

TEACHING ENVIRONMENTS AND STUDENT MOTIVATIONAL OUTCOMES

Running head: PERCEIVED TEACHER CONTROL, STUDENT NEED FRUSTRATION AND
MOTIVATION

Beware of Your Teaching Style:

A School-Year Long Investigation of Controlling Teaching and Student Motivational Experiences

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Abstract

Relatively little research drawing from self-determination theory has examined the links between controlling teaching environments and student motivation. To this end, two longitudinal studies were conducted to explore how students' perceptions of controlling teaching behavior and experiences of psychological need frustration were associated with a number of motivation-related outcomes over a school year. Multilevel growth modelling indicated that changes in perceptions of controlling teaching positively related to changes in need frustration across the school year (Studies 1 & 2) which, in turn, negatively related to autonomous motivation and positively related to controlled motivation and amotivation in Study 1 ($N = 419$); and positively related to fear of failure, contingent self-worth, and challenge avoidance in Study 2 ($N = 447$). Significant indirect effects also supported the mediating role of need frustration. These findings reinforce the need for research on the negative motivational pathways which link controlling teaching to poor quality student motivation. Implications for teacher training are discussed.

Keywords: self-determination theory; controlling teaching; need frustration; physical education.

1. Introduction

1 For some middle school students, the adolescent years mark the beginning of a downward spiral in
2 school-related motivation and engagement that often leads to academic underachievement (Eccles,
3 Wigfield, Midgely, Reuman, MacIver, & Feldlaufer, 1993). This may, in part, be due to a perceived
4 lack of self-determination among students. Many students spend their time in school feeling
5 compelled to follow someone else's rules, study someone else's curriculum, and submit continually
6 to someone else's evaluation (Kohn, 1993). Thus, in order for teachers to successfully facilitate
7 engagement in compulsory curriculum subjects, such as Physical Education (PE), it is vital that
8 students perceive the teaching and learning environment to be motivationally supportive (Haerens,
9 Kirk, Cardon, & De Bourdeaudhuij, 2011; Kirk, 2005). In this regard, the influence of social
10 factors, including the interpersonal style adopted by the teacher, appears to be paramount for
11 student motivation (e.g., Wentzel, 2002). For instance, it has been shown that teachers' instructional
12 behaviors can be discerned according to their dimensions of influence (i.e., power or dominance vs.
13 submission) and proximity (i.e., friendliness or cooperation vs. opposition; Gurtman, 2009).
14 Research suggests that students' perceptions of these types of teacher behaviors relate to outcomes
15 such as student satisfaction, confidence, and effort (Wubbels & Brekelmans, 2005). However,
16 whilst there has been extensive empirical evidence on the role of positive teaching behavior for
17 adaptive student motivation, comparatively less research has been carried out examining the
18 mechanisms via which negative teaching behaviors relate to students' motivation-related outcomes
19 (Juvonen & Wentzel, 1996; Wentzel, 1999).

21 Self-determination theory (SDT; Deci & Ryan, 1985; Ryan & Deci, 2002) is a widely
22 applied contemporary framework for the study of motivation which differentiates between optimal
23 (e.g., autonomy-supportive) and non-optimal (e.g., controlling) teacher behavior (Van den Berghe
24 et al., 2013). Educational research guided by SDT has consistently shown that an autonomy-

1 supportive teaching style nurtures a motivational pathway toward optimal functioning (e.g., Jang,
2 Kim, & Reeve, 2012; Tessier, Sarrazin, & Ntoumanis, 2010; Vansteenkiste et al, 2012). However,
3 the existence of a separate maladaptive pathway activated by controlling social environments has
4 been increasingly measured and empirically tested in a systematic way (Bartholomew et al., 2011a;
5 Bartholomew et al., 2011b; Bartholomew et al., 2010). Nonetheless, very few studies in education
6 have examined controlling teaching behaviors, as explicated by SDT, and the mechanisms by which
7 such behaviors predict maladaptive cognitive, affective, and behavioral outcomes from a
8 longitudinal perspective (Jang, Kim, & Reeve, 2016).

9 **1.1 Controlling Teaching Behaviors**

10 Teachers are controlling when they ignore students' perspectives and behave in authoritarian and
11 pressuring ways in order to impose a specific and preconceived way of thinking, feeling, and
12 behaving (Bartholomew et al., 2009; Grolnick, 2003; Reeve, 2009). According to SDT, a
13 controlling interpersonal style can be expressed in two different ways: externally controlling and
14 internally controlling (De Meyer, Soenens, Aelterman, De Bourdeaudhuij, & Haerens, 2016).
15 Externally controlling teaching refers to the activation of a sense of external obligation in students
16 by using explicit and overtly controlling strategies (Ryan, 1982). For example, Bartholomew et al.
17 (2009) identified intimidation as a controlling strategy which fosters external regulation by creating
18 pressure from outside to behave in certain ways. Behaviors which are used to intimidate others
19 involve the display of power-assertive strategies such as yelling, the use and threat of physical
20 punishment (e.g., running laps in PE), and overly critical attacks on individual students which are
21 designed to humiliate and belittle.

22 Internally controlling teaching refers to the use of tactics that trigger maladaptive
23 motivational forces that reside inside the student by appealing to their feelings of guilt, shame,
24 anxiety, and self-worth. Such internal pressures are usually activated in more covert and subtle

1 ways (Soenens & Vansteenkiste, 2010). For example, teachers may use negative conditional regard
2 (i.e., withdrawing attention, interest, and care when the student fails to act as expected) and other
3 guilt-inducing strategies to express disappointment when their expectations are not met
4 (Bartholomew et al., 2010; Soenens, Sierens, Vansteenkiste, Goossens, & Dochy, 2012).

5 Such external and internal controls pressure students to adhere to the values held by the
6 teacher and can, therefore, be used to enforce discipline and secure student compliance (Soenens et
7 al., 2012). However, behaviors obtained via these compliance techniques are problematic as they
8 impede the internalization of the underlying values of the action (e.g., the health, social, and
9 psychological gains associated with physical activity) and, therefore, undermine optimal student
10 motivation (Deci & Ryan, 2000; De Meyer et al., 2014).

11 Controlling teaching is largely incompatible with the adaptive teaching dimension of
12 autonomy support (Grolnick, 2003). Autonomy-supportive teachers try to foster students' sense of
13 volition and inner motivational resources so that students perceive themselves as the initiator of
14 their actions (Reeve, 2009). However, the behaviors associated with the two interpersonal styles are
15 not necessarily antipodal (Bartholomew et al., 2009; 2010; Tessier, Sarrazin, & Ntoumanis, 2008)
16 and the presence of controlling teaching behavior cannot simply be equated with the absence of
17 autonomy-supportive behavior (Bartholomew et al., 2011b). In the same way as fostering growth
18 takes more than the absence of control, it takes more than the absence of autonomy support to
19 predict negative motivational outcomes. Thus, perceptions of controlling teaching and their impact
20 on student motivation must be assessed in their own right. Whilst this assertion is becoming
21 increasingly accepted in the SDT literature, most research has still focused on adaptive teaching
22 dimensions and their beneficial effects on students; far fewer studies have explicitly addressed
23 controlling teaching and its relations to student motivation, cognition, and well-being (Jang et al.,
24 2016; *cf.* cross-sectional research by Assor, Kaplan, Kanat-Maymon, & Roth, 2005; De Meyer et

1 al., 2014; De Meyer, et al., 2016; Haerens Aelterman, Vansteenkiste, Soenens, & Petegem, 2015;
2 Soenens et al., 2012). The present study will add to this relatively small body of research by
3 examining the stability and the range of the associations between controlling teaching behaviors
4 (i.e., intimidation and negative condition regard) and student motivation-related outcomes in PE.

5 **1.2 Basic Psychological Need Frustration**

6 Deci and Ryan (2000) suggest that the negative impact of controlling teaching environments occurs
7 because such contexts thwart students' basic psychological needs. Three such needs are identified,
8 those for autonomy, competence, and relatedness (Deci & Ryan, 2000). Autonomy reflects a need
9 for individuals to feel volitional and responsible for their own behavior (deCharms, 1968; e.g.,
10 when students experience a sense of choice in relation to the activities they engage in). Competence
11 reflects feelings of effectance and confidence in achieving desired outcomes (White, 1959; e.g.,
12 when students feel capable of completing the tasks set by the teacher). Finally, relatedness concerns
13 the degree to which individuals feel meaningfully connected to and accepted by significant others
14 (Baumeister & Leary, 1995; e.g., when students experience a strong bond with their PE teacher or
15 classmates). Students experience feelings of need frustration when their psychological needs are
16 thwarted in controlling teaching environments (Vansteenkiste & Ryan, 2013). For example,
17 controlling strategies pressure students to change their behavior to conform to their teacher's
18 expectations (autonomy frustration) and, over time, may cause students to doubt their capabilities
19 (competence frustration), and feel rejected and disliked by their teacher and classmates (relatedness
20 frustration; Bartholomew et al., 2011a; Haerens et al., 2015).

21 It is becoming increasingly recognized in SDT that the experience of need frustration is
22 distinct from the absence of need satisfaction (Bartholomew et al., 2011a; Costa, Ntoumanis, &
23 Bartholomew, 2014; Vansteenkiste & Ryan, 2013). This important conceptual differentiation has
24 practical significance as it suggests that processes associated with need satisfaction and need

1 frustration will relate to different motivational and educational outcomes (Bartholomew et al.,
2 2011b; Vansteenkiste & Ryan, 2013). Importantly, Costa et al. (2014) showed that such differential
3 relations are not simply due to the positive and negative wording of the items used to tap
4 experiences of need satisfaction and need frustration, respectively, and associated positive and
5 negative outcomes (i.e., method effects). Whereas need satisfaction should relate primarily to
6 optimal motivation, good academic performance, and well-being, need frustration should be
7 primarily predictive of maladaptive motivational orientations, poor performance, and ill-being.
8 Initial evidence for the practical import of this theoretical assertion has been provided in the sport
9 context (Bartholomew et al., 2011b; Balaguer et al., 2012). For example, Bartholomew and
10 colleagues tested an integrated model incorporating both a positive motivational pathway (i.e., from
11 perceived coach autonomy-support to athlete well-being via need satisfaction) and a negative
12 pathway (i.e., from perceived coach control to athlete ill-being via need frustration). As expected,
13 need satisfaction strongly related to vitality and positive affect whereas need frustration better
14 predicted, among others, burnout and depressive symptoms. In addition, similar findings have been
15 obtained in contexts such as work (Gillet, Fouquereau, Forest, Brunault, & Colombat, 2012), health
16 (Verstuyf, Vansteenkiste, Soenens, Boone, & Mouratidis, 2013), personal relationships (Costa et
17 al., 2014) and, more recently, PE (Haerens et al., 2015).

18 Using a cross-sectional design, Haerens et al. (2015) examined optimal and non-optimal
19 motivational pathways among secondary school PE students and found initial support for a positive
20 pathway in which perceived need satisfaction primarily related to perceived autonomy-supportive
21 teaching and beneficial motivation (i.e., autonomous motivation) and a negative pathway in which
22 need frustration primarily related to perceived controlling teaching and maladaptive motivation
23 (i.e., controlled motivation and amotivation). Recently, in a three-wave one-semester-long
24 longitudinal study of Korean high-school students, Jang et al. (2016) examined the extent to which

1 perceived autonomy-supportive and controlling teaching predicted engagement and disengagement
2 via need satisfaction and need frustration, respectively. The authors demonstrated, among other
3 findings, that perceived controlling teaching at the beginning of the semester predicted need
4 frustration, which, in turn, predicted higher levels of school-related disengagement at the end of the
5 semester in language, mathematics, and social science subjects. Our study complements and
6 extends the study by Jang et al. in various ways. First, we investigated how perceived controlling
7 teaching, need frustration, and their motivational correlates evolve across time. Second, we
8 examined whether the relations among perceived controlling teaching and motivational processes
9 and outcomes would hold throughout a whole school year. An important practical and theoretical
10 question is whether these relations remain stable across time and the extent to which they vary from
11 person to person. Third, we tested all these temporal changes and interrelations in a sample of
12 younger students (i.e., middle school students), in a different subject matter (i.e., PE), and included
13 a number of additional and important motivational correlates. Research including both interpersonal
14 styles has extensively shown that autonomy support and control relate to distinct pathways (e.g.,
15 Bartholomew et al., 2011b; Haerens et al., 2015; Jang et al., 2016), and therefore, the decision was
16 made to carry out a detailed examination of the comparatively under-researched negative
17 motivational pathway.

18 **1.3 A Differentiated Approach to Motivation and the Process of Internalization**

19 When autonomously motivated, an individual fully endorses an activity because it is interesting,
20 challenging, and enjoyable (i.e., intrinsic motivation) or personally important (i.e., identified
21 motivation). Students experience a sense of volition in both cases and, as such, intrinsic and
22 identified motivation represent autonomous forms of motivation. Previous research in the context of
23 PE has shown that autonomous motivation is associated with a number of positive outcomes

1 including greater engagement (Aelterman et al., 2012), concentration (Ntoumanis, 2005), and better
2 grades (Barkoukis, Taylor, Chanal, & Ntoumanis, 2014).

3 Contrastingly, when behaviors are engaged in for reasons which have not been fully
4 internalized, students experience controlled motivation. To be controlled means to act with a feeling
5 of pressure (Deci & Ryan, 2000). Coercive demands and reward contingencies (i.e., external
6 motivation), or one's sense of guilt or obligation (i.e., introjected motivation), can all pressure an
7 individual into engaging in requested behaviors. For instance, students may cooperate during a PE
8 class because they are afraid of getting into trouble or, in the case of introjected regulation, to prove
9 that they are a good student and avoid feelings of guilt. The final regulation embraced by SDT is
10 amotivation, a state in which individuals engage passively in activities without any sense of
11 intention or reason to act in a particular way. An amotivated student may attend class but 'just go
12 through the motions' without directing actions toward an intended outcome (Ntoumanis &
13 Standage, 2009). Controlled motivation and amotivation for PE have been shown to predict
14 boredom and unhappiness (Ntoumanis, 2001), decreased effort (e.g., Aelterman et al., 2012), and
15 lower grades (Barkoukis et al., 2014).

16 Understanding the aspects of teaching styles which forestall student internalization for
17 behavioral engagement is, therefore, important. SDT-based empirical research has indicated that
18 controlling teaching behaviors are associated with maladaptive motivational regulations because
19 they frustrate students' basic psychological needs (Haerens et al., 2015); need frustration, in turn,
20 leads to psychological accommodations and negative cognitive, affective, and behavioral outcomes
21 (Deci & Ryan, 2000). It could be, for instance, that experiences of need frustration predispose
22 individuals to fear failure, avoid challenges, and be insecure about their self-worth (Assor & Tal,
23 2012; Crocker, 2002).

24 **1.4 Fear of Failure, Contingent Self-Worth, and Challenge Avoidance**

1 Ongoing satisfaction of autonomy, competence, and relatedness needs enhances one's intrinsic
2 motivation and, therefore, one's active engagement with tasks (Deci & Ryan, 2000). In contrast,
3 need frustration is likely to negatively influence optimal functioning and behavioral outcomes.
4 School is an environment where achievement is highly sought and part of a student's self-worth
5 may be contingent on their ability to demonstrate competence and success (Crocker, Luhtanen,
6 Cooper, & Bourvrette, 2003). Feelings of inadequacy and failure can, therefore, lead to shame and
7 self-doubt. This may mean that some students fear failure in this environment (i.e., hold beliefs
8 concerning the likelihood that failing to complete a certain task or meet a specific performance
9 standard will lead to aversive consequences; Conroy, Willow, & Metzler, 2002). Students may also
10 fear failure if their needs for autonomy and relatedness are frustrated. For example, when autonomy
11 is frustrated students may come to engage in tasks purely for extrinsic reasons (e.g., to avoid
12 punishment). Concerns about being 'told off' by the teacher or 'criticized' in front of their peers –
13 situations which may also undermine relatedness needs – may increase students' fears about failing
14 in controlling motivational environments. Moreover, high-levels of contingent self-worth could also
15 occur as a result of relatedness thwarting as students learn that they are less valuable as a person if
16 they fail or do not maintain satisfactory relationships with their teacher by performing in line with
17 his or her expectations. Furthermore, when autonomy needs are frustrated and students have no
18 clear agency, identity, and opportunity to endorse their own behavior, their self-worth may become
19 tied up in demonstrating the behaviors desired by their teacher even though these are not integrated
20 into their own sense of self (Deci & Ryan, 2000).

21 In such need thwarting environments, students could also come to exhibit maladaptive
22 coping strategies (De Castella, Byrne, & Covington, 2013). One such coping response is challenge-
23 avoidance: the tendency to withdraw and avoid challenges when chances of success are not clear
24 and/or success is not quickly or easily apparent (Covington, 1992; Elliot & Church, 1997). For

1 instance, if someone fails because he or she did not fully engage with the challenging situation, then
2 the failure does not necessarily suggest that the person lacks the ability or talent to succeed. This
3 avoidant response may minimize further shame because most people believe that when effort
4 investment is minimal, failure does not imply a lack of competence (Dweck, 1999). Similarly, when
5 autonomy is thwarted students have no self-determined or meaningful reason for engaging in the
6 task so they may simply opt out. Finally, when the need for relatedness is frustrated and teacher and
7 or peer support and acceptance is fragile, avoiding tasks where success is not certain may protect
8 the student against embarrassment and further damage to important relationships.

9 Adopting such a response to challenges in controlling environments which invoke concerns
10 about failing may, therefore, help protect contingent self-worth and prevent further experiences of
11 need frustration. Nonetheless, fear of failure, contingent self-worth, and challenge avoidance have
12 all been shown to undermine school adjustment and academic success (Caraway, Tucker, Reinke, &
13 Hall, 2003; Crocker, Sommers, & Luhtanen, 2002; Shim & Ryan, 2005). As such, we would expect
14 controlling teaching behaviors and experiences of need frustration to positively, and
15 simultaneously, predict cognitive-affective concerns such as fear of failure, affective outcomes
16 including contingent self-worth, and self-protecting behavioral modifications such as challenge
17 avoidance (Deci & Ryan, 2000). Initial evidence for such assertions comes from interviews with PE
18 students in which perceptions of controlling teaching were associated with helplessness beliefs and
19 lesson avoidance behaviors (Ntoumanis, Pensgaard, Martin, & Pipe, 2004).

20 **1.5 Gender and Sport Participation**

21 A recent report by the Women's Sport and Fitness Foundation (WSFF, 2012) suggested that some
22 school girls are being put off physical activity by their PE lessons. According to the report, many
23 young girls feel self-conscious when exercising or unhappy during PE. The report found that only
24 12% of girls aged 14 get enough physical activity each week. Likewise, Ruiz et al. (2011) and

1 Troiano et al. (2008) found that boys were more physically active than girls. Similar findings have
2 also been reported in Greece where only 5% of 15-year old girls and 18% of their male counterparts
3 are physically active (World Health Organization, 2010). It is possible that the extent to which
4 males and females perceive their teachers to be controlling and/or experience need frustration
5 during PE might account for the reported sex differences in motivation and engagement. Another
6 individual difference factor which may affect experiences in PE is whether students participate in
7 sport outside of school. For example, Ntoumanis, Barkoukis, and Thøgersen-Ntoumani (2009)
8 showed that Greek students who did not participate in out-of-school sport activities were less self-
9 determined and more amotivated during PE lessons. Therefore, the predictive role of both gender
10 and sport participation will be examined in the present paper.

11 **1.6 The Present Studies**

12 To date, very few longitudinal studies (e.g., Jang et al., 2016) have examined controlling teaching
13 from a SDT perspective. As such, little is known about *how* this aspect of teacher behavior evolves
14 across a school year and if it relates to student motivation and other cognitive, affective, and
15 behavioral factors associated with school adjustment and academic success over time. Hence, the
16 present study, which comprises three time-points across one school year, adds to the literature by
17 examining the ways by which trimester-to-trimester perceived controlling teaching environments
18 are related to trimester-to-trimester experiences of need frustration and, in turn, trimester-to-
19 trimester student motivation (Study 1); and trimester-to-trimester maladaptive cognitive-affective
20 (fear of failure), affective (contingent self-worth), and behavioral (challenge avoidance) outcomes
21 (Study 2). Although studies with shorter time intervals (e.g., week-to-week diary studies) could
22 have been used, we used a one-year time period because we wanted to examine stability and change
23 over a meaningful period of time in the school calendar. Shorter time frames could provide

1 misleading results as findings could depend on seasonal effects (e.g., partaking in PE in bad
2 weather) or variations in the curriculum (e.g., different sport activities taught).

3 In all the three assessment waves, psychological need frustration was expected to mediate
4 the relation between students' perceptions of controlling teaching behaviors and maladaptive
5 motivation-related outcomes. The predictive roles of gender and sport participation were also
6 explored. Such questions have important theoretical and practical implications in terms of better
7 understanding the origins and processes associated with student dissatisfaction in education so that
8 more targeted motivational interventions can be developed in schools.

9 PE was deemed a particularly suitable context in which to explore these issues given its
10 unique characteristics. Unlike many other school subjects, physical education seems at face value to
11 be attractive to many students given its opportunities for active play (Subramaniam & Silverman,
12 2007). Yet, a substantial number of school-aged children appear to dislike the subject (Carlson,
13 1995), but are still required to participate in lessons because they are a compulsory part of the
14 curriculum (European Commission, 2013). We would, however, expect the theoretically based
15 relations explored in this study to generalize to other subjects (see Jang et al., 2006). Similarly to
16 the way in which PE is organized in many European countries and in North America, students in
17 our study participated in two compulsory 45-minute PE classes every week with a focus on team
18 games, personal fitness, and the development of physical competencies associated with the adoption
19 of an active lifestyle during adulthood. Our participants were middle-school students aged around
20 14 years, as previous research has shown that motivation towards PE, and other curriculum
21 subjects, decline around this time (Ntoumanis et al., 2009; Gottfried, Fleming, & Gottfried, 2001).
22 The importance of supportive teacher-student relationships in middle school has also been
23 emphasized in previous research (Pianta, Stuhlman, & Hamre, 2002).

24

2. Study 1

1 The aim of Study 1 was twofold. First, we examined the temporal patterning of each variable. In
2 line with previous research which has shown that perceptions of motivationally adaptive PE
3 environments deteriorate across time (Digelidis & Papaioannou, 1999; Gottfried et al., 2001;
4 Ntoumanis et al., 2009), we expected to observe increases in perceived control, need frustration,
5 and maladaptive indices of motivation (i.e., controlled motivation and amotivation) and decreases in
6 autonomous motivation across the school year (hypothesis 1). The second aim was to examine the
7 relation between perceived controlling teaching and students' experiences of need frustration and,
8 in turn, their motivational orientations across three measurements waves in a school year. The
9 mediating role of need frustration was also tested in each wave. In line with SDT, it was
10 hypothesized that controlling teaching behavior would positively co-vary with need frustration
11 which, in turn, would positively co-vary with controlled motivation and amotivation, and negatively
12 co-vary with autonomous motivation (hypothesis 2). Furthermore, on the basis of previous evidence
13 (e.g., Craig, Goldberg, & Dietz, 1996; Ntoumanis et al., 2009), it was hypothesized that females and
14 those students who did not participate in out of school sport would perceive higher levels of
15 controlling teacher behavior, need frustration, controlled motivation, and amotivation (hypothesis
16 3).

17 3. Method

18 3.1 Participants

19 Four hundred and nineteen students (52.6% males; $M_{\text{age}} = 14.5$, $SD = 0.53$) participated in Study 1.
20 One student missed the first wave of assessment, while another two and nine students missed the
21 second and the third wave of assessment, respectively. A MANOVA comparing the students who
22 provided information across all three waves of assessment with those who missed the T3
23 assessment showed non-significant statistical differences in the mean scores of T1 and T2 measured
24 variables (Wilk's $\Lambda = .992$, $F [10, 405] = 0.33$, $p = .97$). Therefore, the missing observations were

1 considered to be random. The students belonged to 9 classes from three middle schools located in
2 an urban area of average socioeconomic status in Northern Greece. In addition to participating in
3 two 45 minute PE classes each week, 62.6% of the students engaged in out-of-school sport
4 activities, such as soccer ($n = 55$), basketball ($n = 47$), athletics ($n = 30$), volleyball ($n = 25$),
5 handball ($n = 20$), and dance ($n = 16$).

6 **3.2 Procedure**

7 Prior to the initial data collection, informed consent was obtained from the schools' head-teachers,
8 and the students themselves (parents had the option to complete an opt out form if they wished).

9 The first data collection (T1) occurred in November, while the second (T2) and the third (T3) took
10 place in January and April, respectively. At all three assessment times, a research assistant visited
11 the schools and explained the purpose of the study to the students. The students were told that their
12 participation was voluntary and that their responses would remain confidential and would not be
13 shared with their teachers or parents. No students refused to participate in the study. A coding
14 system was developed to match students' responses over time while protecting their anonymity.

15 **3.3 Measures**

16 **3.3.1 Controlling Coach Behaviors Scale (CCBS; Bartholomew et al., 2010).** Two four-item
17 subscales (Intimidation and Negative Conditional Regard), taken from the CCBS scale, were
18 adapted and used for the purposes of the present study (e.g., "My PE teacher shouts at me in front
19 of others to make me do certain things"). We excluded items from the CCBS that were not relevant
20 to the PE context (e.g., "My coach tries to control what I do during my free time"). Bartholomew et
21 al. provided evidence for the internal consistency and factorial validity of the CCBS and its
22 subscales. In the present study the internal consistency (Cronbach alphas) of the scale was .81 for
23 T1, .87 for T2, and .92 for T3 (see Table 1). A test of factorial invariance across time (i.e., where
24 the loadings of the items on the latent factor of perceived controlling teaching are presumed to

1 remain invariant across the three waves of assessment) yielded acceptable fit: $S-B\chi^2(74) = 410.04$,
2 CFI = .931, RMSEA = .068.

3 **3.3.2 Psychological Need Thwarting Scale (PNTS; Bartholomew et al., 2011a).** The PNTS was
4 adapted and used in the present study. The stem was “During PE class” and students responded to
5 three 4-item subscales in order to assess perceptions of autonomy frustration (e.g., “I feel pushed to
6 behave in certain ways”), competence frustration (e.g., “There are situations in which I am made to
7 feel incompetent”), and relatedness frustration (e.g., “I feel I am disliked”). Bartholomew et al.
8 showed that the scale scores had high internal consistency and factorial validity. Similarly, in the
9 present study, the Cronbach alphas for all the subscales across the three waves of assessment ranged
10 between .72 and .86 – see Table 1. Furthermore, a test of factorial time invariance, with the three
11 latent factors of autonomy, competence, and relatedness frustration allowed to freely covary,
12 showed acceptable fit $S-B\chi^2(171) = 695.89$, CFI = .942, RMSEA = .054.

13 **3.3.3 Revised Perceived Locus of Causality in Physical Education Scale (PLOC-R;**
14 **Vlachopoulos, Katartzi, Kontou, Moustaka, & Goudas, 2011).** The PLOC-R assesses different
15 types of motivation for engaging in PE. In particular, the PLOC-R contains 19 items and students
16 were asked to indicate the degree to which they engaged in PE class activities for intrinsic (e.g.,
17 “Because it is enjoyable”), identified (e.g., “Because it is important to me to do well in PE”),
18 introjected (e.g., “Because I would feel bad if I did not do it”), and external (e.g., “Because in this
19 way I will not get a low grade”) reasons as well as the absence of any reason (i.e., amotivation; e.g.,
20 “I don’t see why we should have PE”). Vlachopoulos et al. provided evidence for the reliability and
21 validity of the PLOC-R. Similar to previous studies and aligned with SDT, intrinsic and identified
22 motivation were aggregated to represent a composite score of autonomous motivation, and
23 introjected and external motivation were used to compute a composite score of controlled
24 motivation. A test of factorial time invariance with each set of items defining the respective latent

1 factors (but also [a] with the errors between an intrinsic item and an identified item being allowed to
2 covary and [b] an item from the external regulation subscale being allowed to cross-load to
3 introjected regulation) yielded marginally acceptable fit: $S-B\chi^2(506) = 2075.10$, $CFI = .907$,
4 $RMSEA = .070$. All measures were assessed on a 7-point scale anchored by 1 (*Strongly disagree*)
5 and 7 (*Strongly agree*).

6 **3.4 Plan of Analyses**

7 As a first step, we calculated descriptive statistics, Cronbach alphas, and zero-order correlations
8 amongst the variables of our study. Then, through separate univariate multilevel models, we
9 examined whether there were linear, curvilinear, or no temporal changes in each of the measured
10 variables. We used multilevel modelling because repeated measures were nested within persons.
11 Given that multilevel models can handle missing cases effectively (Raudenbush & Bryk, 2002), we
12 retained all the available information in each model, including those students for which we had
13 missing values at T1 ($n = 1$), T2 ($n = 2$), or T3 ($n = 9$). We disregarded the classroom level as the
14 small number ($n = 9$) would result in unreliable estimates (Maas & Hox, 2005). To ease the
15 interpretation of the coefficients, all continuous predictors were converted into z-scores so that
16 standardized regression coefficients could be reported (Hox, 2010).

17 In our main analyses, we tested the hypothesized associations within a single multivariate
18 multilevel model in which all of the dependent variables (i.e., autonomous motivation, controlled
19 motivation, and amotivation) were simultaneously regressed on to two sets of predictors, the within-
20 and between-person predictors. The within-person predictors included perceived controlling
21 teaching and need frustration and their parameter estimates represented the averaged associations
22 between these variables and the motivational regulations across the three waves of assessment (i.e.,
23 across whole school year). Given that one of the primary goals in our study was to examine student
24 variability in the constructs under investigation, we treated the slopes (i.e., the relations between the

1 constructs) as randomly varying. Slopes that had no significant random effects were fixed. The
2 between-person predictors included gender and out-of-school sport participation and were used to
3 capture between-student differences in the mean levels of autonomous motivation, controlled
4 motivation, and amotivation across the three waves.

5 We favoured multilevel analysis over cross-lag path modelling for two reasons. First,
6 because through multilevel analysis we could address our first research question that pertains to
7 temporal changes across time. Therefore, through multilevel analysis we could calculate changes in
8 relation to the individual and not in relation to the group (Curran, 2000). Second, because we were
9 mainly interested in examining the stability of the associations between perceived controlling
10 teaching and motivational processes and outcomes at three points in time throughout a school year.
11 Although cross-lag analysis permit one to examine to what extent a hypothesized antecedent
12 predicts a subsequent outcome (after controlling for its baseline level), this analysis is done in a
13 rather fragmented manner (i.e., in a series of two-time points comparisons; Curran & Hussong,
14 2002).

15 The within-person predictors were group mean centred to reflect the average within-person
16 relations among the measured variables across the three waves of assessment. Further, the between-
17 person predictors were grand-mean centred to represent the predicted score for all students,
18 regardless of their gender or out-of-school sport participation status. No cross-level interactions
19 (i.e., interactions between between-person and the within-person variables were estimated as
20 including such cross-level interactions yielded unstable standard errors.

21 **4. Results**

22 **4.1. Preliminary Analyses and Temporal Changes**

23 Descriptive statistics, Cronbach alphas, and zero-order correlations are presented in Table 1. The
24 Intraclass Correlation Coefficient (ICC), which indicates the percentage of variance lying at the

1 between-student level as a proportion of the total variance across both levels, was .48 for perceived
 2 controlling teaching, .52 for need frustration, .55 for autonomous motivation, .36 for controlled
 3 motivation, and .33 for amotivation. These findings suggest that there was considerable variance (>
 4 45%) in students' responses from trimester to trimester.

5 With respect to the temporal changes, multilevel analyses showed that perceived controlling
 6 teaching and controlled motivation increased linearly ($\pi_{10 \text{ [time-linear]}} = 0.08, SE = 0.03, p < .01$ and
 7 $\pi_{10 \text{ [time-linear]}} = 0.25, SE = 0.04, p < .01$, respectively). The opposite was true for autonomous
 8 motivation which decreased linearly across time ($\pi_{10 \text{ [time-linear]}} = -0.21, SE = 0.04, p < .01$). These
 9 results suggest that students reported, on average, more perceived controlling teaching, more
 10 controlled motivation, and less autonomous motivation over time. Amotivation showed a
 11 curvilinear trajectory with increases becoming significant (and more marked) at the third semester
 12 ($\pi_{10 \text{ [time-linear]}} = 0.11, SE = 0.12, p > .05$ and $\pi_{20 \text{ [time-quadratic]}} = 0.17, SE = 0.06, p < .01$). No
 13 statistically significant temporal changes were found for need frustration ($\pi_{10 \text{ [time-linear]}} = 0.03, SE =$
 14 $0.03, p = .27$). It should be noted, however, that there was considerable variability in the time-
 15 related changes for all variables as indicated by the random slopes of the models ($e_{ij} = 0.15, 0.18,$
 16 $0.27, 0.28,$ and 0.47 , all $ps < .05$, for perceived teaching control, need frustration, autonomous
 17 motivation, controlled motivation, and amotivation, respectively). These results suggest that the
 18 observed changes across time varied substantially from student to student.

19 **4.2 Main Analyses**

20 The model is presented in Figure 1. Each path at the within-person level represents the intercept of
 21 the slopes, that is the average relation between the measured variables across the three measurement
 22 waves. At the intrapersonal (i.e., within-person) level, and as hypothesized, perceived teacher
 23 control related positively to need frustration ($\beta = .52, p < .01$; 95% *CI*: .30 - .74) which, in turn,
 24 related negatively to autonomous motivation ($\beta = -.14, p < .01$; 95% *CI*: -.24 - -.04) and positively

1 to controlled motivation ($\beta = .23, p < .01$) and amotivation ($\beta = .32, p < .01$; 95% *CI*: .14 - .50).
2 These results suggest that across the three assessment waves, the more students perceived their
3 teacher to be controlling, the more their needs were frustrated, and the less autonomous motivation
4 and more controlled motivation and amotivation they felt. Importantly, the confidence intervals
5 were all in the same direction (and they did not include zero), suggesting that the relations were in
6 the hypothesized direction, irrespective of their fluctuation from student to student. Perceived
7 teacher control and need frustration explained, approximately, 8.8%, 0.8%, and 15.2% of the
8 within-person variance in autonomous motivation, controlled motivation, and amotivation,
9 respectively.

10 A test of the indirect effects revealed that the paths between perceived controlling teaching
11 and autonomous motivation ($B = -0.08, SE = 0.03, z = -2.81, p < .01$), controlled motivation ($B =$
12 $0.07, SE = 0.03, z = 2.49, p = .013$), and amotivation ($B = 0.13, SE = 0.03, z = 3.89, p < .01$), were
13 all statistically significant. This finding suggests that need frustration mediated the relations
14 between perceived controlling teaching and autonomous motivation, controlled motivation, and
15 amotivation.

16 At the between-person level, females as compared to males, reported, on average, lower
17 mean levels of control from the teacher ($\beta = -0.34, p < .01$), need frustration ($\beta = -0.17, p < .01$),
18 and amotivation ($\beta = -0.28, p < .01$). These results suggest that regardless of the patterns of
19 trimester-to-trimester associations among perceived controlling teaching, need frustration, and the
20 three types of motivation, females tended to perceive their teachers as less controlling, to report less
21 need frustration, and to be less amotivated than males. Moreover, students who participated in
22 organized sport activities after school reported higher mean levels of autonomous motivation ($\beta =$
23 $0.28, p < .01$) and less amotivation ($\beta = -0.12, p < .01$) than students who did not participate in such

1 sport activities. Gender and out-of-school sport participation explained, approximately, 8.7%, and
2 20.6% of between-student differences in autonomous motivation and amotivation, respectively.

3 **5. Summary of Study 1**

4 Partial support was found for hypothesis 1 in that linear increases were observed in perceived
5 controlling teacher behavior and controlled motivation across the school year whilst a linear
6 decrease was observed for autonomous motivation. However, a curvilinear trajectory was observed
7 for amotivation with changes becoming more marked at T3. In addition, no changes were reported
8 in perceived levels of need frustration across time. In line with hypothesis 2, trimester-to-trimester
9 perceptions of controlling teaching significantly and positively related to trimester-to-trimester
10 feelings of need frustration which, in turn, were associated negatively with trimester-to-trimester
11 autonomous motivation and positively with controlled motivation and amotivation. Need frustration
12 was also shown to mediate the trimester-to-trimester relations between perceived controlling
13 teaching and autonomous motivation, controlled motivation, and amotivation. Contrary to
14 hypothesis 3, female students reported lower mean levels of perceived controlling teaching
15 behavior, need frustration, and amotivation, compared to males. Finally, and as expected, students
16 who engaged in sport outside of school displayed higher mean levels of autonomous motivation for
17 PE and lower ones for amotivation compared to students who did not engage in such activities.

18 These findings provided initial support for the existence of a consistent pattern of
19 associations between perceived controlling teaching and less optimal forms of motivation with
20 experiences of psychological need frustration mediating these links. Subsequently, a second
21 longitudinal study was conducted to examine whether these findings could be replicated with an
22 independent sample and extended to predict other negative outcomes.

23 **6. Study 2**

1 In addition to undermining motivation, Deci and Ryan (2000) posit that exposure to controlling
2 teaching and need frustration will lead students to engage in other cognitive, affective, and
3 behavioral accommodations associated with impaired school adjustment and academic
4 achievement. Hence, in Study 2 we examined whether perceived controlling teaching manifested in
5 PE relates in a consistent way (i.e., from trimester to trimester) to students' fear failure, contingent
6 self-worth, and challenge-avoidance. As in Study 1, the mediating role of need frustration in these
7 trimester-to-trimester relations was also examined. Similar to Study 1 and in line with prior findings
8 (e.g., Ntoumanis et al., 2009), we expected to see increases in all variables across the school year
9 (hypothesis 1). Similarly to Study 1, our second hypothesis stated that across all three waves
10 perceived controlling teaching behavior would positively covary with need frustration which, in
11 turn, would positively covary with all three negative outcomes (Assor & Tal, 2012; Crocker et al.,
12 2003; De Castella et al., 2013). Finally, individuals who engaged in sport outside of school were
13 expected to report lower mean levels of each maladaptive outcome (Ntoumanis et al., 2009;
14 hypothesis 3). However, given the unexpected findings in Study 1, no specific hypotheses were
15 made regarding gender.

16 7. Method

17 7.1 Participants

18 Participants were $n = 447$ students (44.7% males; $M_{\text{age}} = 14.6$, $SD = 0.58$). Twenty-six, 21, and 33
19 students (representing accordingly 5.8%, 4.7%, and 7.4% of the full sample) were absent at T1, T2,
20 and T3, respectively. A MANOVA showed no significant differences in the variables studied at T2
21 and T3 between those who were absent and those who were present at T1 (Wilk's $\Lambda = .980$, $F [10,$
22 $388] = 0.79$, $p = .64$). The same was true when we compared those who were absent either at T2 or
23 at T3 with their counterparts who were present (Wilk's $\Lambda = .965$, $F [10, 381] = 1.37$, $p = .19$ and

1 Wilk's $\Lambda = .982$, $F [10, 391] = 0.71$, $p = .72$, respectively). Hence, the missing observations were
2 considered to be random.

3 The students were from 9 classes from four middle schools (different from those in Study 1)
4 located in an urban area of average socioeconomic status in Northern Greece. A substantial
5 proportion of the sample, 58.1%, took part in out-of-school sport activities, such as soccer ($n = 54$),
6 dance ($n = 37$), basketball ($n = 32$), swimming ($n = 26$), athletics ($n = 25$), handball ($n = 19$),
7 jogging ($n = 14$), and tae-kwon-do ($n = 9$).

8 **7.2 Procedure**

9 An identical procedure to Study 1 was followed with the three waves of assessment taking place in
10 November (T1), January (T2), and April (T3). Similarly to Study 1, a research assistant explained
11 the purpose of the study to the students and highlighted that participation was voluntary and that
12 individual responses would not be disclosed. All students agreed to participate. The same coding
13 system that had been used in Study 1 was applied to track students' responses while protecting their
14 anonymity.

15 **7.3 Measures**

16 **7.3.1 Controlling Coach Behaviors Scale (CCBS; Bartholomew et al., 2010) and Psychological**
17 **Need Thwarting Scale (PNTS; Bartholomew et al., 2011a).** As in Study 1, the CCBS and PNTS
18 were used to assess students' perceptions of their PE teacher's controlling interpersonal style and
19 feelings of need frustration, respectively. Cronbach alphas were acceptable (see Table 2) and so
20 were the tests of factorial time invariance for both the CCBS ($S-B\chi^2 [74] = 349.87$, CFI = .948,
21 RMSEA = .055) and the PNTS ($S-B\chi^2 [171] = 620.38$, CFI = .946, RMSEA = .049).

22 **7.3.2 Performance Failure Appraisal Inventory (PFAI; Conroy et al., 2002).** We used the short
23 form of the PFAI to assess students' fear of failure (a dispositional measure of appraisals associated
24 with the fear of failure). An example item from this five-item scale is "When I am failing, I worry

1 about what others think about me”. Extensive evidence for the reliability and validity of the PFAI
2 (both the long and the short form) has been provided by Conroy et al. The internal consistency (see
3 Table 2) and factorial time invariance ($S-B\chi^2$ [23] = 75.78, CFI = .967, RMSEA = .048) were also
4 acceptable in the present study.

5 **7.3.3 Contingencies of Self-Worth Scale (CSWS; Crocker et al., 2003).** The CSWS measures
6 contingent self-worth in several domains. For the purposes of the present study, we adapted and
7 used four items that tap academic competence-related contingent self-worth. The adapted scale
8 assessed students’ self-evaluations about whether their self-worth increased or decreased following
9 success or failure in PE lessons. An example item of the scale is “My self-esteem is influenced by
10 my performance in PE lessons”. Evidence for the construct validity and reliability of the CSWS was
11 provided by Crocker et al. In the present study, the four-item scale showed marginally acceptable
12 internal consistency (see Table 2) and factorial invariance across time ($S-B\chi^2$ [12] = 64.74, CFI =
13 .952, RMSEA = .091).

14 **7.3.4 Challenge Avoidance Scale (Assor & Tal, 2012).** Five items, originally used to assess
15 withdrawal from academic challenges, were adapted for the purposes of the present study to
16 measure the degree to which students tended to avoid challenging situations in PE (e.g., “If I don’t
17 succeed at a task in PE for the first time, I stop trying”). The scale showed acceptable levels of
18 reliability in Assor and Tal’s study. The same applied to our study, both in terms of internal
19 consistency (see Table 2) and factorial time invariance ($S-B\chi^2$ [23] = 99.45, CFI = .986, RMSEA =
20 .029). All measures were assessed on a 7-point scale anchored by 1 (*Strongly disagree*) and 7
21 (*Strongly agree*).

22 **7.4 Plan of Analysis**

23 Similarly to Study 1, we first inspected the means, standard deviations, and the bivariate
24 correlations among the measured variables and examined their temporal patterning across the year

1 (i.e., linear, quadratic, or no-changes). We then tested a single multivariate multilevel model to
 2 assess the expected positive trimester-to-trimester relations between perceived teacher control and
 3 need frustration and, in turn, contingent self-worth, challenge avoidance, and fear of failure.
 4 Centering decisions were identical to those made in Study 1. Only statistically significant pathways
 5 were retained in the final model.

6 **8. Results**

7 **8.1 Preliminary Analyses and Temporal Changes**

8 Descriptive statistics, Cronbach's alphas, and bivariate correlations among the measured variables,
 9 are provided in Table 2. Two scales yielded marginally low internal consistency estimates (.66; fear
 10 of failure and contingent self-worth) but were retained. The ICC was .62 for perceived controlling
 11 teaching, .60 for need frustration, .52 for fear of failure, .45 for contingent self-worth, and .49 for
 12 challenged avoidance. These findings suggest that there was considerable variance (> 38%) in
 13 students' responses from trimester to trimester.

14 The analyses concerning temporal changes were the same as in Study 1. No statistically
 15 significant changes were found for perceived controlling teaching ($\pi_{10 \text{ [time-linear]}} = -0.15, SE = 0.08,$
 16 $p > .05$), need frustration ($\pi_{10 \text{ [time-linear]}} = -0.05, SE = 0.03, p > .05$), and contingent self-worth (π_{10
 17 $\text{ [time-linear]} = -0.02, SE = 0.04, p > .05$). On the other hand, a linear, but marginally significant
 18 decrease was found for fear of failure ($\pi_{10 \text{ [time-linear]}} = -0.04, SE = 0.02, p = .05$), whereas there was a
 19 linear increase in challenge avoidance ($\pi_{10 \text{ [time-linear]}} = 0.14, SE = 0.03, p < .05$). Nevertheless, in
 20 accordance with Study 1, the changes in scores of the measured variables significantly varied across
 21 time from person to person for perceived teaching control ($\varepsilon_{ij} = 0.12, p < .01; 95\%-CI: -0.39 -$
 22 0.09), need frustration ($\varepsilon_{ij} = 0.11, p < .01; 95\%-CI: -0.27 - 0.17$), fear of failure ($\varepsilon_{ij} = 0.06, p < .01;$
 23 $95\%-CI: -0.16 - .08$), contingent self-worth ($\varepsilon_{ij} = 0.15, p < .01; 95\%-CI: -0.31 - 0.27$), and

1 challenge avoidance ($\epsilon_{ij} = 0.13, p < .01; 95\%-CI: -0.11 - 0.39$). Again, these findings suggest that
2 the observed changes across time varied from student to student.

3 **8.2. Main Analyses**

4 The final model is displayed in Figure 2. At the within-person level, trimester-to-trimester
5 perceived controlling teaching positively related to trimester-to-trimester need frustration ($\beta = .42, p$
6 $< .01; 95\% CI: .28 - .56$) which, in turn, positively related to trimester-to-trimester challenge
7 avoidance ($\beta = .29, p < .01; 95\% CI: -.18 - .76$), contingent self-worth ($\beta = .16, p < .01; 95\% CI: -$
8 $.09 - .41$), and fear of failure ($\beta = .42, p < .01; 95\% CI: .24 - .60$). As in Study 1, inspection of the
9 confidence intervals suggested that the relations were in the same direction across all students,
10 regardless of the fluctuation of their mean levels from student to student. Perceived teacher control
11 and need frustration explained, 27.0%, 12.8%, and 40.0% of the intrapersonal variance in fear of
12 failure, contingent self-worth, and challenge avoidance, respectively.

13 A test of the indirect effects revealed that the paths between perceived controlling teaching
14 and challenge avoidance ($B = 0.11, SE = 0.03, z = 3.59, p < .01$), contingent self-worth ($B = 0.05,$
15 $SE = 0.03, z = 2.44, p = .015$), and fear of failure ($B = 0.17, SE = 0.03, z = 5.89, p < .01$) were all
16 statistically significant. As in Study 1, this finding suggests that the trimester-to-trimester relations
17 between perceived controlling teaching and challenge avoidance, contingent self-worth, and fear of
18 failure were mediated by need frustration.

19 At the between-student level, females compared with males, reported, on average, lower
20 mean levels of psychological control from the teacher ($\beta = -.33, p < .01$) and, though marginally
21 significant ($\beta = -.12, p = .05$), lower mean levels of need frustration. Similar to Study 1, these
22 findings suggest that regardless of the trimester-to-trimester patterns of associations among
23 perceived controlling teaching, need frustration, and the three motivation-related outcomes, females
24 perceived their teachers to be less controlling, and tended to report less need frustration, than males.

1 Finally, students who participated in organized out of school sport activities reported higher mean
2 levels of contingent self-worth ($\beta = .18, p < .01$) and lower mean levels of challenge avoidance ($\beta =$
3 $-.14, p < .01$) than students who did not participate in such sport activities. Gender and out-of-
4 schools sport activities explained, approximately, 2.2%, and 3.3% of between-student differences in
5 contingent self-worth and challenge avoidance, respectively.

6 **9. Summary of Study 2**

7 Contrary to hypothesis 1, only linear increases were observed for challenge avoidance across the
8 school year. Perceptions of controlling teaching, need frustration, and contingent self-worth all
9 remained stable across the year and there was actually a decrease in fear of failure. In line with
10 hypothesis 2 and the findings from Study 1, trimester-to-trimester perceptions of controlling
11 teaching were positively related to the respective trimester-to-trimester feelings of need frustration,
12 which in turn, related to trimester-to-trimester fear of failure, contingent self-worth, and challenge
13 avoidance. As in Study 1, the mediating role of need frustration was also supported. In support of
14 hypothesis 3, students who engaged in sport outside of school displayed less challenge avoidance
15 and more contingent self-worth. Similarly to Study 1, females reported lower mean levels of
16 controlling teacher behavior and need frustration. Overall, these findings replicate those observed in
17 Study 1 and provide further support for the utility of examining the proposed non-optimal
18 motivational pathway.

19 **10. General Discussion**

20 The two studies reported in the present manuscript are the first in the context of PE to examine the
21 stability (i.e., trimester-to-trimester) of relations between perceived controlling teaching and
22 maladaptive motivational processes and outcomes, as outlined by SDT. To better understand the
23 mechanisms via which perceived teacher behavior relates to student experience, we examined how
24 students' perceptions of controlling teaching behavior and experiences of psychological need

1 frustration related to a number of motivation-related outcomes in three waves of assessment, spread
2 over one school year. The hypothesized maladaptive motivational process was supported in both
3 Study 1 and Study 2. Specifically, across three waves, perceived controlling teaching related
4 positively to need frustration across both studies which, in turn, related negatively to autonomous
5 motivation and positively to controlled motivation and amotivation (Study 1) as well as fear of
6 failure, contingent self-worth, and challenge avoidance (Study 2). The mediating role of need
7 thwarting was also supported across both studies. As such, the findings make a valuable addition to
8 the small body of cross-sectional research on this topic (i.e., De Meyer et al., 2014; Haerens et al.,
9 2015; Soenens et al., 2012) and, in line with the recent longitudinal work of Jang et al. (2016), help
10 to delineate the processes that could explain links between students' perceptions of teaching
11 behavior and motivation. Together, these findings indicate that need frustration seems a consistent
12 mediating mechanism linking covariation between controlling learning environments and undesired
13 motivation-related outcomes.

14 **10.1 Relations Among Controlling Teaching, Need Frustration, and Motivation-Related** 15 **Outcomes**

16 The present findings provide further evidence regarding the links between maladaptive social-
17 psychological factors and negative motivational outcomes. In particular, the findings emphasize the
18 importance of assessing perceptions of interpersonal control and experiences of psychological need
19 frustration if we are to understand why some students have negative experiences in PE. The
20 findings from Study 1 and Study 2 indicated that exposure to teaching environments which are
21 perceived to be controlling is associated, in a quite consistent way, with experiences of need
22 frustration which, in turn, relates to non-optimal forms of motivation and maladaptive cognitive,
23 affective, and behavioral outcomes.

1 The results of Study 1 are largely in agreement with previous work which has revealed
2 decreases in students' adaptive motivation over time (Ntoumanis et al., 2009; Gottfried et al., 2001).
3 However, the decreases in autonomous motivation observed in the present study are particularly
4 worrying given the corresponding linear increase in controlled motivation. Interestingly, the form of
5 motivation most strongly predicted by need frustration was amotivation. In addition, the increase in
6 amotivation, which seemed to accelerate between T2 and T3, suggest, as Jang et al. (2016)
7 indicated, that long-term exposure to need thwarting teaching environments can lead students to
8 motivationally disengage and simply 'give up'. This finding implies that certain maladaptive
9 outcomes, such as amotivation, are more likely to co-occur with prolonged experiences of need
10 frustration (De Meyer et al., 2014). Jang and colleagues (2016), have shown a similar pattern of
11 relations among perceived controlling teaching, need frustration and disengagement in various
12 classroom subjects.

13 A similar pattern was observed in Study 2 leading us to suggest that chronic exposure to
14 controlling environments is associated not only with less optimal forms of motivation but also with
15 more fear of failure, challenge-avoidance, and contingent self-worth. Interestingly, whilst
16 contingent self-worth remained stable across the school year, students reported an increase in
17 challenge avoidance and a decrease in their fear of failure. The fact that we observed a
18 corresponding decrease in fear of failure across the school year may indicate that challenge
19 avoidance represented a rather effective behavioral accommodation in that it protected students
20 from these concerns (Crocker, 2002). Such findings could suggest that pupils became less worried
21 about failing because they began to avoid challenging situations in environments in which they
22 experienced need frustration. This would also be an interesting avenue for future research.

23 The mean occurrence of perceived controlling interpersonal behavior from teachers was
24 relatively low and, whilst it increased in Study 1, it remained stable across time in Study 2. Thus,

1 the findings from Study 1 suggest that maladaptive changes in student motivation coincided with
2 increases in perceived controlling teaching across the school year. Contrastingly, the findings from
3 Study 2 suggest that once students have experienced controlling teaching in the context of PE,
4 controlling behaviors do not need to increase in order for challenge avoidance behaviors to rise over
5 time. Furthermore, interpersonal control consistently related to need frustration at each time point
6 and across both studies. Therefore, in line with previous research (e.g., Bartholomew et al., 2011b;
7 De Meyer, 2014; Haerens et al., 2015), it would seem that even when the incidence of controlling
8 teaching behavior is infrequent, students' perceptions of such behaviors are still associated with
9 their negative experiences, engagement, and motivation in PE.

10 The present findings imply that experiences of need frustration could be an important
11 mechanism via which maladaptive aspects of teacher behavior are linked to negative student
12 outcomes (Bartholomew et al., 2011a; Bartholomew et al., 2011b; Vansteenkiste & Ryan, 2013). It
13 is, however, important to note that perceptions of need frustration remained stable across time in
14 both Study 1 and Study 2. This suggests that experiences of need frustration do not have to increase
15 or, indeed, be particularly high in order to have a negative association with some aspects of student
16 motivation over time.

17 **10.2 Effects of Gender and Sport Participation**

18 In contrast to our third hypothesis, female students perceived less controlling teaching behavior and
19 reported lower levels of need frustration as well as less amotivation in Study 1. This could be
20 because, in comparison to boys, girls are socialized to respond in more accommodative ways to
21 controlling behavior (Maccoby, 1998). Whilst SDT suggests that the three psychological needs are
22 universal, the means through which they are satisfied or thwarted may vary in different groups. Yet,
23 this post-hoc explanation should be considered with caution as most SDT-based research has
24 suggested that controlling teaching behaviors are as harmful for girls as they are for boys (Assor et

1 al., 2005). An alternative explanation could be that teachers actually treat their female students
2 differently. For example, observational research by Duffy, Warren, & Walsh (2002) showed that
3 teachers interact more with male students than with female students and that this tendency is
4 independent of the number of interactions initiated by the students themselves. Overall, the present
5 findings suggest that the interplay between gender and interpersonal control might be an interesting
6 topic for future research.

7 As expected, students who engaged in sport outside of school displayed more autonomous
8 motivation for PE and less amotivation in Study 1. Students who choose to engage in physical
9 activity outside of PE are likely to enjoy it and recognize the benefits of physical activity and,
10 therefore, actively engage in the lesson as opposed to ‘just going through the motions’ (Prochaska,
11 Sallis, Slymen, & McKenzie, 2003). Interestingly, in the second study, students who engaged in
12 sport outside of school displayed less challenge avoidance than those who did not participate in
13 such sport activities, perhaps because they felt more confident in the physical activity domain, but
14 more contingent self-worth. The latter finding is unexpected but could be explained in terms of the
15 relative importance students place on their identity as an ‘athlete’ (Crocker, 2002). Individuals will
16 seek out situations and engage in activities that provide opportunities for them to achieve success in
17 domains in which their self-worth is contingent.

18 **10.3 Implications for Teaching in PE**

19 The present findings suggest that when teachers’ interpersonal behavior is perceived to be
20 controlling, students are more likely to exhibit poor quality motivation and be overly concerned
21 about failure. Therefore, instead of actively engaging in learning activities because they value the
22 learning process, students may simply do so to avoid getting into trouble. Students may also come
23 to avoid challenges in order to protect themselves from failure and maintain feelings of self-worth.
24 It is, therefore, imperative that teachers understand the way in which students’ may perceive their

1 behavior and the potential effects that these judgments can have on their subsequent motivation. To
2 avoid these non-optimal student outcomes, which have been negatively associated with classroom
3 engagement and academic achievement (Barkoukis et al., 2014; Caraway et al., 2003; Crocker et
4 al., 2002; Ntoumanis, 2001; Shim & Ryan, 2005), teachers could be supported in developing the
5 necessary skills to identify and avoid the use of controlling interpersonal strategies (e.g., Cheon &
6 Reeve, 2014). This may involve placing heavy emphasis on developmentally supportive teacher-
7 student relationships, something which is particularly important for teachers working with
8 adolescents in middle-schools (as adolescent students appear to be particularly vulnerable to
9 declines in motivation; Eccles et al., 1993; Pianta et al., 2002).

10 The context in which PE is taught should also be considered if research in this area is to
11 have practical import. Issues to do with organization and discipline may be more pertinent in this
12 environment and, therefore, PE classes may involve a greater provision of rules, instructions,
13 monitoring, and continuous feedback compared to the teaching of regular academic classes (De
14 Meyer et al., 2014). As such, it is important to note that beyond looking at highly-structured
15 instructions, which might actually be necessary and suitable for use in this context (see Mosston &
16 Ashworth 1994), the present studies focused specifically on controlling strategies which are not
17 required for effective teaching (e.g., intimidation and negative conditional regard). Such externally
18 or internally controlling strategies attempt to direct student behavior by overtly manipulating or
19 exploiting the teacher-student relationship and are, therefore, likely to be particularly damaging to
20 feelings of relatedness (e.g., Assor, Roth, & Deci, 2004). Furthermore, students who are subjected
21 to behaviors which are designed to intimidate or are exposed to negative conditional regard may be
22 left feeling humiliated, incompetent, and questioning their own self-worth (Barber, 2001). In the
23 end, these strategies leave students with little choice but to relinquish their autonomy and either
24 comply with advocated behaviors in order to avoid getting into trouble and maintain a satisfactory

1 relationship with their teacher or defy his or her authority (Van Petegem, Soenens, Vansteenkiste,
2 Beyers, 2015). It is, therefore, easy to see how such behaviors might thwart students' psychological
3 needs for relatedness, autonomy, and competence.

4 In sum, teachers need neither engage in power-assertive strategies to maintain discipline
5 (e.g., the threat of punishment) nor use subtle, but equally damaging, internally controlling
6 behaviors (De Meyer, et al., 2016; Soenens & Vansteenkiste, 2010). Teachers may also benefit
7 from paying attention to their body language and the non-verbal behaviors which underpin
8 controlling strategies, such as negative conditional regard (e.g., a look of disappointment or turning
9 away when a student has not met teacher expectations; Pianta et al., 2002). Furthermore, the current
10 findings highlight the importance of teaching contexts in which students do not fear criticism or
11 disapproval from their teacher. Challenge avoidance and fear of failure were positively related to
12 each other at each time point and the temporal patterning of these variables suggests that students
13 will begin to avoid challenging situations in order to manage their concerns about failing. Whilst
14 further research is needed to confirm these associations, providing structure in order to scaffold
15 students' learning and developing warm interpersonal relationships should help create an
16 environment where students feel confident enough to engage in challenging activities without being
17 overly concerned about failure. Furthermore, these findings should also have practical import for
18 teaching subjects beyond PE and could, therefore, be explored explicitly in other classroom settings
19 (e.g., mathematics, science, and literacy classes; see Jang et al. 2016).

20 **10.4 Limitations and Future Directions**

21 Although the present findings have a number of important implications for teachers and the way in
22 which they interact with their students, it is important to recognize that classrooms are dynamic and
23 transactional. Therefore, future studies will need to undertake a more dynamic approach to examine
24 the teacher-student interactions on a lesson-to-lesson basis (Tsai, Kunter, Lüdtke, Trautwein, &

1 Ryan, 2008), or even within lessons (Pennings et al., 2014). Moreover, whilst beyond the scope of
2 the current paper, future research should assess a wider range of teaching behaviors (e.g., those
3 identified in the circumplex model; Gurtman, 2009) as well as the reciprocal effects between these
4 and student behavior (e.g., Curby, Rudasill, Edwards, & Pérez-Edgar, 2011; Skinner & Belmont,
5 1993). Students who initially demonstrate low levels of motivation may be most at risk of
6 experiencing controlling teaching behavior, and therefore, early intervention might help prevent
7 further deterioration of disengaged students in this context. Furthermore, whilst it is likely that
8 interpersonal experiences have their most direct and powerful influence via the way in which they
9 are perceived and interpreted by the students themselves, observations of teaching behavior and
10 objective outcome measures in future longitudinal work would also add value to the current
11 research which relied on self-reported measures only.

12 Future research may also wish to examine other between-student factors which make some
13 students more resilient to need thwarting teaching environments. For example, it may be that
14 students with greater mental toughness (e.g., Mahoney, Gucciardi, Ntoumanis, & Mallet, 2014), or
15 those who have a strong sense of relatedness to the teacher, may interpret behaviors perceived to be
16 controlling by other students as more informational rather than pressuring. In addition, there may be
17 instances where more controlling instruction is necessary and accepted by students in PE classes
18 (e.g., instructions concerning safety matters).

19 Finally, it would be interesting for future longitudinal research to assess both maladaptive
20 and adaptive pathways simultaneously and in relation to a range of motivation-related outcomes.
21 Given that teachers may engage in both autonomy-supportive and controlling behaviors to different
22 extents, it would be interesting to examine how teachers who combine autonomy-supportive and
23 controlling behaviors affect student motivation over time compared to teachers who predominantly
24 rely on either autonomy-supportive or controlling strategies (e.g., latent profile analysis). For

1 example, the use of controlling strategies may not be as detrimental to experiences of autonomy,
2 competence, and relatedness if they are used alongside more autonomy-supportive behaviors. Not
3 including measures of perceived autonomy support and need satisfaction in the present study could
4 be considered a limitation in this respect.

5 **10.5 Conclusion**

6 The present longitudinal studies extended the small body of work which has explicitly addressed
7 the dynamics involved in controlling teaching (e.g., Assor et al., 2005; De Meyer et al., 2014;
8 Haerens et al., 2015; Soenens et al., 2012) and complements the work of Jang et al. (2016).
9 Specifically, the findings support a negative, relatively stable, motivational pathway linking
10 perceived controlling teaching with maladaptive motivational outcomes through need frustration.
11 This type of research is important if we are to more accurately understand the detrimental effects
12 that controlling teaching can have on motivation and engagement in curriculum subjects such as PE
13 and the process via which these negative effects might occur. Overall, our findings imply that future
14 interventions aiming to facilitate optimal student motivation and engagement in PE should focus on
15 avoiding internally and externally controlling teaching behaviors which manipulate the teacher-
16 student relationship. Effective teacher training will, therefore, involve training teachers to become
17 *more* autonomy-supportive and *less* controlling.

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