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EUROPEAN PHYSICAL EDUCATION REVIEW

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Journal:	*European Physical Education Review*
Manuscript ID	EPE-20-0066.R4
Manuscript Type:	Original Research Article
Keywords:	controlling teaching, entity theory, self-determination theory, students' engagement, teaching style, teachers' motivation

Abstract: It is widely acknowledged that teachers' (de)motivating style (what they say, do and how they act) affects students' learning. Understanding what leads teachers to adopt a (de)motivating style is necessary to develop effective training programs. The current study aimed to identify antecedents of teachers' motivating (i.e. need-supportive) and demotivating (i.e. need-thwarting) styles by (1) examining the relationships between five types of pressures and these styles and (2) by investigating the mediating role of motivation. 509 generalist primary school teachers completed a questionnaire about their perceived styles, perceived pressures from above (i.e. time constraints, pressure to display authority), below (i.e. perceptions of students' disengagement) and within (i.e. beliefs about the effectiveness of rewards, and the adherence to entity theory), and their autonomous and controlled motivations to teach physical education. Structural equation modelling showed that a need-supportive style was negatively predicted by students' disengagement and teachers' adherence to entity theory, and this relation was fully mediated by autonomous motivation. A need-thwarting style was positively predicted by pressure to display authority and beliefs about the effectiveness of rewards. Results showed that when pressures from below and from within are reduced, teachers adopt a more need-supportive style, because they are more likely to enjoy and value teaching. Conversely, when pressures from above and from within are prevalent, teachers are more likely to adopt a need-thwarting style. This study identified the pressures to be targeted when developing interventions which aim to modify teachers' (de)motivating styles which in turn could impact students' motivation and behaviors.

RUNNING HEAD: Antecedents of primary school teachers' motivating style

Antecedents of primary school teachers' need-supportive and need-thwarting styles in physical education.

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Abstract

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Keywords

controlling teaching, entity theory, self-determination theory, students' engagement, teaching style, teachers' motivation

Introduction

Grounded in Self-Determination Theory (SDT; Ryan and Deci, 2017), many studies have examined physical education (PE) teachers' motivating style, which represents the interpersonal sentiment and behavior teachers use to motivate their students to engage in the learning activities they propose (Reeve, 2016). Specifically, these studies have investigated how PE teachers, through their motivating style, can foster positive or negative motivational and learning experiences (e.g. De Meyer et al., 2014; Haerens et al., 2015; Van den Berghe et al., 2014). The knowledge gained from these studies is crucially important for teachers' professional development programs. Yet, to design and implement such programs, insight into the antecedents of their motivating (i.e. need-supportive) as much as demotivating (i.e. need-thwarting) style is needed. Compared to studies on the consequences of teachers' motivating style, few studies have focused on the antecedents of teachers' demotivating style. In the literature on the antecedents of motivating style of social agents (i.e. parents or teachers; Grolnick, 2003; Pelletier et al., 2002; Reeve, 2009) a distinction is made between pressures from above (i.e. the context), below (i.e. from students) and within (i.e. from teachers themselves). The main aim of the current study was to examine how these three kinds of pressures relate to primary school teachers' (de)motivating style in PE.

While all of these pressures can directly affect how teachers interact with their students, they can also do so indirectly through their motivation to teach (see Van den Berghe et al., 2014; Abos et al., 2018). While some studies have revealed that PE teachers' motivation is dependent on the school context they are in (e.g. Fernet et al., 2012; Taylor et al., 2008) and recent evidence has shown that PE teachers' own motivation affects the way they interact with their students (Abos et al., 2018; Roth et al., 2007), few studies (Pelletier et al., 2002; Taylor and Ntoumanis, 2007; Taylor et al., 2008) have examined the full model where teachers' motivation to teach mediates the relation between pressures and teachers' (de)motivating style in PE. Thus,

another objective of this study was to extend these findings by examining the mediating role of teachers' motivation in the relation between experienced pressures and their (de)motivating style, hereby distinguishing autonomous and controlled motivation to teach PE.

Motivating style within SDT

SDT distinguishes two independent aspects of teachers' motivating style, namely need-supportive style (NSS) and need-thwarting style (NTS) (Ryan and Deci, 2017). More precisely, an NSS is defined by the provision of autonomy support, structure and involvement. Autonomy support includes identifying students' personal interests by engaging in a dialogue with them, allowing students to work at their own pace and providing meaningful explanatory rationales (Aelterman et al., 2019; Reeve, 2009). Structure refers to offering guidance, giving positive and constructive feedback to help students build on their skills and sense of competence (Aelterman et al., 2019; Mouratidis et al., 2008). Involvement is evident when teachers invest a considerable amount of time, energy, and resources in their students and offer unconditional affection and care (Skinner and Edge, 2002). In contrast, an NTS is characterized by control, chaos and coldness. Controlling practices comprise relying on external sources to get the students to behave in the way teachers want them to behave – by using rewards or threats, or competitive situations (Grolnick, 2003; Reeve, 2009; Soenens et al., 2012). Chaotic practices encompass providing unclear instructions and vague goals, and delivering confusing feedback (Van den Berghe et al., 2013; Reeve, 2009). Emotionally-cold teaching includes offering conditional affection, favoritism, and being hostile or cold toward the students (Skinner and Belmont, 1993).

Research in secondary school PE shows that teachers' NSS is related to adaptive behaviors and positive outcomes such as more self-determined motivation and amplified effort, engagement and persistence (see Van den Berghe et al., 2014, for a review). In contrast, an NTS leads to maladaptive behaviors and negative outcomes such as student disengagement, fear of

failure and challenge avoidance (Bartholomew et al., 2018; Van den Berghe et al., 2016). When compared to the body of evidence in secondary school PE, studies in a primary school setting are far scarcer and focus on NSS only (Vasconcellos et al., 2020). The relatively small body of evidence highlights similar motivational processes with teachers' motivating style being positively linked with students' effort in PE, either self-reported (Leptokaridou et al., 2016) or objectively measured (Escriva-Boulley et al., 2018).

Although an abundant amount of literature supports the benefits of an NSS and the drawbacks of an NTS, prior research has revealed that there is room for PE teachers to act in a more need-supportive and a less need-thwarting way (Haerens et al., 2013). More precisely, some prior studies show that teachers (Reeve, 2009) and PE teachers (Sarrazin et al., 2006) tend to use a controlling motivating style; in particular the use of rewards or threats is a relatively commonly used controlling strategy. Given the consequences of (de)motivating style on students' motivation and behaviors, there is a need to investigate why teachers adopt an NSS and/or an NTS.

Antecedents of motivating style

Antecedents of teachers' motivating style are usually divided into three categories: (a) pressures from above, (b) pressures from below and (c) pressures from within (Grolnick, 2003; Pelletier et al., 2002; Reeve, 2009). Pressuring factors from above refer to the demands teachers encounter within the wider school environment (Pelletier et al., 2002). Results from qualitative (Taylor et al., 2009) and cross-sectional (Taylor et al., 2008) studies investigating secondary PE teachers show that time constraints are perceived as a barrier to implementing autonomy-supportive strategies such as taking time to listen to students' opinions. If teachers are tempted to teach "in a rush" they can also be inclined to urge students to understand, learn and move as quickly as possible (i.e. controlling), give quick and vague instructions (i.e. chaotic) or leave aside students who cannot follow (i.e. chaotic and cold) to save time. To our knowledge, only

one study (Taylor et al., 2008) has examined associations between time constraints and a dimension of teachers' NSS (i.e. autonomy support), and no studies have investigated the link between time constraints and the adoption of an NTS.

Another pressure from above is the pressure to display authority. Many teachers think that one of the teacher's main roles is to exercise authority by controlling their class (Reeve, 2009). Taylor et al. (2009), for instance, show that PE teachers emphasize the need for teachers to show to school actors (e.g. heads, parents, colleagues) that they are authoritarian and can successfully manage their class. These teachers may be convinced that control and hostility (e.g. use of punishment or an aggressive tone) provide them with the necessary authority. As such, one may speculate that the perception that a good teacher needs to display authority may pressure teachers towards adopting a more NTS. Also, they may fear that an NSS will open the door to permissiveness, disrespect and chaos (Aelterman et al., 2019; Reeve, 2009). To date no study has examined the relationship between this pressure and PE teachers' (de)motivating style.

Among the pressures from below, cross-sectional research in secondary schools shows that students' motivation and attitudes in the classroom (e.g. Pelletier et al., 2002; Sarrazin et al., 2006; Taylor et al., 2008) and their (dis)engagement (Van den Berghe et al., 2016; Van den Berghe et al., 2015) relate to teachers' motivating style. These studies reveal that when students are highly engaged in PE, teachers may be more inclined to adopt an autonomy-supportive (e.g. Pelletier et al., 2002; Sarrazin et al., 2006; Taylor et al., 2008) or an NSS (Van den Berghe et al., 2016; 2015) and be less inclined to act in a controlling or a need-thwarting way (Sarrazin et al., 2006; Van den Berghe et al., 2016). In contrast, when students are disengaged, this behavior could be perceived as a pressure that teachers react to by adopting an NTS (Sarrazin et al., 2006; Van den Berghe et al., 2016).

Finally, teachers may also experience pressures from within which are related to their own beliefs. Research has shown that teachers adopt a particular motivating style because they believe that style to be beneficial for their students (Reeve et al., 2014). Teachers generally believe that a controlling style is more effective when compared to an autonomy-supportive one. This is particularly due to teachers' beliefs regarding the effectiveness of rewards to motivate students (Reeve, 2009). Nevertheless, to our knowledge, no study has tested the relationship between beliefs about the effectiveness of rewards and teachers' motivating style. One can expect that teachers who hold this belief about the effectiveness of reward are more inclined to adopt an NTS and less inclined to adopt an NSS.

Teachers could also hold distinct beliefs about whether students' ability in PE is fixed or malleable. In that respect, Dweck (1999) distinguishes two theories of ability to which individuals can adhere. Some see ability as a fixed quality (i.e. entity theory) – i.e. linked to a gift and unlikely to change over time. Others see it as a malleable quality (i.e. incremental theory), likely to evolve over time according to the effort made. The few studies carried out in real (Leroy et al., 2007) or simulated (Rattan et al., 2012) classes show that such beliefs are related to teachers' instructional practices. Leroy et al. (2007) show that generalist primary school teachers who adhere to entity theory are inclined to rely less strongly on an autonomy-supportive and more strongly on a controlling style. Rattan et al. (2012) show that teachers who endorse entity (vs. incremental) theory may be more likely to evaluate students' ability upon a single test score and, when the score is low, to use teaching strategies such as telling them that not everyone can be talented in the subject (i.e. mathematics), assigning less homework or talking about dropping the class, that is they adopt an NTS. To our knowledge, no study has been carried out in the field of PE, and none has linked the teachers' theory about ability in PE and self-reported NSS and NTS.

Mediating role of motivation within SDT

A theoretical question that has been asked in three studies in secondary schools (Pelletier et al., 2002; Taylor and Ntoumanis, 2007; Taylor et al., 2008) is whether the link between these pressures from above, below and within, and an NSS and an NTS, may not be direct, but mediated by motivational variables, such as teachers' motivation to teach. SDT conceptualizes motivation in terms of a continuum of self-determination ranging from autonomous motivation to controlled motivation (Ryan and Deci, 2017). Autonomous motivation, the most self-determined form of motivation, is characterized by a sense of volition and approbation towards specific activities and refers to two types of regulations, intrinsic motivation (i.e. the inherent pleasure and interest derived from the activity) and identified regulation (i.e. the recognition of the values and importance of a behavior). Controlled motivation is characterized by feelings of pressure to participate in certain activities, and involves introjected regulation (i.e. internal pressure such as a desire to avoid feelings of guilt and feeling better about oneself) and external regulation (i.e. external pressure such as a desire to obtain rewards or to avoid criticism) (Ryan and Deci, 2017).

Past studies show relationships between secondary teachers' self-determined motivation (using a self-determination index) and their motivating style. Teachers who are more autonomously motivated to teach rely more on autonomy support (e.g. Radel et al., 2010; Taylor and Ntoumanis, 2007; Taylor et al., 2008), structure and/or involvement (Abos et al., 2018) and use a less controlling style (Soenens et al., 2012). By contrast, teachers with controlled motivation tend to rely less on autonomy support and structure and/or interpersonal involvement (Abos et al., 2018; Van den Berghe et al, 2014), while they are more willing to use an NTS (Van den Berghe et al., 2013). Other studies reveal links between perceived pressures and teachers' motivation. For example, primary and/or secondary teachers' perceptions of time constraints (Fernet et al., 2012; Taylor et al., 2008), or of pressure to display authority (Pelletier et al., 2002) are negatively linked to teachers' self-determined motivation,

while students' engagement is positively linked to teachers' self-determined motivation (Pelletier et al., 2002, Taylor et al., 2007, 2008). Given these results, a mediating role of teachers' motivation between pressures and motivating style is expected. None of these studies examine the relationship between pressures from within (e.g. teachers' beliefs about the effectiveness of rewards and beliefs about the nature of students' ability) and teachers' motivation.

The present study

Currently, the field of research on the antecedents of teachers' (de)motivating style, albeit growing rapidly, is still in its infancy. The first aim of the present study was to examine the relationship between five pressures and teachers' NSS and NTS (Figure 1). The second aim was to examine the mediating role of autonomous and controlled motivation in the relation between pressures and teachers (de)motivating style. Since some pressures/beliefs have not been studied to date, we have considered indirect as much as direct paths (full, partial or no mediation). Based on previous research and SDT, our first hypothesis was that an NSS would be negatively predicted and an NTS would be positively predicted by perceived time constraints, pressure to display authority, students' disengagement, beliefs about the effectiveness of rewards, and adherence to entity theory. Our second hypothesis was related to links between pressures and teachers' motivation. When teachers experience pressures, they are less likely to enjoy and value teaching and they are expected to teach because of the pressures they perceive, which in turn would be related to less NSS and more NTS. The complete model and assumptions are presented in Figure 1.

Methods

Participants

The sample consisted of 509 French generalist primary school teachers (421 females, 88 males, M_{age} = 42.81, SD = 9.23 years; range: 22-65 years old) who were assigned to teach 108 hours

of PE a year according to the curriculum (see recruitment protocol in the supplementary material). Participants had an average experience in teaching of 16.99 years (SD = 9.95 years; range: 0-44 years) and taught from kindergarten to 5th grade[1].

Measures

Motivating style. In order to assess teachers' motivating style and to reduce the burden for the primary school teachers, 14 items that best reflected primary school teaching in PE were adapted from the items used in the Teacher as Social Context Questionnaire (Belmont et al., 1992), the Learning Climate Questionnaire (Black and Deci, 2000) and from a previously validated observation tool (Reeve et al., 2004). Teachers completed seven items assessing the three dimensions of an NSS (e.g. "I explain to my students the value of what there is to learn in PE") and seven items assessing the three dimensions of an NTS (e.g. "In PE, to encourage my students to work, I promise them rewards"; for details see Table 1 in the supplementary material). Responses to all items were rated on a 5-point Likert scale ranging from 1 (never) to 5 (always).

Pressures and beliefs. Five pressures were measured using 15 items (three items per dimension) based on previous work (Table 1 in the supplementary material). For instance, items related to time constraints (e.g. "I think there is not enough time dedicated to PE to allow my students to progress as they should") were based on Taylor et al.'s (2008) work. Three dimensions were created for the purposes of the present study, that is pressure to display authority (e.g. "As a teacher, I am expected to manage my class"), students' (dis)engagement (e.g. "In PE, I constantly need to push my students if I want them to be engaged in PE") and beliefs about the effectiveness of rewards (e.g. "I think that rewards are a good way to motivate students").

[1] In French primary schools, grades are combined in learning cycles. The 1st cycle includes kindergarten, the 2nd cycle includes 1st to 3rd grades, and the 3rd cycle includes 4th to 5th grades. Of the teachers in the present study, 144 taught 1st cycle (28.3%), 155 taught 2nd cycle (30.5%), 132 taught 3rd cycle (25.9%), 77 taught 1st and 2nd cycles or taught 2nd and 3rd cycles (15.1%) and one teacher did not report her teaching grade.

Beliefs about students' ability (e.g. "I think that students may have a certain amount of competence and I really can't do much to change it") was an adapted version of Dweck's (e.g. 1999) questionnaire. Teachers were asked to rate each item on a 6-point Likert scale ranging from 1 (completely disagree) to 6 (completely agree).

Motivation. Primary school teachers' motivation was measured using the French version of the Work Tasks Motivation Scale for Teachers (WTMST; Fernet et al., 2008). The stem "I teach PE…" was followed by 12 possible reasons/items (three for each dimension) which represent teachers' intrinsic motivation (e.g. "…because I find it interesting to do"), identified regulation (e.g. "… because I find it important for the academic success of my students"), introjected regulation (e.g. "… because I would feel guilty not doing it"), and external regulation (e.g. "… because I'm paid to do it"). Teachers rated each item on a 7-point Likert scale ranging from 1 (does not correspond at all) to 7 (corresponds completely). The composite scores for autonomous and controlled motivation were calculated.

Data Analysis

AMOS statistical software was used to perform the analyses. First, Confirmatory Factor Analyses (CFA) were carried out to examine the factorial structure of all the scales. Structural Equation Modeling (SEM) was performed to test a model in which all five antecedents were entered as predictors of an NSS and an NTS (Figures 1 and 2), and another model in which autonomous motivation and controlled motivation were added as mediators (Figures 1 and 3). To evaluate model fit, we relied on multiple indices of fit, including the Goodness of Fit Index (GFI), Tucker-Lewis index (TLI), the comparative fit index (CFI) and the root-mean-square error of approximation (RMSEA). For GFI, TLI and CFI values greater than 0.90 are considered acceptable and for RMSEA values equal to or less than 0.08 are considered acceptable (Marsh

et al., 2004). Students' age was included in the model as a controlling variable given that teachers could use a different motivating style according to students' age (Taylor et al., 2009).

Results

Preliminary analysis

For reasons of brevity, the results of the CFA are not presented here but are available in Table 1 in the supplementary material. After inspection of the standardized loadings and modification indices, and after revision of the scales, all measurement models were found to have acceptable model fit. However, because of their factor loadings and the modification indices, items from the "chaos" dimension were removed. Factor loadings for the remaining items were between .39 and .50. Except for an NTS scale (α =.49) all dimensions had an acceptable (α > .70) or marginally acceptable (α > .60) internal consistency (Table 1). We retained items from the NTS scale because none of them would have substantially increased the alpha coefficient if they were deleted and because the factor loadings of the observed indicators on the need-thwarting factor were satisfactory (i.e. >.40; Ford et al., 1986).

To increase the stability of the parameter estimates and improve the ratio of sample size to estimated parameters, construct-specific parcels were created for the NSS and the NTS scales. Each parcel represented unweighted average scores created by pairing stronger loading items with weaker loading items from the same scale (Little et al., 2002). In line with SDT principles, the two autonomous motivation subscales (i.e. intrinsic motivation and identified regulation) and the two controlled motivation subscales (i.e. introjected regulation and external regulation) were used as indicators of a general autonomous motivation and a general controlled motivation latent variable, respectively.

Descriptive analysis

Descriptive analyses (mean, standard deviation, and Cronbach alphas) are presented in Table 1 and factor loadings are presented in Table 1 and Table 2 in the supplementary material. For the five antecedents, the highest score was related to pressure to display authority and the lowest was related to teachers' beliefs about the effectiveness of rewards. Results from correlation analysis (Table 2) showed that an NSS was negatively correlated to an NTS (r = -.20; p < .001). An NSS was correlated positively to autonomous motivation (r = .43; p <.001) and negatively to controlled motivation, pressure to display authority, students' disengagement, belief in the effectiveness of rewards and adherence to entity theory (rs < -.10; ps < .032). The inverse pattern of relation was found for an NTS with a negative correlation found with autonomous motivation (r = -.16; p <.001) and positive correlations found with controlled motivation and the four previously mentioned dimensions of pressure (rs > .12; ps < .009). Time constraints was the only pressure that was not related either with an NSS (r = .05; p = .236) or an NTS (r = .01; p = .843) and thus was not included in further analyses. Autonomous motivation was negatively related to controlled motivation, and pressure to display authority, students' disengagement, belief in the effectiveness of rewards and to adherence to entity theory (rs < -.11; ps < .010). Controlled motivation was positively correlated to pressure to display authority, student disengagement, belief in the effectiveness of rewards and adherence to entity theory (rs >.13; ps < .004).

Results from Structural Equation Modeling

Model fit for the hypothesized model 1 (Figure 2) was satisfactory (χ^2/df = 2.23, GFI = .94, TLI = .93, CFI = .95, RMSEA = .05). Results revealed four significant paths (p < .05). An NSS was negatively associated with students' disengagement (β = - .19) and adherence to entity theory (β = - .22). An NTS was positively associated with pressure to display authority (β = .73) and

beliefs about the effectiveness of rewards (β = .28). This model explained 14% of the variance for an NSS and 60% of variance for an NTS.

Model fit for the hypothesized model 2 (Figure 3) was satisfactory (χ^2/df = 2.62, GFI = .92, TLI = .90, CFI = .92, RMSEA = .06). Results revealed eight significant paths[2] ($p < .05$). The direct paths from pressure to display authority (β = .73), and from beliefs about the effectiveness of rewards (β = .28) to an NTS remained significant even after the inclusion of autonomous and controlled motivation. These models explained 60% of variance for an NTS, 32% for an NSS, 21% for autonomous motivation and 18% for controlled motivation. The addition of motivation to the model improved the explained variance for the NSS (from 14% to 32%).

Results showed a direct path from pressure to display authority (β = - .13) to an NSS. Bootstrap analyses showed that autonomous motivation fully mediated the relationship between students' disengagement and an NSS (β = - .12) and between adherence to entity theory and an NSS (β = - .15). Students' disengagement (β = - .26) and adherence to entity theory (β = - .32) was negatively associated with autonomous motivation, which in turn was positively associated with an NSS (β = .46). In addition, students' disengagement (β = .32) and teachers' adherence to entity theory (β = .11) were positively associated with controlled motivation (See Table 3 for more details), yet controlled motivation did not mediate any of the direct paths.

Discussion

[2] Results revealed 16 nonsignificant paths (age→ need-supportive and need-thwarting styles, age→ autonomous and controlled motivations, effectiveness of rewards → need-supportive style, effectiveness of rewards → autonomous and controlled motivations, pressure to display authority→ autonomous and controlled motivations, adherence to entity theory→ need-supportive and need-thwarting styles, students' disengagement→ need-supportive and need-thwarting styles, controlled motivation → need-supportive and need-thwarting styles, and autonomous motivation → need-thwarting style). When age is removed from the analyses, results revealed the same remaining significant paths (effectiveness of rewards → need-supportive style, effectiveness of rewards → autonomous and controlled motivations, pressure to display authority→ autonomous and controlled motivations, adherence to entity theory→ need-supportive and need-thwarting styles, students' disengagement→ need-supportive and need-thwarting styles, controlled motivation → need-supportive and need-thwarting styles, and autonomous motivation → need-thwarting style)

A substantial body of evidence has proved that teachers' motivating style affects students' motivation and learning in PE. In order to understand why teachers adopt a (de)motivating style, it is necessary to identify the antecedents of these styles. To this purpose, the aim of the current study was twofold: (1) to examine the relationship between five pressures and teachers' NSS and NTS and (2) to examine the mediating role of autonomous and controlled motivation in these relationships.

Direct paths from pressures to an NSS

Regarding pressures from above, time constraints were not related to either an NSS or an NTS. This is contrary to our hypothesis and unlike findings from prior studies in secondary schools. We can only speculate on the reasons for these findings. In French primary schools, teachers are not required to evaluate students' learning by giving grades. Although teachers have to teach skills and develop motor competences, learning can be evaluated as "acquired", "in the process of being acquired", or "not acquired". Additionally, skills are developed within cycles (e.g. 1st to 3rd grades represent the first cycle) not within grades, perhaps leaving more flexibility in the time frame for acquiring the necessary skills and motor competences. This is different in secondary schools where teachers evaluate and give grades. The findings did reveal that primary teachers do feel the pressure of time constraints (Table 1). Yet, this time pressure could be due to the fact that teachers feel they do not have enough time to teach PE as they sense they are expected to focus on more "academic" subjects. This may explain why this pressure is not related to the motivating style adopted in PE. Future studies could investigate this pressure in different subjects (e.g. mathematics, the sciences) and its consequences regarding teachers' motivating style in these subjects compared to PE. Given that this result is not in line with previous research in secondary schools, another perspective could be to compare the relation between pressures and motivating style in primary schools and secondary schools.

As expected, students' disengagement was negatively related to an NSS. When students are highly engaged in PE, teachers might be more inclined to adopt an NSS, which in turn could help students to maintain or increase their engagement. By contrast, when students are disengaged, teachers may be less inclined to adopt an NSS and consequently students could maintain or increase their disengagement, resulting in a negative spiral. Our results are in line with previous research in secondary school PE (e.g. Taylor and Ntoumanis, 2007; Taylor et al., 2008; Van den Berghe et al., 2016) which shows that students' engagement (or high level of self-determined motivation) and disengagement (or low level of self-determined motivation) are positively and negatively related, respectively, to teachers' NSS. It is possible that students' (dis)engagement could be both an antecedent and a consequence of the teacher's motivating style. In other words, students' disengagement could affect teachers' motivating style which in (re)turn could affect students' disengagement. Because of the present study design, a causal relationship could not be clearly established. Future studies should investigate if this link is reciprocal or univocal.

As for adherence to entity theory, results showed that this belief was negatively related to an NSS. Similar to a previous study (Leroy et al., 2007), results confirm that teachers who adhere to entity theory, which means that they believe that it is pointless to try to improve students' competences, report that they rely less strongly on an NSS. Teachers may be less inclined to support students' needs because these students are perceived as lost causes and time and energy allocated to teach them can be perceived as a waste of time. Along similar lines, Vermote et al. (2020) show that when high school teachers believe that school success is mainly determined by differences in students' intelligence, an NSS might not be seen as functional because such strategies do not influence achievement but rather interest and motivation. Two prior intervention studies (Aelterman et al., 2014; Reeve and Cheon, 2016) show that teachers' pressure from within can be changed through professional training. As such, it would be

interesting for future studies to investigate similar interventions in order to try to modify this belief related to the adherence to entity theory.

Contrary to our hypotheses, pressure to display authority and beliefs about the effectiveness of rewards were not associated with an NSS, yet these were closely linked to an NTS as will be discussed in the next section.

Direct path from pressures to an NTS

Results confirmed the expected positive relation between pressure to display authority and beliefs about the effectiveness of rewards and an NTS. The fact that teachers report experiencing significant pressure to display authority reinforces the findings from Taylor et al. (2009)'s qualitative study: teachers attach great importance to showing to all school actors that they are competent and capable of managing their class, because they are powerful and authoritarian. The results of the current study add to previous work by showing this pressure experienced by teachers positively relates to their engagement in an NTS.

In accordance with previous studies (De Meyer et al., 2016; Reeve et al., 2014), results showed that one of the reasons to adopt an NTS is the belief that promising rewards is an effective strategy to motivate students. Prior studies show that an intervention which aims to modify teachers beliefs, e.g. aims to increase the beliefs about efficacy of an NSS, is efficient and results in an increase of teachers' self-reported adoption of autonomy support (Reeve and Cheon, 2016) and structure (Aelterman et al., 2014). Teachers' beliefs may be indicative of teachers' acceptance or internalization of the proposed alternative way of teaching. Future intervention studies including teachers' professional training could focus on modifying beliefs by discussing the deleterious effects of an NTS, emphasizing the benefits of an NSS and

explaining to teachers how to implement strategies related to this style in an effective and feasible way.

In line with previous results which show that an NTS correlates negatively to students' engagement and positively to students' disengagement or low level of self-determined motivation (Sarrazin et al., 2006; Van den Berghe et al., 2016), students' disengagement showed a significant positive correlation with an NTS. Yet, this association disappeared when using SEM analysis, leaving two other pressures, namely the pressure to display authority and beliefs about the effectiveness of rewards, as more important predictors. It is worth noting that all three predictors were significantly correlated. It is thus likely that teachers experience more pressure to display authority, and are more convinced of the effectiveness of rewards, when they experience their students as being more disengaged.

Although the association between teachers' adherence to entity theory and an NTS was in the expected direction, the strength of this association was weaker than expected. When teachers believe that whatever they do a student's level won't change, they may think that being need-thwarting is useless and a waste of time. Rather than adopting a more need-thwarting style, teachers seem to particularly adopt a less "active" motivating style. It would be interesting to also include a measure of a need-indifferent style (Vansteenkiste and Ryan, 2013). When teachers adopt a need-indifferent style, they talk in a motivationally "empty" manner, they are unresponsive to students' opinions and feelings or they ignore students with a low level of ability and unlikely to improve. In a sport setting, a study showed that coaches' need-indifferent style could affect athletes' outcomes (i.e. irrelevant thoughts, exhaustion) as much as other styles (Bhavsar et al., 2019). This finding could be similar in a PE setting. Further research is needed to examine the need-indifferent style, and its antecedents and consequences in a PE setting.

Mediating role of teachers' motivation

In the current study, we hypothesized that teachers' motivation would mediate the relationship between the pressures experienced and their (de)motivating style. This hypothesis was only partially confirmed. Results showed that teachers who rated their students as higher on disengagement, or who held stronger entity beliefs, enjoyed and valued teaching less, which in turn led them to adopt a less NSS. Such findings are in line with previous work (e.g. Abos et al., 2018; Pelletier et al., 2002; Radel et al., 2010; Taylor and Ntoumanis, 2007; Taylor et al., 2008), revealing that teachers' own motivation may affect the quality of their interactions with their students. In other words, the more teachers teach PE for pleasure or because they value teaching, the more they support students' needs, and teachers are more likely to teach for autonomous reasons if they themselves experience less pressure. Teachers' motivation did not mediate the relationships between pressures experienced and teachers' NTS. One would expect controlled motivation in particular to mediate this relationship, yet controlled motivation did not display a strong correlation with an NTS. Perhaps a different pattern of findings would emerge if we had included amotivation in addition to controlled motivation.

Practical implications

Findings from the present study can help develop effective teacher training. Such training can focus on pressures and can aim to modify adherence to entity theory, to highlight the deleterious effect of rewards and to raise awareness of the possible reciprocal link between their style and students' motivation. As intervention studies show that students can be trained to adhere to incremental theory (Paunesku et al., 2015; Yeager and Walton 2011), positive effects may be expected with teachers as well. According to these studies, providing

opportunities to participants to advise a student who thinks he/she does not have enough skills to succeed could lead to an increase in adherence to incremental theory. Also, teacher training could present the components of an NSS and an NTS and raise awareness of what causes the adoption of these styles. This could help teachers to identify their (de)motivating style and better understand why they adopt an NTS and how to modify it. The present study could also be useful for school authorities and school heads as it highlights the links between teachers' (de)motivating style and the pressures they experience. This can be taken into account by adjusting timetables or informing teachers about effective pedagogical practices (e.g. avoiding the use of rewards and acting in an authoritarian manner). Alternatively, they can use the questionnaire on pressures with their teachers in order to identify the most prevalent pressures and find ways to decrease them or keep them at a low level.

Strengths, limitations and future directions

The present study has several strengths. First, it adds to the literature by examining a specific sample, i.e. generalist primary school teachers. Few previous studies have been conducted in primary schools (Leroy et al., 2007) or have distinguished primary schools from secondary schools in their analyses (Fernet et al., 2012). Second, although previous studies have examined pressures in isolation (e.g. Fernet et al., 2012; Pelletier et al., 2002; Taylor and Ntoumanis, 2007; Taylor et al., 2008), our study examined several pressures simultaneously, thereby allowing us to examine whether each type of pressure is as strongly related to teachers' motivating style. A third strength consisted of investigating all dimensions of teachers' (de)motivating style, while previous studies predominantly focused on autonomy support and did not take into account structure and involvement (e.g. Pelletier et al., 2002; Taylor and Ntoumanis, 2007; Taylor et al., 2008). Finally, the present study adds to this field of research by investigating both NSS and NTS. Although it is well known that an NSS and an NTS are distinct processes, most previous antecedent studies have focused on the former and to date

only two studies have investigated the antecedents of an NTS (Sarrazin et al., 2006; Van den Berghe et al., 2013).

Despite these strengths, some limitations must also be acknowledged. First, although the sample size for the present study is comparable to sample sizes used in similar studies and acceptably large for the statistical analysis conducted, it was relatively low in reference to the number of teachers who were contacted. Descriptive results therefore need to be interpreted with caution. It is, for instance, possible that teachers who answered the questionnaire were more interested in teaching PE and were thus more autonomously motivated than teachers who did not answer. Additionally, the sample is largely composed of women. Although previous studies conducted in primary and/or secondary schools showed that gender is not related to teachers' style (Cheon et al., 2018; Escriva-Boulley et al., 2018; Reeve et al.,2018), future studies should try to increase the response rate and/or focus on including more male primary school teachers.

Second, given the research design adopted (i.e. a cross-sectional study), it was not possible to make causality inferences and thus to rule out the possibility that relationships are reciprocal or influenced by uncontrolled variables. Intervention studies designed to reduce teachers' pressures, to change teachers' beliefs and/or (de)motivating style should be carried out in order to test the causal links between the variables.

Third, the use of self-reported measures (i.e. questionnaires) from the same source (i.e. teachers) is another limitation. This raises questions about the sincerity of responses and problems of shared variance. To avoid teachers' self-bias, future studies could complement data from the teachers' questionnaire with data from questionnaires completed by their students or with observations of their behaviors for a more comprehensive analysis.

Fourth, the NTS alpha coefficient was somewhat problematic. However, all the hypothesized associations emerged significant in the correlation matrix and in the expected direction. Also, SEM analysis takes into account the measurement errors of the measured variables, thus the low internal consistency of the NTS is less of an issue. Future studies would benefit from using tools whose internal consistency seems very satisfactory (e.g. Bhavsar et al., 2019; Vermote et al., 2020).

Fifth, we did not investigate all the components of the motivational sequence presented in SDT as we did not investigate teachers' amotivation, or their need satisfaction/frustration. These variables could be added as mediators in addition to teachers' autonomous and controlled motivations in future studies which would aim to examine the relation between pressures and teachers' NSS and NTS.

We assumed that, as previous studies in primary school settings and in secondary school settings highlighted similar motivational processes with teachers' motivating style being linked with students' investment, the motivational processes we investigated (pressure→motivation→style) would also be similar. Although most of our results confirmed this assumption, some differences appeared (e.g. time constraints, pressure to display authority and beliefs about the effectiveness of rewards and an NSS). An important difference between primary and secondary school PE is that in primary PE, generalist school teachers who are often not PE specialists, teach the lessons. It would be worthwhile for future studies to examine whether this difference in teachers' backgrounds affects how they experience different pressures.

Finally, our findings reveal that it is necessary to raise teachers' awareness about the link between (1) their beliefs (especially related to the theory of ability), (2) the pressures they may feel and their motivating style. In addition, it is necessary to raise teachers' awareness

about the link between their motivating style and students' outcomes. One way to do so is to include in teachers' training empirical and theoretical knowledge as well as concrete illustrations of the benefits of an NSS, the deleterious effects of an NTS and the link that antecedents have with these (de)motivating styles.

Conclusions

The results of this study shed new light on the antecedents of primary school teachers' motivating style in PE. Particularly, pressures from below (i.e. student disengagement) and within (i.e. beliefs about students' ability) were related to teachers' NSS. If these students' characteristics-related pressures were more prevalent, teachers valued and enjoyed teaching less and were in turn less inclined to adopt an NSS. Contrary to our expectations, the pressures from above (i.e. experienced time constraints, pressure to display authority) were not related to primary school teachers' NSS. As for teachers' engagement in an NTS, except for time constraints, results showed particularly that pressures from above (i.e. pressure to display authority) and within (i.e. beliefs about the effectiveness of rewards) were positively and directly related to teachers' engagement in an NTS. These results must be taken into account both theoretically and from an applied perspective when developing and implementing interventions aimed at changing teachers' motivating style via professional development programs.

Table 1. Descriptive analysis: scales, means, standard deviations, and Cronbach's alphas

	Scale	Minimum	Maximum	Mean	Standard deviation	Alpha
Need-supportive Style	1-5	1	5	3.75	.57	.78
Need-thwarting Style[3]	1-5	1	3	1.42	.37	.49
Autonomous motivation	1-7	1	7	5.43	1.15	.89
Controlled motivation	1-7	1	7	3.03	1.45	.81
Time constraints	1-6	1	6	3.49	1.04	.77
Entity theory	1-6	1	6	2.73	.94	.83
Pressure to display authority	1-6	1	6	3.97	.95	.64
Effectiveness of rewards	1-6	1	5	1.91	.80	.67
Students' disengagement	1-6	1	6	2.62	1.00	.82

[3] Because of their factor loadings and the modification indices, items from the "chaos" dimension were removed. Factor loadings for the remaining items were between .39 and .50.

Table 2. Pearson's correlations

	1	2	3	4	5	6	7	8	9
1. Need-supportive Style									
2. Need-thwarting Style	-.17***								
3. Autonomous motivation	.44***	-.08							
4. Controlled motivation	-.19***	.12**	-.38***						
5. Time constraints	.05	.01	.06	-.03					
6. Entity theory	-.25***	.16***	-.32***	.15***	.16***				
7. Pressure to display authority	-.10*	.26***	-.14***	.16***	.12**	.16***			
8. Effectiveness of rewards	-.20***	.37***	-.11**	.13**	.08	.24***	.16***		
9. Students' disengagement	-.27***	.25***	-.30***	.28***	.09*	.32***	.30***	.39***	
10. Students' age	.15***	.13**	-.01	.01	.14***	.06	.03	-.01	-.09*

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

Table 3. Estimate, confidence interval and p-value for total, direct and indirect effect

	Total effect	Direct effect	Indirect effect
Need-supportive Style → Entity theory	-.22 (IC 95%: [-.35,-.08]; p < .01)	-.08 (IC 95%: [-.20, .08]; p = .33)	-.15 (IC 95%: [-.23,-.09]; p < .01)
Need-thwarting Style → Entity theory	-.04 (IC 95%: [-.21, .12]; p = .63)	-.02 (IC 95%: [-.21, .16]; p = .84)	-.02 (IC 95%: [-.08, .04]; p = .48)
Autonomous motivation → Entity theory	-.32 (IC 95%: [-.44,-.19]; p = .01)	-.32(IC 95%: [-.44,-.19]; p = .003)	
Controlled motivation → Entity theory	.11 (IC 95%: [-.01, .25]; p = .06)	.11 (IC 95%: [-.01, .25]; p = .06)	
Need-supportive Style → Students' disengagement	-.19 (IC 95%: [-.33,-.01]; p = .04)	-.07 (IC 95%: [-.21, .01]; p = .42)	-.12 (IC 95%: [-.21,-.04] ; p < .01)
Need-thwarting Style → Students' disengagement	-.11 (IC 95%: [-.34,.18]; p = .37)	-.11 (IC 95%: [-.35, .17]; p = .40)	-.01 (IC 95%: [-.07, .06] ; p = .72)
Autonomous motivation→ Students' disengagement	-.26 (IC 95%: [-.43,-.08]; p< .01)	-.26 (IC 95%: [-.43,-.08]; p = .01)	
Controlled motivation→ Students' disengagement	.32 (IC 95%: [.13,.53]; p = .01)	.32 (IC 95%: [.13, .53]; p = .01)	
Need-supportive Style → Pressure to display authority	-.09 (IC 95%: [-.23, .08]; p = .34)	-.13 (IC 95%: [-.26, .01]; p = .07)	.04 (IC 95%: [-.03, .13] ; p = .27)
Need-thwarting Style → Pressure to display authority	.73 (IC 95%: [.52, .96]; p < .01)	.73 (IC 95%: [.50, .95]; p = .008)	.01 (IC 95%: [-.01, .60]; p = .36)
Autonomous motivation → Pressure to display authority	.09 (IC 95%: [-.07, .26]; p = .27)	.09 (IC 95%: [-.07, .26]; p = .27)	
Controlled motivation → Pressure to display authority	-.03 (IC 95%: [-.20, .16]; p = .83)	-.03 (IC 95%: [-.20, .16]; p = .83)	

Need-supportive Style → effectiveness of rewards	.01 (IC 95%: [-.13, .16]; p = .88)	.03 (IC 95%: [-.09, .20]; p = .64)	-.02 (IC 95%: [-.11, .04]; p = .56)
Need-thwarting Style → effectiveness of rewards	.28 (IC 95%: [.12, .47]; p = .004)	.28 (IC 95%: [.11, .48]; p = .003)	.00 (IC 95%: [-.03, .04]; p = .87)
Autonomous motivation → effectiveness of rewards	-.04 (IC 95%: [-.21, .11]; p = .63)	-.04 (IC 95%: [-.21, .11]; p = .63)	
Controlled motivation → effectiveness of rewards	.12 (IC 95%: [-.03, .29]; p = .12)	.12 (IC 95%: [-.03, .29]; p = .12)	
Need-supportive Style → Autonomous motivation	.46 (IC 95%: [32, .57]; p < .01)	.46 (IC 95%: [32, .57]; p = .005)	
Need-thwarting Style → Autonomous motivation	.07 (IC 95%: [-.12, .26]; p = .47)	.07 (IC 95%: [-.12, .26]; p = .47)	
Need-supportive Style → Controlled motivation	-.01 (IC 95%: [-.11, .14]; p = .99)	-.01 (IC 95%: [-.11, .14]; p = .98)	
Need-thwarting Style → Controlled motivation	.03 (IC 95%: [-.11, .24]; p = .61)	.03 (IC 95%: [-.11, .24]; p = .61)	

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Acknowledgements

This study was facilitated by the educational authorities of the department of Drôme and Voiron (southeast France) as well as by the union of teachers SNUipp-FSU from the French departments of Drôme, Hérault, Isère, Rhône, Savoie and Haute-Savoie.

Figure 1 Hypothesized model of relations between pressures, styles and motivations

Figure 2 Results of structural equation modelling for relations between pressures and styles

Figure 3 Results of structural equation modelling for relations between pressures, styles and motivations

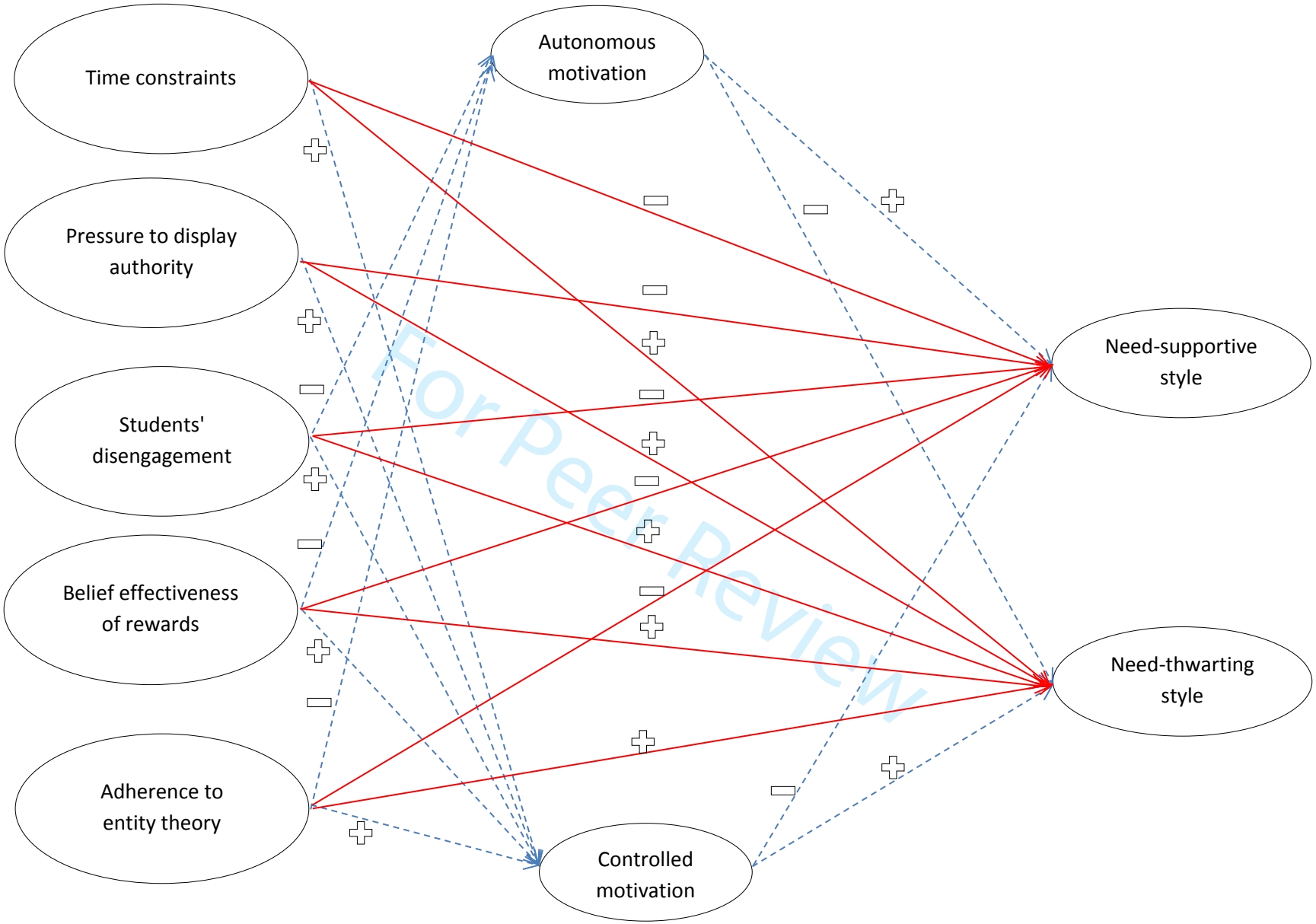

Figure 1 Hypothesized model of relations between pressures, styles and motivations
Note. solid line represents direct path, dashed line represents indirect path

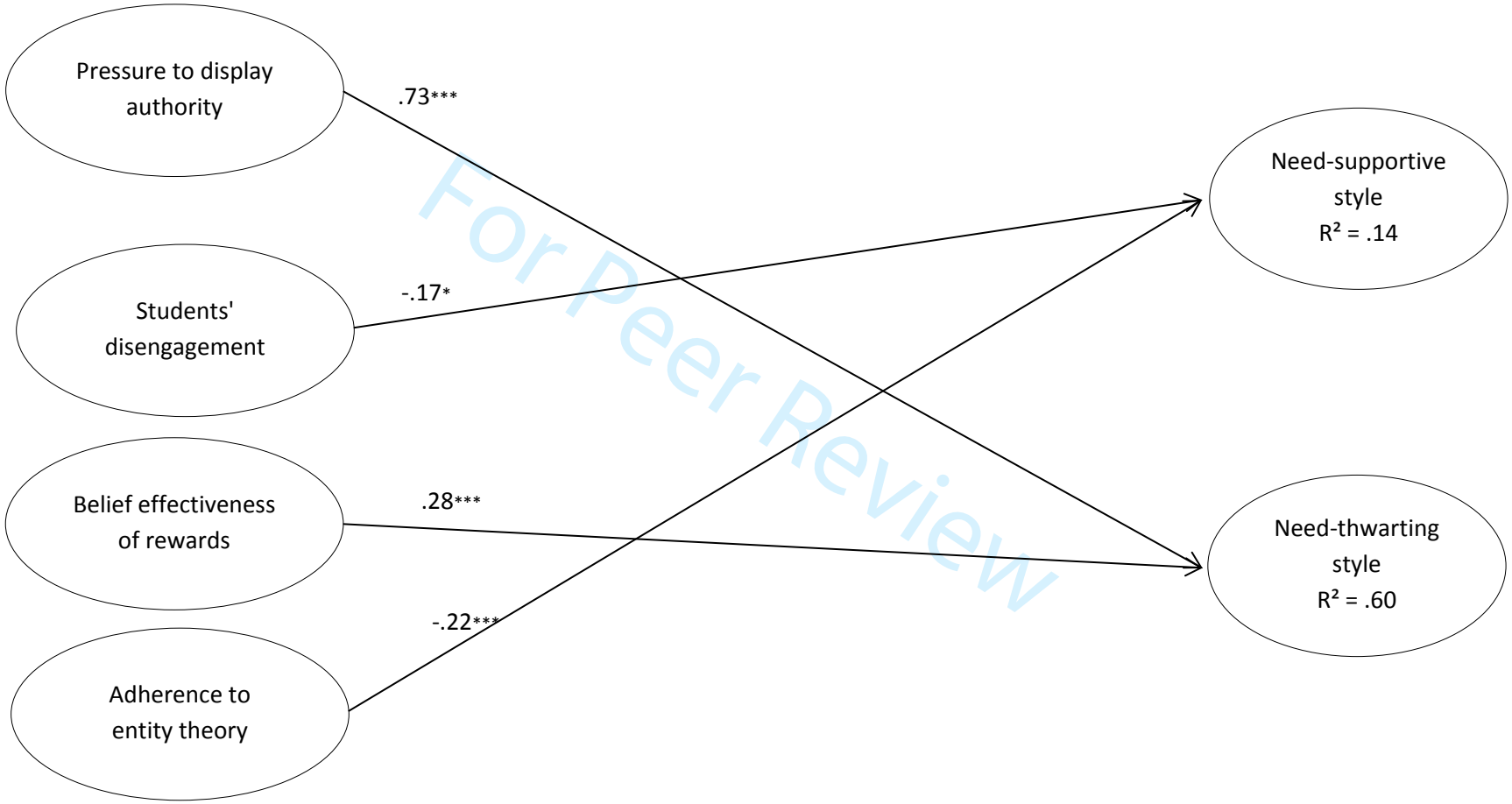

Figure 2 Results of structural equation modelling for relations between pressures and styles
Notes. ***$p < .001$, *$p < .05$. Only significant paths are shown.
Time constraints was the only pressure that was not related either with need-supportive style nor with need-thwarting style and thus was not integrated in further analysis

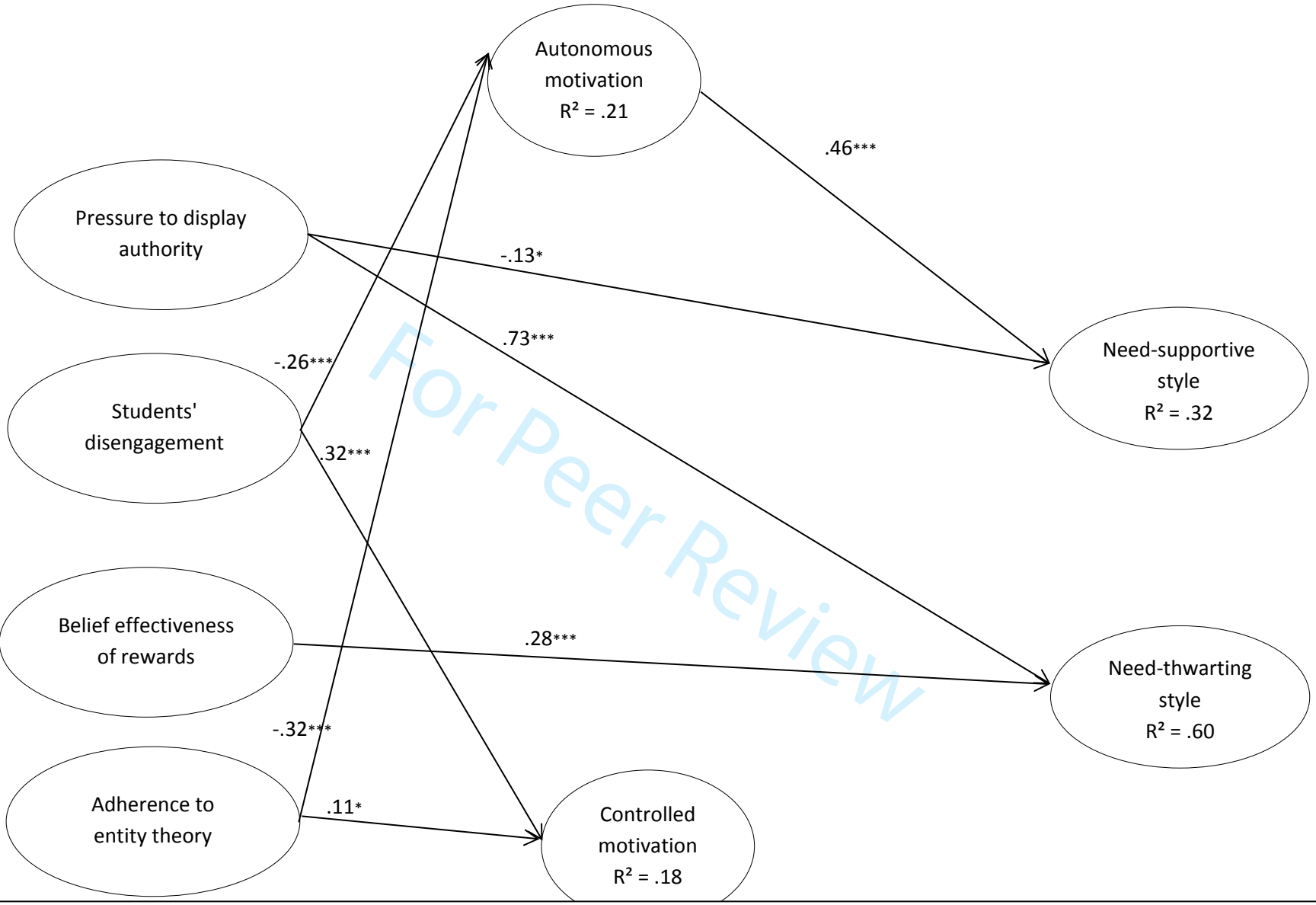

Figure 3 Results of structural equation modelling for relations between pressures, styles and motivations
Notes. ***$p < .001$, *$p < .05$. Only significant paths are shown.
Time constraints was the only pressure that was not related either with need-supportive style nor with need-thwarting style and thus was not integrated in

Supplementary material

Recruitment protocol

The study was approved and supported by the academic authorities based on its scientific and ethical characteristics. A total of 2512 primary schools were contacted by email and asked to participate in a research study about their teaching in PE. School principals were given detailed information about the goals of the study and the contents of the online questionnaire. Then, they were asked to forward to their colleagues the numerical link to access the questionnaire. The response rate was 4%. Participants who completed the surveys were volunteers, and their anonymity was guaranteed.

Table 1. Items and factors loading for motivating styles and pressures

			Loading	Indices fit
Need Supportive Style	*Autonomy support*	I explain to my students the value of what there is to learn in PE.	.79	$\chi^2/df = 4.51$, GFI = .97, TLI = .91, CFI = .94, RMSEA = .08
		I explain to my students why it is important to make PE efforts.	.71	
	Structure	In PE, I am specific about the exercises to be performed (e. g., the purpose, instructions for completion...)	.47	
		In PE, I give advice adapted to the difficulties of my students	.55	
		I provide constructive feedback to help my students progress in PE	.61	
	Involvement	I am attentive to my students' frustrations when they are in difficulty in PE.	.51	
		I spend time with my students in PE	.45	
Need Thwarting Style	*Control*	When students do not want to work in PE, I use to punishment.	.43	$\chi^2/df = 1.88$, GFI = .99, TLI = .95, CFI = .98, RMSEA = .04
		In PE, to encourage my students to work, I promise them rewards	.44	
	Chaos	In PE, I don't know what to teach my students.	.19	
		In PE, I sometimes I have hard time to explain the exercises	.23	
	Cold environment	In PE, I sometimes do favoritism.	.43	
		In PE, I sometimes make fun of students who are not perform well.	.33	
		In PE, I sometimes talk to my students in a harsh way even aggressive.	.54	
Pressures	*Time constraints*	I feel that I don't have enough time in PE to improve my students' skill as I would like.	.63	$\chi^2/df = 2.54$, GFI = .95, TLI = .94, CFI = .96, RMSEA = .06
		I think there is not enough time dedicated to PE to allow my students to progress as they should	.73	
		I find that the duration of the PE courses does not allow me to help the students to progress as I would like.	.82	
	Entity theory	I consider that students' level of PE is something that does not change much.	.71	
		You can certainly teach new thing to a student in PE, but I don't think you can really change his or her overall level.	.79	
		I think that students may have a certain amount of competence and I really can't do much to change it	.86	
	Pressure to	As a teacher, I am expected to manage my class	.61	

display authority	My profession as a teacher requires me to demonstrate authority in PE.	.67
	"I decide and the students apply" fits quite well with my philosophy of teaching PE	.45
Effectiveness of rewards	I think that rewards are a good way to motivate students	.71
	In PE, I quite agree with the idea that the higher the reward expected by the student, the more motivated he or she will be.	.80
	I consider that to motivate students to practice in PE, it is useful to offer them rewards.	.47
Students' disengagement	In PE, I feel that I must constantly be behind my students in order for them to practice correctly.	.80
	In PE, I feel that my students are unable to work independently.	.67
	In PE, I constantly need to push my students if I want them to be engaged in PE	.86

Confirmatory Factor analysis

Motivating style

CFA for need support showed a marginally adequate goodness-of-fit $\chi^2/df = 6.45$, GFI = .95, TLI = .86, CFI = .91, RMSEA = .10. After inspection of the standardized loadings and modification indices, covariation between two items related to how teachers take into account the students need to understand what they do and why ("In PE, I give advices which is adapted to the students' issues" and "I explain the interest of what they learn in PE"). CFA for need support improved and showed adequate goodness-of-fit $\chi^2/df = 4.51$, GFI = .97, TLI = .91, CFI = .94, RMSEA = .08). Regarding need-thwarting, CFA showed inadequate goodness-of-fit $\chi^2/df = 8.37$, GFI = .94, TLI = .44, CFI = .63, RMSEA = .12. Two items were deleted from all further analyses because their factor loading were below .40 : "In PE I don't know what to teach to my students" ($\beta = .29$, $p = .003$) and "In PE, sometimes I have trouble to explain what students have to do" ($\beta = .21$, $p = .006$). After deletion of these two items, and the addition of a covariation between two items that highlighted teachers behaviors related to punishments ("When students do not want to work, I punish them", "In PE, sometimes I used an aggressive tone"), CFA showed adequate goodness-of-fit $\chi^2/df = 1.88$, GFI = .99, TLI = .95, CFI = .98, RMSEA = .04). The Cronbach coefficient assessing the internal consistency was acceptable for need-support style ($\alpha = .78$). For the NTS the coefficient was $\alpha = .49$. We retained the five remaining items because, none of them would have substantially increased the alpha coefficient if it was deleted and because their factor loadings of the observed indicators on the need-thwarting factor were satisfactory (i.e., >.40; Ford, MacCallum, & Tait, 1986)

Pressures and beliefs

CFA was performed and results showed adequate goodness-of-fit $\chi^2/df = 3.12$, GFI = .94, TLI = .91, CFI = .93, RMSEA = .07). All dimensions had an acceptable ($\alpha > .70$) or marginally acceptable ($\alpha > .60$) alpha coefficient, except for the subscale measuring teachers' beliefs with regard to the authority they display ($\alpha = .58$). The deletion of one item (i.e., "I decide and students obey, correspond quite well to my teaching philosophy in PE") improved the internal consistency ($\alpha = .64$). After deletion, CFA showed better goodness-of-fit $\chi^2/df = 2.54$, GFI = .95, TLI = .94, CFI = .96, RMSEA = .06).

Motivation

CFA showed that one item (i.e., "… because if I don't teach PE, I will feel bad") loaded poorly on controlled motivation latent factor ($\beta = .14$; $p = .005$). Consequently, this item was deleted from all further analyses. After deletion, and addition of covariation between two items of intrinsic motivation, two item of identified regulation and two items of introjected regulation, CFA showed adequate goodness-of-fit $\chi^2/df = 4.43$, GFI = .94, TLI = .94, CFI = .96, RMSEA = .08). Internal consistency was acceptable ($\alpha = .80$).

Table 2. Descriptive analysis: Loading factors for parcels

	Loading
Need-supportive Style	
Parcel 1	.52
Parcel 2	.65
Parcel 3	.77
Parcel 4	.86
Need-thwarting Style[1]	
Parcel 1	.48
Parcel 2	.39
Parcel 3	.61

[1] Because of their factors loading and the modification indices, items from the dimension "chaos" were removed. Factor loading for remaining items were between .39 and .50.