1993). Motivation in the classroom: Reciprocal effects of teacher behavior and student engagement across the school year. *Journal of Educational Psychology, 85*(4), 571–581. doi:10.1037/0022-0663.85.4.571

Skinner, E.A., Kindermann, T.A., & Furrer, C.J. (2009). A motivational perspective on engagement and disaffection. *Educational and Psychological Measurement, 69*(3), 493–525. doi:10.1177/0013164408323233

Skinner, E.A., Marchand, G., Furrer, C., & Kindermann, T. (2008). Engagement and disaffection in the classroom: Part of a larger motivational dynamic? *Journal of Educational Psychology, 100*(4), 765–781. doi:10.1037/a0012840

Skinner, E.A., Wellborn, J.G., & Connell, J.P. (1990). What it takes to do well in school and whether I've got it: A process model of perceived control and children's engagement and achievement in school. *Journal of Educational Psychology, 82*(1), 22–32. doi:10.1037/0022-0663.82.1.22

Soenens, B., Berzonsky, M.D., Vansteenkiste, K., Beyers, W., & Goossens, L. (2005). Identity styles and causality orientations: In search of the motivational underpinnings of the identity exploration process. *European Journal of Personality, 19*(5), 427–442. doi:10.1002/per551

Soenens, B., Sierens, E., Vansteenkiste, M., Dochy, F., & Goossens, L. (2012). Psychologically controlling teaching: Examining outcomes, antecedents, and mediators. *Journal of Educational Psychology, 104*(1), 108–120. doi:10.1037/a0025742

Taylor, I.M., & Ntoumanis, N. (2007). Teacher motivational strategies and student self-determination in physical education. *Journal of Educational Psychology, 99*(4), 747–760. doi:10.1037/0022-0663.99.4.747

Taylor, I.M., Ntoumanis, N., & Standage, M. (2008). A self-determination theory approach to understanding the antecedents of teachers' motivational strategies in physical education. *Journal of Sport & Exercise Psychology, 30*(1), 75–94. PubMed

Tessier, D., Sarrazin, P., & Ntoumanis, N. (2008). The effects of an experimental programme to support students' autonomy on the overt behaviours of physical education teachers. *European Journal of Psychology of Education, 23*(3), 239–253. doi:10.1007/BF03172998

Tessier, D., Sarrazin, P., & Ntoumanis, N. (2010). The effect of an intervention to improve newly qualified teachers' interpersonal style, students motivation and psychological need satisfaction in sport-based physical education. *Contemporary Educational Psychology, 35*(4), 242–253. doi:10.1016/j.cedpsych.2010.05.005

United States Census Bureau. (2012). High school students engaged in physical activity by sex: 2009. Retrieved June 20, 2014, from www.census.gov/compendia/statab/2012/tables/12s0214.pdf

Van den Berghe, L., Soenens, B., Aelterman, N., Cardon, G., Tallir, I.B., & Haerens, L. (2014). Within-person profiles of teachers' motivation to teach: Associations with need satisfaction at work, need-supportive teaching, and burnout. *Psychology of Sport and Exercise, 15*(4), 407–417. doi:10.1016/j.psychsport.2014.04.001

Van den Berghe, L., Soenens, B., Vansteenkiste, M., Aelterman, N., Cardon, G., Tallir, I.B., & Haerens, L. (2013). Observed need-supportive and need-thwarting teaching behavior in physical education: Do teachers' motivational orientations matter? *Psychology of Sport and Exercise, 14*(5), 650–661. doi:10.1016/j.psychsport.2013.04.006

Vansteenkiste, M., Niemiec, C., & Soenens, B. (2010). The development of the five mini-theories of self-determination theory: An historical overview, emerging trends, and future directions. In T.C. Urdan & S.A. Karabenick (Eds.), *Advances in motivation and achievement, vol. 16: The decade ahead* (pp. 105–166): UK: Emerald Publishing.

Vansteenkiste, M., Simons, J., Soenens, B., & Lens, W. (2004). How to become a persevering exerciser? Providing a clear, future intrinsic goal in an autonomy-supportive way. *Journal of Sport & Exercise Psychology, 26*(2), 232–249.