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Review

Do students with different motives for physical education respond differently to autonomy-supportive and controlling teaching?

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ABSTRACT

Objectives: This study examined whether the effects of autonomy-supportive and controlling teaching in physical education depend on students' motivation.
Design: A preliminary, cross-sectional study relied on questionnaires administered to teachers. The main study involved an experimental design with students.
Methods: In the preliminary study, 95 teachers reported on their beliefs regarding the effectiveness of autonomy supportive and controlling teaching styles for students with different motivational profiles. In the main study, 320 students completed a questionnaire on motivation and were then randomly assigned to an experimental condition in which they watched video-based vignettes of either an autonomy-supportive or a controlling style. After the experimental induction, students completed questionnaires on need satisfaction, need frustration, engagement, and oppositional defiance.
Results: Teachers tend to believe that autonomy support and control work best for students scoring high on, respectively, autonomous and controlled motivation. The main study, however, showed that the moderating role of student motivation in the effect of teaching style was limited. The few interactions obtained suggested that even students with poor quality motivation report that they would benefit from an autonomy-supportive approach and suffer from a controlling approach. Students in the autonomy-supportive, relative to the controlling, condition reported more engagement and less oppositional defiance, effects that were mediated by need satisfaction and frustration.
Conclusions: All students, independent of their motivational regulations when entering the experiment, reported that they would be more engaged and would show less oppositional defiance when they would interact with an autonomy-supportive instead of a controlling teacher during PE.

Contents

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"Unmotivated students are a real problem. As a teacher, you need to pressure them constantly, because if you don't, they will either do nothing or they will disturb the lesson. Providing choice and explaining the purpose of the lesson only works with motivated students. With unmotivated students there is only one way to go, and that is being controlling." (Peter, teacher)

Statements like these are characteristic of teachers who believe that students with a lack of motivation or poor quality motivation are better off when being pressured by teachers. They also suggest that autonomy support would only be beneficial for already optimally motivated students. This anecdotal statement raises the question whether teachers need to match their teaching style to students' motivation or whether an autonomy-supportive style is universally effective to promote engagement. Grounded in Self-Determination Theory (SDT; Ryan & Deci, 2000), the main goal of this research was to examine whether students' type of motivation alters the effectiveness of an autonomy-supportive (relative to a controlling) teaching style in the context of physical education (PE).

Type of student motivation for PE

Student' intensity and type of motivation has been found to predict key student outcomes in PE such as engagement, physical activity, and persistence (Ntoumanis & Standage, 2009). SDT conceptualizes motivation in terms of a continuum of increasing autonomy ranging from a lack of motivation (amotivation), over controlled to autonomous motivation (Deci & Ryan, 2000). When students are amotivated, they lack a sense of goal-directedness and intentionality. They display low motivation to engage in the required activity because they do not value the goal served by the behaviour, because they believe the behaviour is not instrumental to reach the goal, or because they lack the competence to perform the activity (Ryan, Lynch, Vansteenkiste, & Deci, 2011).

Yet, even when students put effort in the required activity, their reasons for doing so can differ. In the case of controlled motivation, activity engagement is driven by external pressures, including the promise of good grades or the threat of punishments, or by internal pressures, such as guilt, shame, anxiety or self-worth contingencies. In contrast, autonomous motivation entails more volitional reasons for putting effort into the lesson, either because students understand and endorse the value of an activity or because they find the activity to be truly enjoyable and challenging (Deci & Ryan, 2000).

Students' type of motivation is essential for their engagement, performance, and adjustment (Ryan & Connell, 1989). Research in the context of PE has shown that autonomous motivation contributes positively to concentration (Standage, Duda, & Ntoumanis, 2005), vitality (Mouratidis, Vansteenkiste, Sideridis, & Lens, 2011), objectively recorded physical activity (Aelterman et al., 2012), and performance (Vansteenkiste, Simons, Soenens, & Lens, 2004). In contrast, controlled motivation is either unrelated or negatively related to desirable outcomes (Aelterman et al., 2012; Standage et al., 2005) and positively related to maladaptive outcomes, such as poor coping (Ryan & Connell, 1989).

Autonomy-supportive and controlling teaching

SDT specifies teachers' interaction style as an important contextual factor influencing students' motivation. Particular attention has been paid to the degree to which teachers interact with their students in an autonomy-supportive (relative to a controlling) way (Reeve, 2009). Autonomy-supportive teachers adopt the students' perspective, highlight the relevance of learning activities, offer meaningful choices, and encourage initiative taking. Controlling teachers impose their own frame of reference, thereby pressuring students to think, feel, or behave in particular ways, for instance, through the use of threats of sanction, controlling language, and guilt-induction. Correlational and experimental studies found autonomy-supportive teaching to be associated with autonomous motivation, engagement and higher grades, while controlling teaching behaviour was found to be related to amotivation and controlled motivation, disengagement, and resentment vis-à-vis the teacher (see Ntoumanis & Standage, 2009; Reeve, 2009 for overviews).

Herein, we examined the impact of an autonomy-supportive and controlling style on student engagement and oppositional defiance, two outcomes that received relatively little attention in

prior experimental work. Engagement reflects students' behavioural, emotional, and cognitive involvement. It is a malleable construct which has been studied extensively (see Christenson, Reschly, & Wylie, 2012) and which yields manifold desirable outcomes, such as better learning, higher grades, and less drop-out (Skinner, Kindermann, Connell, & Wellborn, 2009; Skinner, Wellborn, & Connell, 1990). In addition, engagement is considered an observable indicator of students' underlying motivation in school in general (Reeve, Jang, Carrell, Jeon, & Barch, 2004; Skinner & Belmont, 1993) and in physical education in particular (Ferrer-Caja & Weiss, 2000; Ntoumanis, 2001). In spite of its presumed importance, engagement and its relation with underlying motivational processes has primarily received attention in correlational studies, but far less in experimental research. These correlational studies have shown that perceived autonomy-supportive teaching is related to engagement, both within and across time (e.g., Reeve, 2013).

Whereas autonomy-supportive teaching may be primarily conducive to positive outcomes, controlling teaching may elicit more negative outcomes, including oppositional defiance (Bartholomew, Ntoumanis, Ryan, Bosch, & Thogersen-Ntoumani, 2011; Vansteenkiste & Ryan, 2013). Oppositional defiance has been defined as a blunt rejection of the request of an authority figure, as reflected in a tendency to do the opposite of what is expected. It is conceived as a defensive, compensatory way of coping with a controlling environment (Skinner, Edge, Altman, & Sherwood, 2003; Vansteenkiste & Ryan, 2013). Research in the parenting context indicates that adolescents' oppositional defiance vis-à-vis their parents is related to externalizing and internalizing behavioural problems (Van Petegem, Soenens, Vansteenkiste, & Beyers, 2015). Similarly, in the context of PE, oppositional defiance as experienced during a single lesson was found to relate positively to feelings of resentment vis-à-vis the content of the lesson and the teacher (Aelterman, Vansteenkiste, Soenens, & Haerens, submitted). In addition, a few studies in the parental and educational context demonstrated that a controlling way of interacting with students is related to higher levels of oppositional defiance. Vansteenkiste, Soenens, Van Petegem, and Duriez (2014) found that a controlling parental style of introducing a prohibition predicted increasing levels of oppositional defiance in adolescents. Similarly, in the PE context perceived controlling teaching was found to relate to more oppositional defiance in students (Haerens, Aelterman, Vansteenkiste, Soenens, & Van Petegem, 2015).

On the basis of this research we expected that an experimental induction of autonomy-supportive (relative to controlling) teaching would result in higher levels of student engagement and lower levels of oppositional defiance.

Need satisfaction and need frustration as underlying processes

According to SDT, the effects of autonomy-supportive and controlling teaching on students' outcomes can be explained through processes of need satisfaction and need frustration. SDT specifies three psychological needs that are considered inherent, universal, and essential for individuals' psychological growth and well-being (Deci & Ryan, 2000). Specifically, while the satisfaction of the needs for autonomy (i.e., experiencing a sense of volition), competence (i.e., experiencing a sense of effectiveness), and relatedness (i.e., experiencing a sense of closeness) is said to promote optimal functioning, the frustration of the needs for autonomy (i.e., experiencing a sense of pressure), competence (i.e., experiencing a sense of inadequacy), and relatedness (i.e., experiencing interpersonal alienation) would predict maladjustment and even psychopathology (Vansteenkiste & Ryan, 2013).

The distinction between need satisfaction and need frustration is critical because the absence of need satisfaction does not by definition constitute the presence of need frustration (Bartholomew, Ntoumanis, Ryan, & Thøgersen-Ntoumani, 2011; Vansteenkiste & Ryan, 2013). To illustrate, when students experience little volition when engaging in an activity (low autonomy satisfaction), this does not necessarily imply that they feel forced to do things against their will (autonomy frustration). As such, experiences of need frustration would be relatively distinct from experiences of low need satisfaction. Also, both processes would have somewhat differential antecedents and outcomes. Specifically, while autonomy supportive behaviours would be primarily beneficial for experiencing need satisfaction and be conducive to optimal outcomes (i.e., need satisfaction; engagement), controlling behaviours would be specifically predictive of experiences of need frustration and relate to maladaptive outcomes (i.e., need frustration; defiance) (Bartholomew, Ntoumanis, Ryan, Bosch, et al., 2011; Haerens et al., 2015; Vansteenkiste & Ryan, 2013).

Motivation as a potential moderator of teaching behaviour

Consistent with the critical role of autonomy-supportive and controlling teaching in the prediction of motivation, most studies have modelled students' motivation as either an outcome of teaching behaviour or as a mediator in the relation between teaching behaviour and student outcomes. However, students' motivation could also play a different role. That is, students' motivation may alter the effect of teaching behaviour, an idea that is consistent with the general notion that children are pro-active agents in the socialization process rather than just passive recipients of socialization figures' behaviour (Reeve, 2013).

One way in which the pro-active role of students' motivation can manifest is by affecting students' responsiveness to teachers' behaviour. Specifically, depending on their intensity and type of motivation, students may differ in the degree to which they benefit from autonomy-supportive teaching and suffer from controlling teaching. Although this is an intriguing possibility, research examining this issue is scarce, with the few studies available yielding somewhat conflicting findings. Black and Deci (2000) found evidence for an interaction effect, such that only students with relatively low autonomous motivation (but not those with high autonomous motivation) performed better if they perceived their teachers as more autonomy-supportive. In contrast, Mouratidis et al. (2011) demonstrated that students with high autonomous motivation, as compared to those with low autonomous motivation, benefited somewhat more from an experimentally induced need-supportive PE lesson in terms of enjoyment and vitality. Given these discrepancies and the paucity of studies on the potentially moderating role of student motivation, more work is needed in this area. We suggest a number of different hypotheses regarding the potential role of student motivation.

As illustrated by the anecdotal quote above, one possibility is that only students high on autonomous motivation would benefit from autonomy support and that students high on amotivation or on controlled motivation would thrive most when exposed to a controlling teacher. Such a *match perspective* is inconsistent with SDT because autonomy-supportive and controlling teaching styles are expected to contribute, respectively, to greater need satisfaction and need frustration and because these experiences are considered universal determinants of students' adjustment (Deci & Ryan, 2000).

Still, it is possible that there may be variation in the extent to which autonomy-supportive and controlling styles affect students' needs, engagement, and oppositional defiance (Soenens, Vansteenkiste, & Van Petegem, 2015). Among other factors, this

variation may depend upon students' motivation. Specifically, the *sensitization perspective* on psychological needs (Moller, Deci, & Elliot, 2010) suggests that individuals with a history of need satisfaction are more sensitive to new opportunities for need satisfaction. They may be more receptive to notice the provided need support and, when noticed, they may extract more benefits from it. Conversely, individuals with a history of need frustration would be less sensitive to such opportunities for need satisfaction. They may even be more sensitive to potentially need thwarting events, thereby more readily interpreting them as need frustrating and displaying more maladaptive outcomes following need frustrating events. According to such a sensitisation perspective, students higher in autonomous motivation (who are likely to have experienced more need satisfaction in the past) would benefit more from an autonomy-supportive approach. In contrast, students higher in controlled motivation and amotivation (who are likely to have experienced more need frustration in the past) would benefit less from an autonomy-supportive approach and would be more sensitive to a controlling approach, with more negative consequences as a result.

The present study

Our main research goal was to examine whether students with different motivational orientations towards PE benefit from different teaching styles. We examined this issue using a video-based experimental approach. Students were asked to imagine that they were a student in a randomly assigned autonomy-supportive or controlling videotaped lesson. They were then asked to report on their experiences of need satisfaction and need frustration, engagement, and oppositional defiance vis-à-vis the teacher. The use of videos to induce teaching style has the advantage of standardisation, while self-reports of teaching style may be coloured by students' personal motivation. Further, compared to written vignettes, videos include more lively material, which increases the ecological validity of the study. We tested the following five hypotheses.

First, on the basis of SDT, we expected that exposure to an autonomy-supportive (relative to a controlling) teaching style would predict engagement and less oppositional defiance (Hypothesis 1). Second, based on theorizing (Vansteenkiste & Ryan, 2013) and previous empirical studies (Haerens et al., 2015), need satisfaction was expected to account primarily for the effect of induced teaching style on the positive outcome (engagement), whereas need frustration would account primarily for the effect of induced teaching style on the negative outcome (oppositional defiance) (Hypothesis 2). Third, we anticipated that more autonomously motivated students would report greater need satisfaction and engagement, while students high on controlled motivation and amotivation would report more need frustration and oppositional defiance, independent from their condition assignment (Hypothesis 3). Fourth, we examined the interplay between students' motivation for PE and experimentally induced teaching style in predicting the outcomes. On the basis of a match perspective, it can be predicted that the effect of teaching style depends on students' motivational orientation, such that an autonomy-supportive style is beneficial only for students high on autonomous motivation and a controlling style is beneficial for students high on either controlled motivation or amotivation. Yet, on the basis of SDT, we expected students' motivation to affect the gradation (but not the direction) of the effects of teaching style (Hypothesis 4), so that students who are more autonomously motivated for PE in general will be more sensitive to autonomy support and will therefore report more positive outcomes after watching the autonomy-supportive teacher. Given that students who are less optimally motivated would be more sensitive to controlling teaching, they would report more negative outcomes in the controlling (relative to the autonomy-supportive) condition than students who are more optimally motivated. Finally, the inclusion of need satisfaction and need frustration in the model provided us with another opportunity to test the sensitization hypothesis. That is, effects of sensitization could be observed not only in effects of (experimentally induced) teaching style on the needs and the outcomes but also in relations between the needs and the outcomes (Hypothesis 5).

Prior to addressing these hypotheses, in a preliminary study we examined to what extent teachers endorse the idea that a match between teachers' teaching style and students' motivation is required to obtain optimal student outcomes. Specifically, we examined whether teachers would hold the belief that a particular teaching style works best for students with a corresponding type of motivation (i.e., belief in the motivation-dependent effectiveness of teaching style) or, instead, would believe that a particular teaching style yields similar effects irrespective of students' motivation (i.e., belief in the absolute effectiveness of teaching style).

Preliminary study

Method

Teachers (n = 150) who were attending a seminar on extra-curricular school sport participation were asked to participate in the study immediately after the seminar. The seminar dealt with the topic of after-school sport, a topic which was unrelated to the present study. Ninety-five teachers agreed to participate, of whom 7 did not complete the entire questionnaires. Ultimately, 88 PE teachers (55% males) participated. They had an average age of 37 years (SD 11, range 23–59 years) and an average of 14 years of teaching experience (SD = 11, range 0–39 years). They were teaching in 7th to 12th grade of secondary school and in different educational tracks (i.e., general, technical, and vocational education).

A first part of the questionnaire consisted of two vignettes describing students with autonomous motivation for PE and students high on controlled motivation for PE. These vignettes were developed for the purpose of the current study and can be obtained from the authors upon request. Following the vignettes describing students' motivation, the questionnaire included two vignettes describing an autonomy supportive, and a controlling teaching style. These vignettes were developed by Reeve et al. (2014), and were shortened and adapted to the context of PE. Participants then filled out 2 items, one regarding teachers' belief in the motivation-dependent effectiveness of a teaching style [i.e., “An autonomy supportive (controlling) style works best for autonomously motivated students (for students with controlled motivation)”] and one regarding teachers' belief in the absolute effectiveness of the teaching styles [i.e., “An autonomy supportive (controlling) style works best for all students”]. A 1–7 response scale from “completely disagree” to “completely agree” was used to rate both items (separately for an autonomy-supportive and a controlling style).

Results

Results of paired samples *t*-tests showed that, on average, teachers were more likely to believe in the motivation-dependent effectiveness of an autonomy-supportive style than in its absolute effectiveness [$t(87) = -7.44$, $p < .001$, $M_{\text{motivation-dependent}} = 5.44$, $M_{\text{absolute}} = 3.91$]. Similarly, teachers were more likely to believe in

the motivation-dependent effectiveness of a controlling style than in its absolute effectiveness, [$t(87) = -2.23$, $p < .05$, $M_{\text{motivation-dependent}} = 4.33$, $M_{\text{absolute}} = 3.93$]. Independent samples t-tests showed that there were no gender differences in the study variables [t-values ranging from −.69–1.78, ns]. Participants' age and years of teaching experience were also unrelated to the study variables. Overall, findings from the preliminary study showed that teachers believe more strongly in the motivation-dependent effectiveness of teaching styles than in their absolute effectiveness.

Main study

Method

Participants

Three hundred and twenty students from 42 different classes out of two secondary schools in Flanders (Belgium) were recruited for the present study. In Flanders PE is a legally required school subject of the compulsory schooling for all students in secondary school, until the age of 18 years. The students were on average 17.28 years old ($SD = 1.36$ ranging from 15 to 22 years) and 33.1% (n = 106) of them were boys. The majority of the sample (n = 258 students, 80.6%) was enrolled in the final years of the vocational track, in which students are professionally prepared to enter the labour market after secondary school. The other students (19.4%) were in the technical track, in which students are being prepared for technical higher education. The study protocol was approved by the Ethical Committee of Ghent University. Both students and their parents read and signed informed consent forms.

Procedure

A between-subjects design was used with students being randomly assigned to an autonomy supportive condition or a controlling condition. For practical reasons, the randomization process was performed differently in both schools. In one school the randomisation occurred at the within-class level, with students belonging to the same class being randomly assigned to one of two different multimedia rooms, with both rooms representing the two conditions. In the second school the randomization occurred at the class level, with whole classes being assigned to a single condition, as all students watched the same videos in one and the same multimedia room. The reason for performing the randomization differently in the second school was the absence of a second multimedia classroom.

The researcher first explained the format of the experiment and allowed the students to ask questions. Then, students completed a paper and pencil questionnaire on their general motivation towards PE. Next, the students watched a series of five short film fragments, which lasted on average 1 min and 26 s. In between each video fragment students filled out a short questionnaire containing items measuring perceived autonomy-supportive and controlling teaching, credibility of the film fragments, anticipated satisfaction and frustration of their psychological needs, and anticipated engagement and oppositional defiance towards the teacher. The experiment lasted for approximately 40 min.

Materials

Video fragments

Both the autonomy supportive and controlling condition contained a series of five video fragments displaying typical situations that occur in a regular PE class (e.g., providing help or dealing with disruptive students). Specifically, the situations dealt with a class in which the students were taught the somersault. While the situations themselves were identical in the two conditions, the way the teacher interacted with the students differed. At the beginning of each fragment, a voice over provided a standardized short overview that prepared students for what they would see in that particular fragment. A researcher played the role of the teacher in each of the conditions. This researcher was experienced in teaching gymnastics and was familiar with the concepts of SDT. Ten students who were enrolled in the PE teacher education program acted as secondary school students. The videos were filmed in a sports gymnasium by a professional camera team to ensure good quality footage.

The five video fragments shown in both conditions represented different situations that occur throughout a single class and were presented in a chronological order: (a) a teacher giving verbal instructions at the beginning of the class, (b) a teacher offering help during an exercise, (c) a teacher providing feedback during an exercise, (d) a teacher dealing with disruptive student behaviour, and (e) a teacher discussing and evaluating the class at the end of the class. To ensure that both conditions represented an ecologically valid PE lesson and differed only in terms of teachers' interpersonal style, a detailed script was written for both conditions. Except for the verbal information that came from the teacher, all other interactions were held constant (e.g., students' behaviours and interactions with the teacher). The writing of the scripts proceeded in several steps. First, the authors discussed which autonomy-supportive and controlling strategies would be included, thereby aiming to include a diverse spectrum. To ensure that the scripts and strategies operationalized would be credible and ecologically valid, real-life videotaped PE lessons on gymnastics were watched. This procedure resulted in five detailed scripts for both conditions. In a final phase, these detailed scripts were presented to a panel of experts in the domain of SDT and PE. Based on their suggestions, some final adjustments were made before the videos were recorded.

Measures

All items in the questionnaires were rated on a 5 point Likert scale ranging from 1 (*not at all true for me*) to 5 (*very true for me*).

Students' motivation (assessed before the experiment)

To measure students' general motivation towards PE, students filled out the well-validated Behavioural Regulations in Physical Education Questionnaire (BRPEQ; Aelterman et al., 2012). The stem "I put effort in PE classes because …" was followed by items reflecting autonomous motivation (8 items; e.g., "I enjoy PE classes") and controlled motivation (8 items; e.g., "I have to prove myself"). Amotivation was measured using 4 items (e.g., "I find PE a waste of time"). Cronbach's alphas of these scales were .92, .69, and .79, respectively.

Students' perceptions of teaching behaviour (manipulation check)

To determine whether students perceived the conditions as we intended, they completed 4 items immediately after each fragment about whether they perceived the teacher to be autonomy-supportive ("e.g., If my teacher would teach as shown in the video, I would feel that he/she shows interest in me and is willing to listen") or controlling ("If my teacher would teach as shown in the video, I would feel that he/she insists on doing everything in his/her way). Items were based on the Teacher As Social Context Questionnaire (TASCQ; Skinner & Belmont, 1993) and the Psychologically Controlling Teaching (PCT) scale (Soenens, Sierens, Vansteenkiste, Dochy, & Goossens, 2012). Cronbach's alphas for the autonomy supportive and controlling scores were .95 and .94, respectively.

Credibility of the videos

To examine how credible and recognizable the video fragments were, students completed a 5-item questionnaire immediately after each fragment. Specifically, these items tapped into the credibility of the teacher's behaviour (e.g., "The teacher's behaviour is credible"), the credibility of the students' behaviour (e.g., "The students' behaviour is credible"), and the credibility of the fragment as a whole (e.g., "The video fragment is credible"). In addition, students were asked to indicate to what extent the videos were recognizable for them, in terms of how comparable they were with their own PE teacher's teaching style (e.g., "My PE teacher teaches in the same way as the teacher in the film fragment") or with the style of teachers of other subjects (e.g., "Many teachers teach in the same way as the teacher in the film fragment"). Cronbach's alphas for the credibility and recognisability scores were .91 and .69, respectively.

Students' need satisfaction and frustration

Need satisfaction and need frustration were measured with a selection of six items derived from the Basic Psychological Needs Satisfaction and Need Frustration Scale (BPNSNF; Chen et al., 2015), a questionnaire that has previously been used in the context of PE (Haerens et al., 2015). Cronbach's alphas of need satisfaction and need frustration were .90. and .81, respectively.

Oppositional defiance

After each fragment participants filled out a single item ("If I would be a student in this particular lesson, I would tend to do the opposite of what the teacher expects me to do"). This item was adopted from a recently developed and validated scale (Vansteenkiste et al., 2014). We computed a total score for oppositional defiance by aggregating scores on this item across the 5 fragments (Cronbach's alpha = .83).

Student engagement

Student engagement was measured after each fragment using a single item ("If I would be a student in this particular lesson, I would commit myself and cooperate"). This item was based on the validated and widely used measure developed by Skinner, Kindermann, and Furrer (2009), and assessed only the behavioural component of engagement. We computed a total score for engagement by aggregating scores on this item across the 5 fragments (Cronbach's alpha = .89).

Plan of analyses

Preliminary analyses

Because randomization was performed differently in the two schools (i.e., once at the student-level and once at the class-level), we first examined whether randomization was successful, that is, whether students in the two experimental conditions were similar in terms of background variables (i.e., gender, education, age), thereby using a Pearson's χ^2 test, and general motivation for PE as measured prior to the experiment, thereby using a MANOVA. For the manipulation check, we performed two MANOVAs with experimental condition as the independent variable, one with the scores for credibility and recognizability as dependent variables and one with perceptions of autonomy-supportive and controlling teaching as dependent variables. Finally, we examined the relation between relevant background variables (i.e., gender, education, age) and all the assessed variables by using a MANCOVA with gender and education as fixed factors, age as a covariate, and the variables of interest as dependent variables.

Primary analyses

We conducted a series of Structural Equation Models (SEM) using the Mplus 7.00 software (Muthén & Muthén, 2012) to test our main hypotheses, thereby controlling for relevant background variables (based on the preliminary analyses). A measurement model was created with latent constructs represented by three parcels, which were created through a random selection of the items of each scale (Little, Cunningham, Shahar, & Widaman, 2002). Experimental condition was modelled as a dummy variable [with the autonomy-supportive equalling 0 (reference category) and with the controlling condition equalling 1]. 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 inspected. According Hu and Bentler (1999), good model fit is indicated by combined cut-off values of .95 or higher for CFI, .06 or lower for RMSEA, and .09 or lower for the SRMR. After estimating the fit of the measurement model, we investigated structural relationships. Unstandardized effects were computed for each path in all structural models through the use of 1000 bootstrapped samples.

To examine the main effects of experimental condition on student engagement and oppositional defiance, we estimated the structural relationships between the experimental condition and the latent constructs representing engagement and oppositional defiance. Second, we tested the intervening role of need satisfaction and need frustration in the relation between experimental condition and engagement and oppositional defiance.

Next, we examined the role of individual differences in motivation for PE. In a first step we added structural relationships between each type of motivation (i.e., autonomous motivation, controlled motivation, amotivation) and student engagement and oppositional defiance. In a second step we examined the latent interactions between each of the three motivational variables and experimental condition in the prediction of the outcomes.

Finally, we included the motivational variables in the integrated model, thereby estimating main effects of motivation on need satisfaction, need frustration, engagement, and oppositional

Table 1
Mean-level differences in the study variables as a function of gender and type of education.

	Gender			Eta^2	Type of education			Eta^2
	Male	Female	$F(1,315)$		Technical	Vocational	$F(1,316)$	
Motivational differences								
Autonomous motivation	3.64	2.94	30.76***	.09	3.21	3.17	.05	.00
Controlled motivation	1.72	1.68	.27	.00	1.50	1.74	8.18**	.03
Amotivation	1.87	2.34	13.63***	.04	1.88	2.26	6.23*	.02
Situation-specific measures								
Need satisfaction	2.97	2.54	11.69**	.04	2.16	2.81	19.25***	.06
Need frustration	2.45	2.87	13.39***	.04	3.06	2.65	8.11**	.03
Engagement	3.75	3.31	11.30**	.03	3.11	3.54	9.33*	.02
Oppositional defiance	2.16	2.34	2.48	.01	2.44	2.24	2.03	.01

Note. $^*p < .05$. $^{**}p < .01$. $^{***}p < .001$.

Table 2
Means, standard deviations, and correlations among the study variables.

		Total		Autonomy-supportive condition		Controlling condition		1.	2.	3.	4.	5.	6.
		M	*SD*	*M*	*SD*	*M*	*SD*						
1.	Autonomous motivation	3.18	1.10	3.19	1.17	3.17	1.04						
2.	Controlled motivation	1.70	.60	1.75	.62	1.64	.57	.14*					
3.	Amotivation	2.18	1.09	2.24	1.11	2.12	1.06	−.65**	.08				
4.	Need satisfaction	2.69	1.07	3.52	.70	1.85	.64	.14*	.16*	−.05			
5.	Need frustration	2.74	.97	2.10	.68	3.37	.079	.02	.12*	.10	−.65**		
6.	Engagement	3.46	1.10	4.04	.84	2.88	1.03	.33**	.10	−.21**	.70**	−.49**	
7.	Oppositional defiance	2.28	.99	1.83	.83	2.73	.94	−.12*	.05	.17*	−.52**	.59**	−.61**

Note. *p < .05. **p < .01. ***p < .001.

defiance as well as interaction effects between motivational variables and experimental condition on the needs and interactions between motivational variables and the needs on the outcomes.

Results

Preliminary analyses

Pearson's χ^2 analyses indicated significant differences according to condition with regard to gender [$\chi^2(1) = 22.57$, $p < .001$] and educational track [$\chi^2(1) = 18.00$, $p < .001$]. Specifically, there were relatively more girls (79%) and relatively more students following the technical track (29%) in the controlling condition, in comparison with the autonomy supportive condition which contains relatively less girls (54%) and relatively less students from the technical track (10%).

The MANOVA indicated no significant differences between both conditions in terms of age or in terms of individual differences in motivation, Wilks' Lambda $F(4,306) = 1.25$; $p = .29$; $\eta_p^2 = .02$. A MANOVA analysis indicated a multivariate effect of experimental condition on the scores for recognizability and credibility, Wilks' Lambda $F(2,317) = 12.41$; $p < .001$; $\eta_p^2 = .07$. Subsequent univariate analyses indicated that students in both conditions perceived the teacher's behaviour as equally recognizable [$F(1,318) = .85$, $p = .36$, $\eta^2 = .00$, $M_{AS} = 2.50$, $M_{CON} = 2.41$]. However, students watching the controlling teaching style rated the fragments as being more credible than students in the autonomy-supportive condition [$F(1,318) = 16.87$, $p < .001$, $\eta^2 = .05$, $M_{AS} = 2.89$, $M_{CON} = 3.33$].

Then, we tested for condition differences in terms of perceived autonomy-supportive and controlling teaching. A multivariate effect of condition was found [Wilks' Lambda $F(2,317) = 449.06$; $p < .001$; $\eta_p^2 = .74$], together with two univariate effects, indicating that students in the autonomy-supportive, relative to the controlling, condition perceived the teacher to be significantly more autonomy supportive, [$F(1,318) = 801.21$, $p < .001$, $\eta^2 = .72$, $M_{AS} = 3.85$, $M_{CON} = 1.73$], whereas students in the controlling, relative to the autonomy-supportive, condition perceived the teacher to be significantly more controlling [$F(1,318) = 286.71$, $p < .001$, $\eta^2 = .58$, $M_{AS} = 2.20$, $M_{CON} = 4.10$].

Next, we examined whether the main study variables differed as a function of gender, age, and educational track (see Table 1). The multivariate effects of gender, Wilks' Lambda = .88, $F(7,310) = 6.09$, $p < .001$, $\eta^2 = .12$ and educational track, Wilks' Lambda = .91, $F(7,310) = 4.09$, $p < .001$, $\eta^2 = .09$, were significant, but not for age, $F(7,281) < 1$. Given these results, we controlled for gender and educational track in all subsequent analyses.

Descriptive statistics and correlations are presented in Table 2. Before testing our hypotheses, a measurement model including all assessed constructs was tested. The model fitted the data well [$\chi^2(168) = 266.92$; $p < .001$, RMSEA = .04, SRMR = .04, CFI = .97].

Primary analyses

A first model tested Hypothesis 1, which stated that a controlling (relative to autonomy-supportive) teaching style would predict reduced engagement and greater oppositional defiance. In this structural model the experimental condition was modelled as a predictor of student engagement and oppositional defiance, thereby controlling for student gender and educational track. The model had a good fit [$\chi^2(20) = 50.32$; $p < .001$, RMSEA = .07, SRMR = .03, CFI = .97]. In line with Hypothesis 1, students in the controlling, relative to those in the autonomy-supportive, condition reporting less engagement ($b = -1.14$, $p < .001$, 95% CI = [−1.38, −.91]) and more oppositional defiance ($b = .98$, $p < .001$, 95% CI = [.72, 1.24]).

A second model tested Hypothesis 2, involving the mediating role of need satisfaction and need frustration in effects of teaching style on the outcomes (i.e., engagement and oppositional defiance). In this structural model the needs were modelled as an intervening variable in the relationship between experimental condition and engagement and oppositional defiance, thereby controlling for student gender and educational track. We also allowed the direct paths from condition to engagement and oppositional defiance.

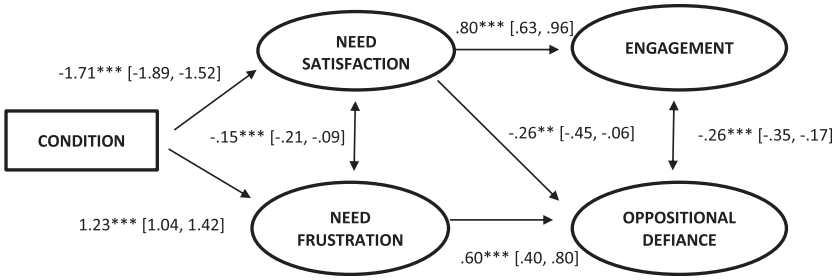
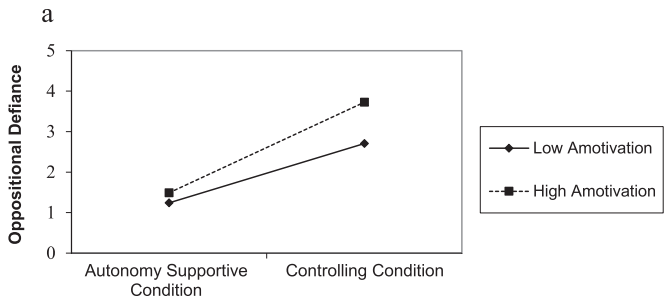
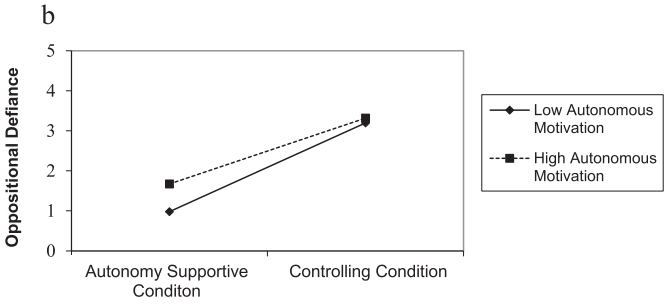


Fig. 1. Unstandardized path coefficients for structural model of the relation between experimentally induced teaching style and student engagement and oppositional defiance through need satisfaction and need frustration (Hypothesis 2).



This interaction was close to significance ($p = .09$), interaction effects were performed with gender and educational track as covariates



This interaction was close to significance ($p = .10$), interaction effects were performed with gender and educational track as covariates

Fig. 2. a. Interaction effect Between Amotivation and Experimentally Induced Teaching Style in the Prediction of Oppositional Defiance (Hypothesis 4). b. Interaction effect Between Autonomous Motivation and Experimentally Induced Teaching Style in the Prediction of Oppositional Defiance (Hypothesis 4).

Variables at the same level were allowed to correlate. The estimated model [χ^2 (72) = 232.12; $p < .001$, RMSEA = .08, SRMR = .03, CFI = .96] is presented in Fig. 1. The direct paths from experimental condition to engagement and oppositional defiance were no longer significant when need satisfaction and need frustration were included in the model. Experimental condition related negatively to need satisfaction and positively to need frustration. Need satisfaction, in turn, related positively to engagement and negatively to oppositional defiance, while need frustration related positively to oppositional defiance and was unrelated to engagement. In line with Hypothesis 2, need satisfaction accounted primarily for the effect of teaching style on engagement and need frustration accounted primarily for the effect of induced teaching style on oppositional defiance.

To address Hypothesis 3, which states that more autonomously motivated students would report greater need satisfaction and engagement, while students high on controlled motivation and amotivation would report more need frustration and oppositional defiance, we added the main effects of interindividual differences in motivation to the two previously tested models, thereby controlling for student gender and educational track. The first structural model, including only engagement and oppositional defiance, [χ^2 (119) = 222.43; $p < .001$, RMSEA = .05, SRMR = .06, CFI = .96] showed a positive effect of autonomous motivation on engagement ($b = .32$, $p < .05$, 95% CI = [.06, .58]). Autonomous motivation was unrelated to oppositional defiance. Controlled motivation was unrelated to engagement and oppositional defiance. The relationship between amotivation and oppositional defiance ($b = .41$ $p = .06$, 95% CI = [-.01, .82]) was close to significance. Amotivation was unrelated to engagement. In the second structural model [χ^2 (219) = 453.66; $p < .001$, RMSEA = .06, SRMR = .05, CFI = .95] all paths between students' general motivation and our variables of interest (i.e., need satisfaction, need frustration, engagement, and oppositional defiance) were allowed. We also included direct paths from condition to engagement and oppositional defiance. Autonomous motivation was positively related to engagement ($b = .30$ $p < .05$, 95% CI = [.05, .54]), and unrelated to the other constructs. Controlled motivation was positively related to need frustration ($b = .31$ $p < .01$, 95% CI = [.09, .52]), and was unrelated to other variables. Also amotivation was positively related to need frustration, ($b = .38$ $p < .05$, 95% CI = [.07, .68]), but unrelated to all other variables.

Next, to test for the moderating role of motivation in the relationship between experimental condition and engagement and oppositional defiance (Hypothesis 4), six latent interaction effects were tested (i.e., three moderator variables × two outcome variables), while controlling for student gender and educational track. None of the latent interactions in the prediction of engagement were significant (t-values ranging between −.39 and 1.27, all ns). In the prediction of oppositional defiance there were two interaction effects that were close to significance as indicated by their p-value: $t = 1.71$, $p = .09$ for amotivation, and $t = -1.65$, $p = .10$, for autonomous motivation. As shown in Fig. 2a, the controlling (relative to autonomy-supportive) style yielded a stronger effect on oppositional defiance among students high on amotivation, indicating that students high on amotivation reported that they would display higher levels of oppositional defiance if exposed to a controlling (relative to autonomy-supportive) teaching style. As shown in Fig. 2b, being exposed to the autonomy-supportive (relative to controlling) style resulted in lower oppositional defiance scores among students low on autonomous motivation. In other words, students low on autonomous motivation reported that they would be less defiant against the teacher when the teacher relies on autonomy-supportive (relative to controlling) teaching strategies.

Finally, we tested the moderating role of students' motivation in the fully integrated model (Hypothesis 5). We examined whether interindividual differences in motivation moderated any of the structural paths, while controlling for student gender and educational track. Of the 18 interaction terms (3 motivational orientations as possible moderators in the relations between condition and need satisfaction and frustration on the one hand, and in the relations between need satisfaction and frustration and the outcome variables on the other hand), only 2 were significant. Specifically, amotivation and autonomous motivation moderated the relationships between need frustration and oppositional defiance ($t = 2.64$, $p < .01$ and $t = -2.27$, $p < .05$, respectively), in the same way as they moderated the effect between the experimental condition and oppositional defiance. Students high on amotivation responded more negatively to experienced need frustration, so that they reported higher levels of oppositional defiance. The interaction effects with autonomous motivation indicate that students low on autonomous motivation might benefit more from an absence of need frustrating experiences, when compared to students high on autonomous motivation.

Discussion

According to SDT, autonomy-supportive PE teachers foster positive student outcomes such as engagement and interest because they effectively nurture students' basic psychological needs for autonomy, competence, and relatedness. When teachers actively thwart the same basic and universal needs through a controlling style (i.e., ignoring students' perspective and by pressuring students to make them think, feel, and act in particular ways); (Reeve, 2009), students are more likely to display

maladaptive outcomes (e.g., De Meyer et al., 2014; Haerens et al., 2015). Given these findings, an increasing number of researchers have developed and tested evidence-based interventions to train PE teachers to adopt an autonomy supportive teaching style (e.g., Cheon, Reeve, & Moon, 2012; Reeve et al., 2004). During such professional teacher training programs some PE teachers raise doubts about whether in real-life an autonomy supportive teaching style would always lead to positive outcomes (Aelterman et al., 2013). That is, they suggest that a controlling approach is necessary and effective for at least some students. Results of the preliminary study confirmed that PE teachers more strongly underscored the belief that an autonomy-supportive style is especially effective for autonomously motivated individuals instead of being effective irrespective of students' motivation. Similarly, PE teachers expressed the belief that students high on controlled motivation would benefit most from a more controlling approach. These results were in line with a study by Ng, Thogersen-Ntoumani, and Ntoumanis (2012) which showed that trainee sport and exercise science students perceived autonomy-supportive strategies to be less effective for obese individuals with controlled motivation.

Effectiveness of teaching styles from students' perspective

Given PE teachers' belief in the motivation-dependent effectiveness of both autonomy support and control, this issue was examined from the side of students. That is, we addressed the question whether students' personal motivation when they enter a PE lesson, actually interacts with teachers' interpersonal style to predict outcomes, an issue that has received little attention so far. While the idea that an absolute match between students' type of motivation (i.e., autonomous, controlled) and type of teaching style (i.e., autonomy-supportive, controlling) would be most effective is inconsistent with SDT, SDT does leave room for the possibility that students, depending on their motivational profile, might vary in their sensitivity to different teaching styles (Soenens et al., 2015).

Using a novel video-based approach, we found that students viewing an autonomy-supportive PE teacher reported that they would be more engaged and display lower levels of oppositional defiance, compared to students viewing a controlling teacher. These findings are consistent with a plethora of cross-sectional, longitudinal, and experimental studies documenting the benefits of an autonomy supportive (compared to a controlling) teaching style for students' learning, well-being, and behaviour (Reeve, 2009).

Further, consistent with recent empirical research (e.g., Bartholomew, Ntoumanis, Ryan, Bosch, et al., 2011) and theorizing (Vansteenkiste & Ryan, 2013) distinguishing between experiences of need satisfaction and need frustration, the effect of induced autonomy support relative to control on reported engagement occurred through need satisfaction, whereas the effect of the experimental condition on reported oppositional defiance occurred mainly through need frustration. These findings are consistent with recent evidence in the PE domain for the existence of a dark pathway and a bright pathway in the process of psychological needs (Haerens et al., 2015; Vansteenkiste & Ryan, 2013).

Most importantly, we were interested in the question whether and how students' overall motivation influenced the effects of the videos of teaching behaviours on student-reported outcomes. Students' motivation was found to play a role in two different ways. First, main effects revealed that students' general motivation had a direct relation to students' need experiences and outcomes. Irrespective of the type of video they had watched, more autonomously motivated students reported higher engagement. Students with higher levels of controlled motivation as well as students with higher levels of amotivation reported more need frustration under both conditions. These main effects suggest that students' trait levels of motivation (which are likely rooted in a longer history of need satisfying and need frustrating experiences in the context of PE) determine to some extent how they experience and respond to experimentally manipulated videos of PE-related situations, irrespective of how the PE teacher behaves in those situations.

Second, we examined interactions between students' motivation and condition on their reports of how they would feel and respond to a PE teacher as shown in the video. Overall, the number of observed interactions was small. Of the 24 interactions tested, only two were significant and two were close to significance, with p-values of .09 and .10, respectively. Further, inspection of the nature of these interactions showed that they did not confirm the match hypothesis, as they were a matter of gradation. That is, students' motivation affected the degree to which the experienced autonomy-supportive (relative to controlling) teaching style and subsequent responses of decreased need frustration predicted outcomes rather than completely altering (reversing) these effects. In none of the four interactions were the condition effects and the effects of reported need frustration cancelled, let alone reversed. Together, these findings suggest that, in contrast to teachers' beliefs regarding the motivation-dependent effectiveness of their teaching style, the moderating role of students' motivation is probably limited. Interpreted differently, our findings suggest that an autonomy-supportive approach will most likely yield adaptive outcomes, even among students with poor quality of motivation, and a controlling approach will most likely lead to detrimental outcomes even if students are controlled motivated or amotivated.

Practical implications

Our findings suggest that PE teachers sometimes hold inaccurate beliefs regarding the effectiveness of an autonomy-supportive or controlling teaching style. This is an important issue that needs to be taken into account when developing professional training programs for PE teachers. That is, the pre-training beliefs that participants might have about the effectiveness of proposed motivating strategies need to be addressed as they may affect participants' receptiveness to the training as well as its effectiveness (Pintrich, Marx, & Boyle, 1993). Indeed, a recent intervention study by Aelterman, Vansteenkiste, Van den Berghe, De Meyer, and Haerens (2014), showed that PE teachers' change in effectiveness beliefs regarding the provision of autonomy support was positively associated with changes in teacher-reported autonomy-supportive behaviours. Hence, it is important that teachers' beliefs are targeted in training programs for PE teachers, as was also suggested by Taylor, Ntoumanis, and Smith (2009), who demonstrated that teachers' beliefs are not always in line with their teaching approach.

The results of the current study furthermore suggest that teachers should not be advised to aim for an absolute match between their teaching style and students' motivation, that is, to be autonomy-supportive only with autonomously motivated students and to be controlling with students with poor quality motivation (i.e., controlled motivation and amotivation). Instead, based on the results of the experiment presented here, it can be hypothesized that also in real-life all students would thrive under autonomy-supportive conditions and suffer from controlling strategies, an issue that warrants further investigation.

We would like to caution, however, that the current findings do not suggest that autonomy supportive teaching represents a motivational cook book, including recipes that work all the time for all students, as if teachers do not need to adjust their style to students whatsoever. On the contrary, autonomy-support involves an interpersonal style where teachers attempt to identify, nurture, and develop students' inner motivational resources, thereby flexibly

adapting their strategies to contextual and student factors. We argue that for teachers to be experienced as need-supportive, it is essential that they take their students' frame of reference. Indeed, such an empathic stance is perhaps the most central feature of a need-supportive teaching style (Vansteenkiste, Niemiec, & Soenens, 2010), as it allows teachers to adjust their strategies (to some extent) to student characteristics and to maximally enhance experiences of need satisfaction. For instance, while some autonomy-supportive strategies (such as providing choice and encouraging initiative) might work particularly well with autonomously motivated students because these students are already passionate about physical exercise and sports, other autonomy-supportive strategies might be needed to energize students with low quantity and poor quality of motivation. For those students, it might be relatively more important for the teacher to acknowledge students' negative feelings regarding exercises and to provide a meaningful rationale. Future research manipulating specific autonomy-supportive practices is needed to test these speculations.

Limitations and directions for future research

Although the use of video-based vignettes is preferable above self-reports, our video-based experimental induction also has two drawbacks. First, although the conditions were distinguished clearly in terms of depicting either autonomy-supportive or controlling teaching behaviours, in real-life many teachers rely on a mixture of strategies, alternating between more autonomy-supportive and more controlling behaviours. Such a pronounced distinction between the two conditions may have led to strong condition effects and as a consequence it may have led also to an underestimation of the role of students' motivation, as interindividual differences may be especially critical in more ambiguous situations or in situations in which both styles are combined. Another reason why students' motivation plays a minor role in the present study is that students' motivation was measured at a different level (i.e., the contextual level) than students' feelings and outcomes, which were measured at the situational level. Possibly, students' subject-specific motivation (e.g., motivation for gymnastics) could play a more prominent role, as studies have shown that students' motivation for PE may differ depending on the topic at hand (Guay, Ratelle, Roy, & Litalien, 2010). Future research would do well to investigate the moderating role of students' motivation in more ambiguous situations and including both general and situational measures of students' motivation.

Second, because we assessed students' hypothetical responses to the vignettes we cannot tell with certainty whether they would feel and respond the same way in an actual class. Accordingly, future research could further address our research questions by manipulating teaching style in a real-life context (e.g., Mouratidis et al., 2011) and by assessing students' real-life responses and feelings. A third limitation is related to the measurement of engagement and oppositional defiance. Both concepts were only measured with a single item. The items for engagement only captured the behavioural component, while at least two other forms can be distinguished, that is, cognitive and emotional engagement (Fredricks, Blumenfeld, & Paris, 2004). Future research would do well to measure engagement in a more multidimensional fashion. Similarly, oppositional defiance was measured in a general way with a single item. To gain more insight in specific manifestations of defiance (e.g., chatting with friends, not performing the exercise) future research needs to rely on a more fine-grained measure. Another limitation of our study is the relatively small and fairly homogeneous sample. Clearly, caution is warranted in generalizing the current findings, and future research would do well to examine our proposed model in larger samples with more diversity in terms of, for example, class subject, level of education, and ethnicity. Using larger samples is important because statistical interactions are notoriously difficult to find. Studies need to rely on large samples to obtain sufficient statistical power. At the same time, one may wonder whether interactions that show up only in very large samples are meaningful and sufficiently large in terms of effect size. Although we obtained few systematic moderating effects of students' motivation in this study, it is premature to conclude that this moderating effect can be dismissed.

Conclusion

Teachers appear to believe that the effects of autonomy-supportive and controlling teaching styles depend on students' motivation for PE. Contradicting these beliefs, however, an experimental study with students showed that students' motivation plays only a modest role in impacting the effectiveness of an autonomy-supportive teaching style on engagement, and oppositional defiance. Hence, if teachers want to promote their students' motivation and thriving, they would do well to adopt an autonomy-supportive stance, even if their students appear to be controlled motivated or amotivated.

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