

## Do perceived autonomy-supportive and controlling teaching relate to physical education students' motivational experiences through unique pathways? Distinguishing between the bright and dark side of motivation



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### ABSTRACT

**Objectives:** Grounded in Self-Determination Theory (SDT), this study examined the mediating role of students' experiences of need satisfaction and need frustration in associations between perceived teaching style and students' motivation and oppositional defiance in the context of physical education. Specifically, we tested an integrated model including both a 'bright' path from perceived autonomy-supportive teaching through need satisfaction toward autonomous motivation and a 'dark' pathway from perceived controlling teaching through need frustration toward controlled motivation, amotivation, and oppositional defiance.

**Design:** Cross-sectional study.

**Methods:** To investigate the proposed paths structural equation modeling was used in a sample of 499 secondary school students (44% boys,  $M_{age} = 15.77 \pm 1.16$ ).

**Results:** We found that perceived autonomy-supportive and controlling teaching, as well as need satisfaction and need frustration, constitute different constructs relating distinctively to motivational outcomes. Consistent with the notion of a bright and dark path, perceived autonomy support was related primarily to autonomous motivation, with need satisfaction mediating this association, whereas perceived controlling teaching was related primarily to controlled motivation and amotivation, through need frustration. Perceived controlling teaching also displayed a direct and unique relationship with oppositional defiance.

**Conclusions:** To more accurately capture the detrimental effects of controlling teaching, this teaching dimension along with its consequences in terms of need frustration and motivational outcomes needs to be studied in its own right. It is also discussed that effective teacher training may raise awareness among teachers about the motivational risks associated with controlling practices.

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Teachers can vary substantially in the way they begin a physical education (PE) lesson. Some teachers focus primarily on sparking enthusiasm in their students and begin by explaining the relevance of the lesson or by soliciting students' own experiences with the topic of the lesson. In contrast, other teachers focus on disciplinary matters first, and when students do not meet expectations, they rely on guilt-induction and criticism to correct students. Whereas

the former teachers predominantly rely on autonomy-supportive teaching practices, the latter teachers make use of more controlling teaching practices.

A substantial body of research grounded in Self-Determination Theory (SDT, Deci & Ryan, 2000), a well-investigated macro-theory on human motivation, indicates that an autonomy-supportive teaching style catalyzes a 'bright' pathway toward more optimal functioning because an autonomy-supportive teaching style nurtures students' basic psychological needs for relatedness, competence, and autonomy (e.g., Filak & Sheldon, 2008; Jang, Kim, & Reeve, 2012). Apart from this bright pathway, SDT researchers have increasingly argued for the existence of a separate 'dark'

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pathway activated by controlling socialization (Ryan & Deci, 2000b; Vansteenkiste & Ryan, 2013) and experiences of need frustration (e.g., Bartholomew, Ntoumanis, Ryan, Bosh, & Thøgersen-Ntoumani, 2011; Bartholomew, Ntoumanis, Ryan, & Thøgersen-Ntoumani, 2011). If this dark pathway would be elicited, it would have unique predictive validity for suboptimal or even maladaptive motivational outcomes, including controlled motivation, amotivation, and oppositional defiance. Support for the existence of a specific dark pathway was obtained in the domains of sports (Bartholomew, Ntoumanis, Ryan, Bosch, et al., 2011; Stebbings, Taylor, Spray, & Ntoumanis, 2012), work (Gillet, Fouquereau, Forst, Brunault, & Colombat, 2012), and health (Verstuyf, Vansteenkiste, Soenens, Boone, & Mouratidis, 2013). However, few studies in the educational literature have examined the dark pathways involved in students' motivation (De Meyer et al., 2014). The present study aimed to fill this gap by investigating a theoretically driven model involving a bright path from perceived autonomy support via need satisfaction to optimal motivational functioning and a dark pathway from perceived controlling teaching via need frustration to maladaptive motivational dynamics in the context of PE.

### Autonomy-supportive and controlling teaching

Autonomy-supportive teachers attempt to identify, develop, and nurture students' interests (Reeve, 2009). They can do so by relying on a variety of strategies, including soliciting the students' interests and points of view, using inviting language (e.g., Ryan, 1982), offering meaningful choices (e.g., Prusak, Treasure, Darst, & Pangrazi, 2004), and creating opportunities for initiative taking (e.g., Reeve & Jang, 2006). In contrast, controlling teaching involves the use of pressuring tactics to make students think, feel, or behave in a teacher-prescribed way, thereby bypassing the students' viewpoints (Reeve, 2009). Controlling teaching can manifest in at least two different ways (Soenens & Vansteenkiste, 2010). First, teachers can rely on externally controlling tactics that typically involve the use of relatively overt and bluntly controlling strategies, such as punishments, yelling, and the use of controlling language including statements such as 'you have to' (e.g., Assor, Kaplan, Kanat-Maymon, & Roth, 2005; Reeve & Jang, 2006). Second, teachers make use of internally controlling tactics that sometimes manifest in relatively subtler and less directly observable ways. For instance, teachers can appeal to students' feelings of guilt, shame, or anxiety and they can display an orientation of contingent regard, where their involvement in the students' activities and display of appreciation covaries with the students' performance and ability to meet the teacher's expectations (e.g., Soenens, Sierens, Vansteenkiste, Dochy, & Goossens, 2012).

Whereas autonomy-supportive teaching has been found to relate to students' need satisfaction, high-quality motivation, and positive course-related outcomes in a number of studies both in education generally (e.g., Jang, Reeve, Ryan, & Kim, 2009) and in PE in particular (e.g., Taylor, Ntoumanis, Standage, & Spray, 2010), the concept of controlling teaching has been studied less frequently in its own right. In most studies in which both teaching dimensions were assessed, they were subtracted from each other to yield an aggregate measure of autonomy-supportive versus controlling teaching (e.g., Jang et al., 2009). Herein we argue that it is important to consider the distinct contribution of both teaching dimensions because an absence of autonomy support would not necessarily imply the presence of controlling teaching. Teachers who do not actively promote volitional functioning (e.g., by providing a rationale for the activity at hand or by building in choices) do not necessarily engage in controlling tactics. Teachers can also be relatively uninvolved or can use a relatively neutral style. Further,

we argue that both teaching dimensions may each have relatively unique and differential associations with adaptive and maladaptive types of student motivation. According to SDT, these differential associations would be accounted for by the differential mediating role of experiences of, respectively, need satisfaction and need frustration.

### Need satisfaction and need frustration

The psychological needs for autonomy, competence, and relatedness are at the heart of SDT and are considered essential to understand how teaching behaviors relate to students' type of motivation (Reeve & Jang, 2006; Ryan & Deci, 2000a). The need for autonomy refers to the experience of being the initiator of one's actions and to a sense of psychological freedom when engaging in an activity (Deci & Ryan, 2000). The need for competence refers to the feeling of being effective and to the experience of confidence in achieving desired outcomes (Skinner & Belmont, 1993). The need for relatedness refers to experiences of positive and mutually satisfying relationships, characterized by a sense of closeness and trust (Ryan & Deci, 2000a). Much like an absence of teacher autonomy support does not necessarily entail the presence of a controlling style, it is argued increasingly in SDT that need frustration is distinct from an absence of need satisfaction (Bartholomew, Ntoumanis, Ryan, Bosch, et al., 2011; Bartholomew, Ntoumanis, Ryan, & Thøgersen-Ntoumani, 2011; Vansteenkiste & Ryan, 2013). When frustrated, the needs would manifest in feelings of pressure (autonomy need frustration), inferiority and failure (competence need frustration), and loneliness and alienation (relatedness need frustration). We note that whereas Bartholomew, Ntoumanis, Ryan, Bosch, et al. (2011) and Bartholomew, Ntoumanis, Ryan, and Thøgersen-Ntoumani (2011) used the term need thwarting to reflect students' personal feelings, we prefer, consistent with other work (e.g., De Meyer et al., 2014; Vansteenkiste & Ryan, 2013), to use the term need frustration. This is because the term need frustration more closely reflects students' personal experiences (in the same way as need satisfaction does), whereas the term need thwarting is used in reference to contextual features that undermine students needs.

The distinction between need satisfaction and need frustration is said to be important because both processes would have differential antecedents and outcomes (Vansteenkiste & Ryan, 2013). Specifically, teacher autonomy support would be particularly important for fostering experiences of need satisfaction (Ryan & Deci, 2000b). An autonomy-supportive teacher would, for instance, display a sincere interest in the way students dealt with an exercise and asks them whether they need any additional help. In such a situation, students probably feel they have a say in how to proceed (autonomy satisfaction), are perhaps more likely to feel more confident to improve their skills (competence satisfaction), and feel understood by their teacher (relatedness satisfaction). For need frustration to occur, teachers would not simply have to be low on autonomy support but would engage in an actively controlling style. To illustrate, it is not because students experience few opportunities for choice (low autonomy need satisfaction) that they feel pressured to engage in activities against their will (autonomy need frustration). It is especially when teachers engage in controlling behaviors that students may feel pressured to change their behavior (autonomy frustration), may start to doubt their capabilities (competence frustration), and may feel rejected and disliked by the teacher (relatedness frustration). Consistent with this reasoning, Bartholomew, Ntoumanis, Ryan, Bosch, et al. (2011) showed that while autonomy-supportive coaching was related more closely to athletes' experiences of need satisfaction, controlling coaching was related primarily to athletes' experiences of need

frustration. To the best of our knowledge, the differential role of autonomy-supportive and controlling teaching in relation to need satisfaction and need frustration has not yet been examined in the context of PE.

Apart from being associated differentially with separate teaching style dimensions, need satisfaction and need frustration would also have differential relations to students' motivational outcomes. While need satisfaction is considered conducive to individuals' engagement, well-being, and adaptive motivation (e.g., Mouratidis, Vansteenkiste, Lens, & Sideridis, 2011), it is increasingly recognized that need frustration represents a vulnerability factor for maladaptive motivation, ill-being, and even psychopathology (Bartholomew, Ntoumanis, Ryan, & Thøgersen-Ntoumani, 2011; Vansteenkiste & Ryan, 2013). Consistent with this claim, need satisfaction has been found to relate fairly specifically to positive outcomes (e.g., vitality, positive affect), whereas need frustration has been found to relate more strongly to negative outcomes (e.g., disordered eating, depressive symptoms, burn-out, and stress) in samples of athletes (Bartholomew, Ntoumanis, Ryan, Bosch, et al., 2011; Bartholomew, Ntoumanis, Ryan, & Thøgersen-Ntoumani, 2011). Similar findings were obtained in samples of sport coaches (Stebbing et al., 2012), trainees in a police officer program (Gillet et al., 2012), and adolescents involved in a diary study (Verstuyf et al., 2013). In the context of PE, the differential role of need satisfaction and need frustration in the prediction of motivational dynamics deserves greater attention.

### A differentiated view on motivational outcomes in physical education

SDT employs a differentiated view on motivation, distinguishing between more autonomous and more controlled forms of motivation (Deci & Ryan, 2000). Specifically, intrinsic motivation represents the prototype of autonomous motivation and refers to participating in PE lessons out of interest and enjoyment. For instance, students can be excited for learning a dance because they watched a really engaging video of professional dancers. With identification, a second type of autonomous motivation, students engage in a PE-related activity because they understand why it is personally valuable or important to do so. For instance, students may put effort in the PE lessons because they value being in good shape.

Introjected and external regulations are considered two relatively controlled forms of motivation. Introjected regulation occurs when students pressure themselves to engage in an activity because their self-worth is dependent upon their success or because they would feel ashamed or guilty for not putting effort in the activity. For instance, students may volunteer in a PE lesson to show to their peers how 'sporty' or 'muscular' they are function on the basis of introjected regulation. External regulation represents the most pressuring form of motivation and refers to putting effort into the lesson to comply with coercive demands of others, to avoid punishment, or to obtain contingently offered rewards.

Previous research in the context of school PE (see Ntoumanis & Standage, 2009 for an overview) has shown that autonomous motivation predicts higher activity levels and greater engagement (Aelterman et al., 2012), higher concentration (Ntoumanis, 2005) and more participation in optional physical activities (Haerens, Kirk, Cardon, De Bourdeaudhuij, & Vansteenkiste, 2010; Taylor et al., 2010). In contrast, controlled forms of motivation are usually linked to negative outcomes such as boredom (Ntoumanis, 2001), unhappiness (Standage, Duda, & Pensgaard, 2005), and decreased intention to participate in physical activity (Haerens et al., 2010).

Students differ not only in the type of motivation they display, but also in the intensity of motivation. In SDT, the term amotivation is used to refer to low intensity of motivation. When amotivated,

students lack the intentionality to participate in the learning activity, for instance because they feel helpless and unable to affect their learning process (Ryan, Lynch, Vansteenkiste, & Deci, 2011). Past research has shown that amotivation relates positively to negative outcomes such as unhappiness (Standage et al., 2005) and boredom (Ntoumanis, 2001), and negatively to positive outcomes such as students' engagement (Aelterman et al., 2012). Much like controlled motivation, amotivation is theorized to be rooted in a controlling teaching environment (Assor et al., 2005; De Meyer et al., 2014).

Apart from doing the activity for pressured reasons (controlled motivation) and becoming discouraged and passive (amotivation) when being exposed to controlling environments, students might also actively defy the teacher's request. That is, under pressuring circumstances students can become inclined to straightforwardly defy the pressuring requests and expectations altogether (i.e., oppositional defiance). SDT indeed assumes that the active thwarting of the psychological needs engenders defensive and compensatory attempts to cope with experiences of need frustration (Deci & Ryan, 2000; Vansteenkiste & Ryan, 2013). Although not yet investigated in the context of physical education, recent studies in the parenting domain support this view by showing that children tend to defy parental rules more frequently when they perceive their parents as being controlling and when they experience need frustration in the parent-child relationship (Van Petegem, Soenens, Vansteenkiste, & Beyers, 2014; Vansteenkiste, Soenens, Van Petegem, & Duriez, 2014). As such, it was deemed important to study oppositional defiance as an outcome in the 'dark' pathway in addition to amotivation and controlled motivation.

### The present study

In light of the theoretical assertion that need frustration and need satisfaction represent relatively distinct processes, each with their own antecedents and motivational outcomes (Bartholomew, Ntoumanis, Ryan, & Thøgersen-Ntoumani, 2011; Vansteenkiste & Ryan, 2013), the primary aim of the present study was to test a theory-based model encompassing perceived teaching style, needs, and motivational outcomes. It was hypothesized that students' perceived autonomy support would relate primarily to autonomous motivation via need satisfaction and that perceived controlling teaching would relate primarily to controlled motivation, amotivation, and oppositional defiance via need frustration. Although perceived autonomy-supportive teaching would primarily feed into need satisfaction, we also considered the possibility that it would be a buffer against need frustration and maladaptive motivational outcomes (Vansteenkiste & Ryan, 2013). Indeed, past work provided evidence for a negative relationship between autonomy support and negative outcomes (e.g., Bartholomew, Ntoumanis, Ryan, & Thøgersen-Ntoumani, 2011). Similarly, although perceived controlling teaching would relate primarily to need frustration, it may also forestall optimal motivation via low need satisfaction. Such a cross-path would be consistent with past work showing that controlling socialization also relates negatively to positive outcomes (e.g., Bartholomew, Ntoumanis, Ryan, & Thøgersen-Ntoumani, 2011). Overall though, we expected the cross-paths to be less pronounced compared to the hypothesized predominant symmetrical relations (e.g., perceived autonomy support- > need satisfaction- > optimal motivation).

### Method

#### Participants and procedure

The sample of the present study consisted of 499 students (43.8% boys, mean age 15.76 years  $\pm$  1.16) from 30 classes out 11

secondary schools in Flanders (Belgium) who filled out a set of questionnaires at the end of a PE lesson. The questions dealt with their experiences during the past lesson. Students were in 9th (15.4%), 10th (23.4%), 11th (43.2%) or 12th (18.0%) grade. Class sizes ranged from 7 to 26 students per class. For each of the participating students passive consent was obtained from their parents to participate in the present study.

Each of the 30 classes was taught by a different teacher. Although all teachers gave informed consent for their voluntary participation in the study, two teachers did not return their questionnaires. The remaining 28 teachers were on average 40.68 years old ( $SD = 10.35$ , range = 25–56) and they had an average of 17.96 years of teaching experience ( $SD = 10.80$ , range = 2–37). All participating teachers were full-time certified PE teachers, 68% of whom obtained a master degree in movement and sport sciences at the university (including an academic master degree in teacher education), whereas 32% had received a teacher education program at the college level (i.e., professional bachelor in PE teacher education). The topic of the PE lesson was determined by the PE teacher and was categorized as dealing with either interactive games (e.g., basketball, volleyball, soccer, badminton, table tennis; 70%) or individual sports (e.g., athletics, gymnastics, dance; 30%). Similar to the students, teachers were asked to fill out a set of questionnaires at the end of the PE lesson. The Ethical Committee of Ghent University approved the study protocol.

### Measures

All questionnaires were administered in Dutch, the participants' mother tongue. Unless mentioned otherwise, participants responded to the items on a 5-point Likert scale ranging from 1 (*not at all true for me*) to 5 (*very true for me*).

### Perceived teaching behavior

Similar to previous studies (De Meyer et al., 2014) students' perceptions of autonomy support and perceived controlling teaching were measured by means of items from the Teacher As Social Context Questionnaire (TASCQ; Belmont, Skinner, Wellborn, & Connell, 1988) and the Psychologically Controlling Teaching scale (PCT; Soenens et al., 2012). To measure perceived autonomy support, we used the six positively worded items from the TASCQ autonomy support scale (e.g., "During this class my teacher gave me a lot of choices about how to do the exercise"). Controlling teaching was measured with the seven-item scale for psychologically controlling teaching (e.g., "During this class the teacher made me feel guilty when I dissatisfied him/her") supplemented with the two negatively worded items from the TASCQ autonomy support scale (i.e., "During this class it seemed like my teacher was always telling

me what to do" and "During this class my teacher often criticized me on how I do the things during class").

Confirmatory Factor Analysis (CFA) was performed with Mplus Version 7.0 (Muthén & Muthén, 1998–2012) to test the proposed two-factor model. However, fit indices were not satisfactory,  $\chi^2(76) = 237.70$ ,  $p < .001$ , RMSEA = .07, CFI = .89, SRMR = .06. Problems mainly involved the loadings of the two negatively worded items of the TASCQ on the latent construct of perceived controlling teaching. Therefore, these two items were removed from the analyses, which yielded a significant improvement in model fit,  $\chi^2(53) = 119.72$ ,  $p < .001$ , RMSEA = .05, CFI = .95, SRMR = .05. In this final model all item loadings were above .45,  $p < .001$ . Cronbach's alpha for perceived autonomy-supportive teaching was .79. Cronbach's alpha of the perceived controlling teaching scale based on the seven items of the PCT was .82. Students' perceptions of autonomy-supportive and controlling teaching were slightly negatively correlated ( $r = -.15$ ,  $p < .001$ , see Table 1).

### Experiences of need satisfaction and need frustration

Students' experiences of need satisfaction and frustration were measured with an adapted version of the Basic Psychological Need Scale and Need Frustration Scale (BPNSNF; Chen et al., 2014), a recently developed and validated 24-item scale. Chen et al. (2014) provided evidence for the factorial and predictive validity of this scale in four samples from diverse cultural backgrounds (i.e., China, US, Peru, and Belgium). Each need was assessed with eight items, of which four tapped into need satisfaction and four into need frustration. For the present study, this general need satisfaction scale was slightly adjusted by adding the stem "During the past PE lesson" and by slightly rewording some of the items to better reflect the specific context of a PE lesson. To illustrate, the item "I feel that my decisions reflect what I really want" was changed into "I felt that the exercises reflected what I really wanted to do".

To examine the internal structure of this questionnaire, a higher-order CFA was conducted thereby modeling the items as indicators of 6 first-order factors (autonomy satisfaction, autonomy frustration, competence satisfaction, competence frustration, relatedness satisfaction, and relatedness frustration) that, in turn, served as indicators for 2 higher-order factors, that is, need satisfaction and need frustration. This higher-order model fitted the data well,  $\chi^2(243) = 530.49$ ,  $p < .001$ , RMSEA = .05, CFI = .91, SRMR = .06. All indicator loadings were above .45,  $p < .001$ . Internal consistency was good for the second order factors of need satisfaction (Cronbach's  $\alpha = .87$ ) and need frustration (Cronbach's  $\alpha = .84$ ), and for each of the six first-order factors ( $.71 < \alpha < .80$ ). The items of both the original scale (Chen et al., 2014) and the version that was revised for the present study are presented in Appendix 1.

**Table 1**  
Descriptive statistics and correlations between study variables.

	Total sample		F-value	Boys		Girls		2	3	4	5	6	7	8
	M	SD		$n = 215$		$n = 279$								
				M	SD	M	SD							
1 Autonomy-support	2.98	.81	10.18**	3.12	.82	2.88	.79	-.15***	.61***	-.26***	.51***	-.01	-.29***	-.15***
2 Controlling teaching	1.79	.68	17.10***	1.94	.74	1.68	.61	–	-.20***	.51***	-.25***	.32***	.35***	.56***
3 Need satisfaction	3.21	.73	5.80*	3.30	.72	3.14	.72	–	–	-.36***	.70***	-.02	-.36***	-.20***
4 Need frustration	1.96	.63	.00	1.96	.61	1.96	.65	–	–	–	-.37***	.48***	.51***	.34***
5 Autonomous motivation	3.43	.90	14.68***	3.61	.90	3.30	.86	–	–	–	–	.01	-.62***	-.20***
6 Controlled motivation	1.67	.64	3.13	1.73	.66	1.63	.62	–	–	–	–	–	.27***	.15***
7 Amotivation	1.82	.79	.85	1.77	.82	1.85	.76	–	–	–	–	–	–	23***
8 Oppositional defiance	1.82	.84	10.05**	1.96	.90	1.72	.78	–	–	–	–	–	–	–

Note: \* $p \leq .05$ ; \*\* $p \leq .01$ , \*\*\* $p \leq .001$ .

### Motivational outcomes

Students' motivation toward the past PE lesson (i.e., situational motivation) was assessed by means of the validated Behavioral Regulations in Physical Education Questionnaire (BRPEQ; Aelterman et al., 2012). We used the stem 'I put effort in this past PE lesson because ...'. This stem was followed by items reflecting autonomous motivation (8 items; e.g., 'because I enjoyed this PE class', 'because I found this PE class personally meaningful'), controlled motivation (8 items; 'because I had to prove myself', 'because otherwise I got criticized'), and amotivation (4 items; e.g., 'I didn't see why this PE class is part of the curriculum').

CFA showed that a higher-order model, with intrinsic motivation (4 items) and identified motivation (4 items) loading on the higher-order latent variable autonomous motivation, with introjected motivation (4 items) and external motivation (4 items) loading on the higher-order latent variable controlled motivation (8 items), and with amotivation (4 items) as a separate latent factor, yielded an acceptable fit,  $\chi^2(165) = 468.80$ ,  $p < .001$ , RMSEA = .06, CFI = .90, SRMR = .09. However, one item from the introjection subscale ("because it is the only way to be pleased with myself") loaded relatively low on its corresponding factor (i.e., .42) and cross-loaded strongly (.40) with the identification subscale. To avoid that the introjection subscale would include only avoidance-oriented items, the current scale contained a combination of two items tapping into the avoidant type (e.g., "because I will feel like a failure if I don't") and two items tapping into the approach type (e.g., "because it is the only way to be pleased with myself") of introjected regulation. Although such introjected approach items could be separated from identified motivation in previous studies (e.g., Assor, Vansteenkiste, & Kaplan, 2009), the item "because it is the only way to be pleased with myself" did display a cross-loading with autonomous motivation in the present study. Theoretically, the cross-loading of an introjection-approach item is not unexpected, as introjection-approach regulation is more volitional in nature when compared to introjection-avoidance regulation. As the same item also had the lowest standardized loading on controlled motivation in the study of Aelterman et al. (2012), it was decided to remove this item from the final analyses. This resulted in a significantly better fit,  $\chi^2(147) = 350.04$ ,  $p < .001$ , RMSEA = .05, CFI = .93, SRMR = .07. All indicator loadings were above .55. Internal consistencies were good with Cronbach's alphas of .91, .81, and .79 for autonomous motivation, controlled motivation and amotivation, respectively.

### Oppositional defiance

Students' oppositional defiance was measured with a recently developed and validated scale (Van Petegem et al., 2014; Vansteenkiste et al., 2014) that was adjusted to the PE context. The scale assesses students' tendencies to reject the PE teacher's authority and contained 4 items that follow the stem "During the past PE lesson": "I had the tendency to do exactly the opposite of what the teacher expected me to do", "I sometimes thought about completely ignoring what the teacher asked me to do", "I had the tendency to rebel against the teacher's requests", and "I didn't care about what the teacher asked me to do: I'd rather done my own thing". A CFA modeling the 4 items as indicators of the latent construct of oppositional defiance showed a good fit ( $\chi^2(2) = 5.55$ ,  $p = .06$ , RMSEA = .06, CFI = .996, SRMR = .01). All loadings were higher than .74. The scale had good reliability ( $\alpha = .87$ ).

### Plan of analyses

Structural Equation Modeling (SEM) based on maximum likelihood estimation with 5000 bootstrap samples in Mplus (Muthén &

Muthén, 1998–2012) was used to test the theory-based model specifying paths from teaching behaviors via experiences of need satisfaction and need frustration toward motivational outcomes. To evaluate the model fit, the Comparative Fit Index (CFI); the Root Mean Squared Error of Approximation (RMSEA) and the Standardized Root Means Square Residual (SRMR) were selected. According to Hu and Bentler (1999), combined cut-off values close to .95 for CFI and close to .06 for RMSEA and .09 for the SRMR indicate good fit.

Latent constructs for need satisfaction and need frustration as well as for autonomous motivation and controlled motivation were estimated based on four two-item parcels. Latent constructs for perceived autonomy support and perceived controlling teaching were represented by three two-item parcels. Parcels were created by combining stronger loading items with weaker loading items from the same scale (Little, Cunningham, Shahar, & Widaman, 2002). The latent constructs for amotivation and oppositional defiance were indicated by the four items representing both scales. As recommended by Hayes and Scharkow (2013) and Cerin and Mac Kinnon (2008), points of estimate as well as the bias-corrected bootstrapped confidence intervals were calculated for each of the proposed pathways. Gender was included as a control variable in the model because a MANOVA analysis showed differences according to gender (see Preliminary Analyses section).

Total effects ( $\tau$ ) were first estimated through a structural model with paths from the teaching dimensions (perceived autonomy-supportive and controlling teaching) directly toward the motivational regulations (autonomous motivation, controlled motivation, amotivation, oppositional defiance). Next, we added need satisfaction and need frustration in the model to investigate the theory-based hypothesis (Ryan & Deci, 2000a; Vansteenkiste & Ryan, 2013) that the direct associations between autonomy-supportive teaching and autonomous motivation would be accounted for need satisfaction, and that the direct associations of controlling teaching with controlled motivation, amotivation, and oppositional defiance would be accounted for by need frustration. In addition to the theoretically expected symmetrical paths (e.g., from autonomy support to autonomous motivation via need satisfaction), we also tested all other possible indirect effects (e.g., from autonomy support toward autonomous motivation via need frustration). For this purpose, we used the product-of-coefficient test of mediation through the MODEL INDIRECT procedure in Mplus, as recommended by Cerin and Mac Kinnon (2008). This method tests the statistical significance of the product of two regression coefficients ( $\alpha\beta$ ), where  $\alpha$  represents the relationships between the independent variable (i.e., perceived autonomy-supportive teaching, perceived controlling teaching) and the potential mediators (i.e., need satisfaction, need frustration), and  $\beta$  represents the relationship between the mediator and motivational outcomes (i.e., autonomous motivation, controlled motivation, amotivation, oppositional defiance), while simultaneously adjusting for the direct relationship ( $\tau'$ ) from teaching behavior toward motivational outcomes. Mediation effects represented by  $\alpha\beta$  were considered statistically significant when their 95% bootstrap-based confidence interval did not include zero. Both specific indirect effects (' $\alpha\beta$ ' for need satisfaction, and ' $\alpha\beta$ ' for need frustration) as well as total indirect effects through both mediators simultaneously (sum of  $\alpha\beta$  for each of the mediators) were estimated. In addition, the structural model also included correlations between autonomy support and controlling teaching, between need satisfaction and need frustration, and between each of the motivational outcomes.

**Table 2**  
Multiple-mediator model from teaching behavior to students' motivation through need satisfaction and need frustration.

	Total effect ( $\tau$ ) 95% CI <sub>BC</sub>	Direct effect ( $\tau'$ ) 95% CI <sub>BC</sub>	Need satisfaction			Need frustration			Sum of indirect ( $\alpha\beta$ ) 95% CI <sub>BC</sub>
			$\alpha$ -coefficient 95% CI <sub>BC</sub>	$\beta$ -coefficient 95% CI <sub>BC</sub>	Specific indirect ( $\alpha\beta$ ) 95% CI <sub>BC</sub>	$\alpha$ -coefficient 95% CI <sub>BC</sub>	$\beta$ -coefficient 95% CI <sub>BC</sub>	Specific indirect ( $\alpha\beta$ ) 95% CI <sub>BC</sub>	
<b>Perceived autonomy support</b>									
Autonomous motivation	.58*** (.46, .71)	.06 (-.09, .21)	.59*** (.48, .70)	.86*** (.67, 1.06)	.46*** (.34, .58)	-.12** (-.19, -.04)	-.07 (-.24, .11)	.01 (-.01, .03)	.47*** (.35, .58)
Controlled motivation	.06 (-.03, .15)	-.01 (-.13, .11)	.59*** (.48, .70)	.25** (.11, .42)	.18*** (.07, .29)	-.12** (-.19, -.04)	.66*** (.50, .87)	-.10** (-.16, -.03)	.08 (-.04, .20)
Amotivation	-.27*** (-.38, -.15)	-.11 (-.27, .05)	.59*** (.48, .70)	-.15 (-.32, .03)	-.09 (-.19, .02)	-.12** (-.19, -.04)	.60*** (.39, .83)	-.07** (-.12, -.02)	-.16** (-.27, .05)
Oppositional defiance	-.05 (-.15, .05)	.00 (-.16, .16)	.59*** (.48, .70)	-.11 (-.30, .07)	-.06 (-.17, .04)	-.12** (-.19, -.04)	-.10 (.31, .07)	.01 (-.01, .04)	-.05 (-.16, .05)
<b>Perceived controlling teaching</b>									
Autonomous motivation	-.30*** (-.44, -.17)	-.13 (-.30, .02)	-.13** (-.23, -.03)	.86*** (.67, 1.06)	-.09* (-.16, .01)	.55*** (.45, .64)	-.07 (-.24, .11)	-.03 (-.10, .05)	-.11* (-.22, -.01)
Controlled motivation	.42*** (.30, .55)	.09 (-.06, .24)	-.13** (-.23, -.03)	.25** (.11, .42)	-.03 (-.07, .00)	.55*** (.45, .64)	.66*** (.50, .87)	.37*** (.26, .48)	.34** (.23, .45)
Amotivation	.49*** (.34, .65)	.14 (-.03, .33)	-.13** (-.23, -.03)	-.15 (-.32, .03)	.02 (-.01, .04)	.55*** (.45, .64)	.60*** (.39, .83)	.27*** (.17, .37)	.29*** (.19, .38)
Oppositional defiance	.80*** (.63, 1.01)	.83*** (.62, 1.07)	-.13** (-.23, -.03)	-.11 (-.30, .07)	.01 (-.01, .03)	.55*** (.45, .64)	-.10 (.31, .07)	-.05 (-.14, .05)	-.03 (-.13, .06)

Note: \* $p \leq .05$ ; \*\* $p \leq .01$ ; \*\*\* $p \leq .001$ . Model fit structural model with total effects from perceived controlling teaching directly to motivational outcomes:  $\chi^2(210) = 369.85$ ; RMSEA = .04; CFI = .97; SRMR = .04. Model fit full model with mediators:  $\chi^2(399) = 731.25$ ; RMSEA = .04; CFI = .96; SRMR = .04.

## Results

### Preliminary analyses

Means, standard deviations, and correlations among the study variables are presented in Table 1. Pearson bivariate correlations between students' age and each of the study variables were non-significant (all  $r_s < .08$ , all  $p > .07$ ). To examine whether the main study variables differed according to student gender, we conducted a MANOVA with student gender as an independent variable and with the eight study variables as dependent variables. The multivariate effect of student gender was significant, Wilks' Lambda = .90,  $F(7,473) = 6.74$ ,  $p < .001$ ,  $\eta^2 = .10$ . Univariate tests were significant for autonomy-supportive teaching ( $F(1,481) = 10.18$ ,  $p < .01$ ,  $\eta^2 = .02$ ), controlling teaching ( $F(1,481) = 17.10$ ,  $p < .001$ ,  $\eta^2 = .03$ ), need satisfaction ( $F(1,481) = 5.80$ ,  $p = .02$ ,  $\eta^2 = .01$ ), autonomous motivation ( $F(1,481) = 14.68$ ,  $p < .001$ ,  $\eta^2 = .03$ ), and oppositional defiance ( $F(1,481) = 10.05$ ,  $p < .01$ ,  $\eta^2 = .02$ ). Boys scored higher than girls on all these variables (see Table 1). In light of these findings we controlled for gender in the primary analyses.

Multilevel SEM has become an established method to analyze data that are hierarchically structured (Preacher, Zhang, & Zyphur, 2011), as is the case in the present study (with 499 students nested within 30 classes and 11 schools). Accordingly, we estimated the variances at the school and class level using the statistical program MLwin version 2.20 (Rasbash, Steele, Browne, & Goldstein, 2009) prior to conducting SEM analyses in Mplus Version 7.0 (Muthén & Muthén, 1998–2012). Three-level models indicated that there was no significant variance at the school level (all  $\chi^2(1) < 1.007$ ,  $p = .32$ ). We proceeded with estimating two-level models with students nested within classes. Class-level variance was significant for perceived autonomy support ( $\chi^2(1) = 9.727$ ,  $p < .01$ ; ICC = .21), perceived controlling teaching ( $\chi^2(1) = 8.209$ ,  $p < .01$ ; ICC = .14), need satisfaction ( $\chi^2(1) = 7.309$ ,  $p < .01$ ; ICC = .13), autonomous motivation ( $\chi^2(1) = 8.601$ ,  $p < .01$ ; ICC = .17), amotivation ( $\chi^2(1) = 5.812$ ,  $p = .02$ ; ICC = .09) and oppositional defiance ( $\chi^2(1) = 5.864$ ,  $p = .02$ ; ICC = .09), but not for need frustration ( $\chi^2(1) = 2.912$ ,  $p = .09$ ; ICC = .05) and controlled motivation ( $\chi^2(1) = .049$ ,  $p = .82$ ; ICC = .01). These analyses showed that the class-level variance was relatively small and in some cases even not

significant. According to Preacher et al. (2011), multilevel SEM is less efficient when ICC's are lower than .10, which was the case for 4 out of 8 variables. Testifying to the fact that problems may arise when using multilevel SEM when Level 2 variance (<.10) and sample size are small ( $n < 100$ ), an attempt to estimate the hypothesized multilevel SEM model did not yield a converging solution. Therefore, we proceeded with single level SEM in the primary analyses.

### Primary analyses

In a first model, we estimated the total effects ( $\tau$  coefficients) from perceived autonomy support and perceived controlling teaching directly toward motivational outcomes, without inclusion of the mediators. This model showed good fit to the data [ $\chi^2(210) = 369.85$ ,  $p < .001$ ; RMSEA = .04; CFI = .97; SRMR = .04]. Table 2 shows that all direct relationships ( $\tau$ ) were significant, except for the relationship between autonomy support and oppositional defiance. While perceived autonomy-supportive teaching was related positively to autonomous motivation and negatively to amotivation, perceived controlling teaching was related negatively to autonomous motivation and positively to controlled motivation, amotivation, and oppositional defiance. The most pronounced paths were the ones expected on the basis of the distinction between dark and bright pathways (i.e., between autonomy-supportive teaching and autonomous motivation and between controlling teaching and the maladaptive outcomes).

Next, we tested the theory-based model specifying paths from teaching behaviors via experiences of need satisfaction and need frustration toward motivational outcomes. The measurement model of all eight latent constructs and 31 indicators yielded good fit to the data [ $\chi^2(407) = 784.03$ ; RMSEA = .04; CFI = .96; SRMR = .05]. The factor loadings of the indicators ranged between .57 and .86. In the structural model, we added direct paths ( $\tau'$ ) from teaching behaviors toward each of the motivational outcomes in addition to the indirect paths ( $\alpha$ ,  $\beta$ ) from teaching behaviors through need satisfaction/frustration toward the motivational outcomes. Both the theoretical expected symmetrical paths (e.g., autonomy support toward need satisfaction, need satisfaction

toward autonomous motivation), as well as the cross-paths were tested (e.g., from autonomy support toward need frustration, from need satisfaction toward defiance). Results of the structural model, which had a good fit [ $\chi^2(399) = 731.25, p < .001$ ; RMSEA = .04; CFI = .96; SRMR = .04], are presented in Table 2. In this full model, direct relationships ( $\tau'$ ) between teaching behaviors and motivational outcomes were no longer significant, apart from the direct relationship between perceived controlling teaching and oppositional defiance ( $\tau' = .83, p < .001$ ). Relationships between teaching behaviors and the mediators (i.e., need satisfaction, need frustration), and between the mediator and motivational outcomes (i.e., autonomous motivation, controlled motivation, amotivation, oppositional defiance) are represented by  $\alpha$  and  $\beta$ , respectively in Table 2 and are displayed graphically in Fig. 1. Table 2 also presents the point of estimates as well as the bias-corrected bootstrapped for the mediated effects ( $\alpha\beta$ ). The relationship between perceived autonomy support and autonomous motivation was mediated only by need satisfaction ( $\alpha\beta = .46, p < .001$ ) and not by need frustration ( $\alpha\beta = .01, p = .47$ ). Similarly, only need satisfaction ( $\alpha\beta = -.09, p = .02$ ) and not need frustration ( $\alpha\beta = -.03, p = .45$ ) mediated the relationship between perceived controlling teaching and autonomous motivation. The opposite pattern was observed for amotivation, with only need frustration ( $\alpha\beta = -.07, p = .007$ ) and not need satisfaction ( $\alpha\beta = -.09, p = .09$ ) mediating the relationship between perceived autonomy support and amotivation, and between perceived controlling teaching and students' amotivation ( $\alpha\beta = .27, p < .001$  for need frustration,  $\alpha\beta = .02, p = .21$  for need satisfaction). As for the relationship between perceived autonomy support and controlled motivation, mediation occurred both through need satisfaction ( $\alpha\beta = .18, p < .001$ ) and need frustration ( $\alpha\beta = -.10, p < .001$ ), with both specific indirect effects canceling each other out (sum of  $\alpha\beta = .08, p = .18$ ). Only need frustration ( $\alpha\beta = .37, p < .001$ ) but not need satisfaction ( $\alpha\beta = -.03, p = .06$ ) mediated the relationship between perceived controlling teaching and controlled motivation. Finally, for oppositional defiance, none of the mediated effects were significant in the full model.

In line with the correlational analyses in Table 1 we also found a significant negative relationship between the latent construct for need satisfaction and need frustration ( $\beta = -.05, p < .001, 95\% \text{ CI}_{\text{BC}}: -.09, -.03$ ), and between the latent constructs for perceived autonomy support and perceived controlling style ( $\beta = -.11, p < .001, 95\% \text{ CI}_{\text{BC}}: -.17, -.06$ ).

## Discussion

The present study adds to the findings of a large number of SDT-based studies in education more broadly (e.g., Filak & Sheldon, 2008; Jang et al., 2009) and in the context of PE in particular (see Van den Berghe, Vansteenkiste, Cardon, Kirk, & Haerens, 2012 for a recent overview) by revealing a bright pathway in which experienced need satisfaction primarily relates to perceived autonomy-supportive teaching and beneficial motivational outcomes. The novelty of the present study, however, lies in the fact that it attempted to better understand whether and how controlling teaching behaviors relate to unfavorable motivational outcomes in the context of PE. It did so by distinguishing between pathways involved in perceived autonomy-supportive and controlling teaching and by identifying need satisfaction and need frustration as differential mediators in relations between perceived teaching style and diverse motivational outcomes. Several findings were consistent with recent claims that a dark motivational pathway deserves being studied separately from a bright motivational pathway.

First, we found rather modest negative correlations between perceived autonomy-supportive and controlling teaching indicating that both constructs do not necessarily fall along a single continuum, but constitute separate constructs. The same was true for the association between need satisfaction and need frustration. The correlations between autonomy-supportive and controlling style obtained in the present study were even somewhat smaller than correlations obtained in other studies (e.g., Bartholomew, Ntoumanis, Ryan, Bosh, & Thøgersen-Ntoumani, 2011). This finding might have to do with the fact that we assessed perceptions of teachers' behavior with reference to one specific lesson. When evaluating a socialization figure's behavior immediately after an interaction of about an hour, students may be more likely to recall instances of both autonomy-supportive and controlling behaviors. When tapping into more general retrospective accounts of teachers' style, students may be more likely to report on a more general impression of autonomy-supportive or controlling teaching rather than concrete events, possibly resulting in a stronger negative association between both.

Second, on the basis of findings in a small set of studies in contexts such as sport (Bartholomew, Ntoumanis, Ryan, Bosh, & Thøgersen-Ntoumani, 2011; Bartholomew, Ntoumanis, Ryan, &

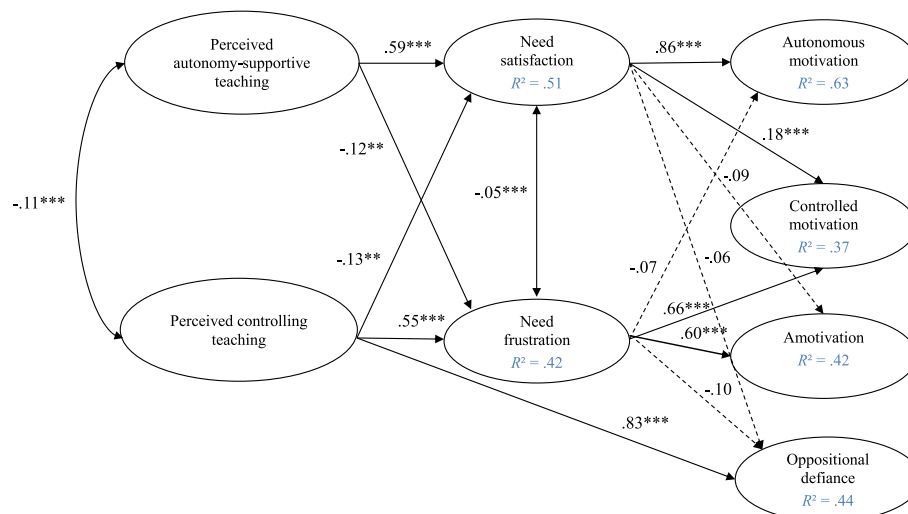


Fig. 1. Graphical representation of the  $\alpha$  and  $\beta$  coefficients as estimated in the full model. Note. The direct relationships between teaching behaviors and students' motivation ( $\tau'$ , see Table 2) were also estimated and were not significant, except for the direct path from perceived controlling teaching to oppositional defiance, which is graphically presented.

Thøgersen-Ntoumani, 2011; Stebbings et al., 2012), work (Gillet et al., 2012), and health (Verstuyf et al., 2013), we had hypothesized that perceived controlling teaching behaviors, rather than the mere lack of perceived autonomy support, would be related most strongly to need frustration, which in turn would be related primarily to less optimal motivational functioning (controlled motivation, amotivation, and oppositional defiance). Indeed, our findings revealed that while perceived autonomy support was related primarily to need satisfaction and autonomous motivation, perceived controlled teaching was related more closely to need frustration and controlled motivation, amotivation, and oppositional defiance. These findings are consistent with those from a recent study, in which it was found that observed controlling teacher behavior was related either directly or indirectly (through students' perceived controlling teaching) to controlled motivation and amotivation (De Meyer et al., 2014).

The current study adds to the De Meyer et al. (2014) study by examining the mediating role of students' experiences of need frustration in the relationship between perceived controlling teaching and students' motivational regulations. Consistent with SDT, associations between perceived controlling teaching and both controlled motivation and amotivation were mediated by students' experienced need frustration. When students reported that their teacher was more controlling, they were also more likely to feel pressured (autonomy frustration), to doubt their capabilities to perform well (competence frustration), and to get the idea that the teacher disliked them (relatedness frustration). In turn, these experiences of need frustration were related to suboptimal motivational outcomes. Specifically, students reporting high levels of need frustration were not only more likely to see the lesson as a waste of time (amotivation), they also reported having put effort into the lesson only to meet externally or internally pressuring demands (controlled motivation).

Based on theorizing and recent studies in the parenting domain (Van Petegem et al., 2014; Vansteenkiste & Ryan, 2013), we expected that need frustration would also account for associations between a controlling teaching style and oppositional defiance. The tendency to rebel against a teacher would then represent a derivative and compensatory way of dealing with the experiences of need frustration following from controlling teaching. Yet, need frustration did not account for the association between controlling teaching and oppositional defiance. Results showed that students' tendency to oppose the teacher's authority had a more direct relationship with controlling teaching, suggesting that students tended to straightforwardly defy the pressuring requests and expectations of controlling teachers in a direct (i.e., unmediated) fashion. There are several possible explanations for this finding. First, perceptions of a teacher as being controlling in a specific context and within a short time frame might elicit a direct and impulsive desire to oppose the teacher's authority. Compared to studies in the parenting domain capturing more general perceptions of parental behavior (Van Petegem et al., 2013), we might have tapped into a more impulsive and context-specific type of oppositional defiance. Perhaps the route via need frustration entails a more deliberate process where students decide relatively consciously to rebel against socialization figures' authority after having been exposed to a long history of controlling interactions, involving an accumulation of need frustrating experiences. Second, as the present study was cross-sectional in nature, it remains unclear whether controlling teaching elicited the tendency to defy the teacher or whether teachers increased their use of controlling strategies when noticing that students rebelled against them. As such, at least part of the direct association between a controlling teaching style and student oppositional defiance might represent a student-teacher rather than teacher-student effect. This issue

certainly deserves greater attention in future studies with longitudinal (e.g., Jang, et al., 2012) and experimental (e.g., Mouratidis et al., 2011) designs.

Although some studies showed that aggregate measures of controlling (versus autonomy-supportive) teaching are related to lower need satisfaction and low-quality motivation (e.g., Jang et al., 2009), few studies have looked at the specific cross-path relationships between controlling teaching and positive motivational outcomes. Although we found that symmetrical relationships (i.e., between autonomy support and need satisfaction) were stronger than cross-paths (i.e., between autonomy support and need frustration), all of the cross-paths between teaching behaviors and students' needs were significant. This suggests that students also experienced less need frustration when they perceived their teachers as more autonomy-supportive, while feelings of need satisfaction were lower when teachers were perceived as more controlling. Such cross-paths are consistent with theorizing (Vansteenkiste & Ryan, 2013) and past work showing that controlling socialization also relates negatively to positive outcomes (e.g., Bartholomew, Ntoumanis, Ryan, & Thøgersen-Ntoumani, 2011).

Finally, in the structural model we found an unexpected positive relationship between need satisfaction and controlled motivation, although bivariate correlations between manifest variables were not significant. To better understand this unexpected positive relationship, the structural model was further refined by modeling each of the separate needs and by separating controlled motivation into external regulation and introjected regulation. This refined structural model showed that, while external regulation was unrelated to satisfaction of each of the three needs, introjected regulation was related positively to competence satisfaction in particular. Hence, the positive association between need satisfaction and controlled motivation in the structural model was due to a specific association between competence satisfaction and introjected regulation. Although we did not anticipate this association, it is consistent with the notion in SDT that competence need satisfaction is an essential, yet not sufficient, condition to foster internalization and intrinsic motivation. That is, in isolation from the other two needs, and from the need for autonomy in particular, satisfaction of the need for competence may result only in partial internalization, as reflected in introjected regulation. To obtain fuller internalization of behavior and even intrinsic motivation, students ideally need to experience competence in combination with autonomy (Ryan & Deci, 2000a; Vansteenkiste, Niemiec, & Soenens, 2010). Consistent with this reasoning, Silva et al. (2010) found that competence need satisfaction had a unique association with introjected regulation in a sample of overweight women involved in a program to increase physical activity. In contrast, identified regulation and intrinsic motivation were predicted by a combination of competence and autonomy need satisfaction. The findings in this study are strikingly similar with those of Silva et al. (2010) and indeed suggest that competence need satisfaction alone may not always suffice to promote deep internalization and intrinsic motivation.

#### *Limitations and directions for future research*

In the present study we examined a structural model, the sequence of which was strongly based upon theory. However, the design of the study was cross-sectional with all measures being assessed at the same moment in time. Hence, possible alternative models for which the same variables are put in a different order fitted the data equally well. Accordingly, the question remains whether the proposed direction of relationships would hold if an experimental or longitudinal design was used. Following this



limitation, future studies can aim at experimentally manipulating teachers' behaviors (e.g., Mouratidis, et al., 2011) or at longitudinally investigating whether changes in teaching behaviors lead to changes in students' motivational experiences (e.g., Jang et al., 2012) to gain insight into the directionality of the proposed relationships.

Secondly, the data in the present study were all based on student self-reports. Although students' perceptions of their teacher's behavior are considered the most proximal indicators of motivational outcomes, in future studies a multi-informant (teacher, observer, student) perspective could be taken to gain more insight into the way teachers actually behave, self-declare to behave and are perceived by the students. Such research is important because one might argue that, rather than representing substantive dimensions, the distinctions between controlling and autonomy-supportive teaching and between need satisfaction and need frustration are caused by response tendencies.

Another possible limitation relates to the use of parcels to estimate latent constructs (Kline, 2010). Parceling requires that items within each set are unidimensional, thus measuring one underlying construct. Therefore, the confirmatory factor analyses on separate scales tapping into teaching style, the needs, and the motivation outcomes were performed with the individual items (rather than parcels) as indicators. However, as described by Little et al. (2002) and as also underscored by Kline (2010), parceling has important advantages when estimating complex structural models. A parcel-based structural model is less biased, more parsimonious and more stable. Therefore, we used parcels when the focus was on the structural relationships between latent constructs.

The relatively modest negative correlations observed between students' perceptions of autonomy-supportive and controlling teaching behaviors are in line with previous research in the sport (Bartholomew, Ntoumanis, Ryan, & Thøgersen-Ntoumani, 2011) and educational domain (e.g., Reeve et al., 2013). Such findings indicate that perceived autonomy support and control are not always perfectly opposite sides of the same coin and may at times even co-occur (Bartholomew, Ntoumanis, Ryan, & Thøgersen-Ntoumani, 2011). As such, teachers may rely on a cocktail of both autonomy-supportive and controlling teaching behaviors during the course of the lesson. It might thus be interesting to examine in future studies whether and how teachers, who combine autonomy-supportive and controlling behaviors, affect students' motivation compared to teachers who predominantly rely on either autonomy-supportive or controlling behaviors.

As according to SDT (Deci & Ryan, 2000), need frustration occurs not only in controlling environments, but can also emerge when interactions are cold, unfriendly, indifferent, and or when teachers engage in a chaotic style, future studies could try to simultaneously incorporate students' perceptions of controlling, cold, and chaotic teaching behaviors. Moreover, as teachers' style represents only one source of influence on students' motivational experiences in PE, it might be interesting to investigate in future studies which other factors influence students' 'dark' experiences in PE. Such factors may include other characteristics of teachers (e.g., years of teaching experience, standing, ...) as well as other socialization figures (e.g., peers and parents) and students' personality.

#### *Practical implications*

Although longitudinal, experimental and interventional studies are needed to confirm the direction of the proposed relationships in the present study, one obvious recommendation following from current and previous findings is that, besides training teachers to become more autonomy-supportive toward their students (Su &

Reeve, 2011), raising awareness among teachers about the motivational risks associated with controlling practices and discouraging them from engaging in such practices, might be equally important. By providing teachers with insight into the motivational dynamics demonstrated in this study, they may come to a deeper understanding of what it means to be controlling, which is a starting point to begin avoiding these behaviors.

Moreover, it seems crucial that teachers not only reflect on their interpersonal style, but also think about how their didactical approach might frustrate students' needs. For instance, when composing the teams in a basketball lesson a teacher might pick three students who can in turn pick students for their teams. In such a situation students who were selected last by their classmates will probably doubt their capabilities (competence frustration) and feel excluded or disliked (relatedness frustration). Although the teacher's interpersonal style in this situation is not necessarily controlling, cold, or chaotic, this didactical approach might still have elicited feelings of need frustration among some students.

Encouraging teachers to avoid the use of controlling tactics might not be as easy as it seems at first sight as it represents a change in one's motivating style. Moreover, teachers frequently engaging in controlling teaching might be less open to change and may hesitate to decrease their engagement in controlling behaviors because the use of a controlling style is intertwined with their broader personality functioning (Van den Berghe et al., 2013). Specifically, teachers with a controlled causality orientation, that is, teachers who tend to perceive pressure more easily in their environment and who at the same time are more sensitive for pressuring cues around them, were found to engage in more controlling behaviors, as rated by external observers. Clearly, this issue deserves attention when designing continuous professional development (CPD) programs for teachers.

#### **Conclusion**

The present study added to a small body of work (e.g., Bartholomew, Ntoumanis, Ryan, Bosh, & Thøgersen-Ntoumani, 2011; Bartholomew, Ntoumanis, Ryan, & Thøgersen-Ntoumani, 2011; De Meyer et al., 2014) demonstrating that the well-investigated bright pathway from autonomy support toward need satisfaction and autonomous motivation is relatively distinct from a darker pathway from controlling teaching toward need frustration and less optimal motivational outcomes. Together, the findings of the present study suggest that controlling teaching (and subsequent experiences of need frustration) do not simply reflect an absence of autonomy support (and subsequent experiences of low need satisfaction). To more accurately capture the detrimental effects of controlling teaching, this teaching dimension along with its consequences in terms of need frustration needs to be studied in its own right. Overall, the results suggest that effective teacher training in terms of motivational style may involve more than training teachers to become more autonomy supportive toward their students (Su & Reeve, 2011); it may also involve raising awareness among teachers about the motivational risks associated with controlling practices and discouraging them from engaging in such practices.

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## Appendix A. Supplementary data

Supplementary data related to this article can be found at <http://dx.doi.org/10.1016/j.psychsport.2014.08.013>.

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