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ARTICLE

What Kind of Interpersonal Need-Supportive or Need-Thwarting Teaching Style Is More Associated With Positive Consequences in Physical Education?

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Purpose: Based on a multilevel approach (individual and class level), this study aimed to test which need-supportive/thwarting teaching styles were more closely associated with students' motivation and other positive physical education (PE) out-of-school consequences. ***Method:*** Participants were 654 primary ($n = 385$) and secondary ($n = 269$) PE students ($M_{age} = 11.96 \pm 1.95$; boys = 317 and girls = 337). ***Results:*** The three need-supportive teaching behaviors were related to autonomous motivation, PE importance and usefulness, and the intentions to practice physical activity at the individual level; the role of competence support at both individual and class levels is highlighted. Competence-thwarting style was also negatively related to autonomous motivation at both levels, and jointly to relatedness-thwarting behaviors positively to a motivation at the individual level. ***Conclusion:*** Our results provide insight into how the specific type of interpersonal styles adopted by teachers can be decisive to achieve positive PE outcomes in and out of school.

Keywords: basic psychological needs, motivation, physical activity, self-determination theory, teaching behaviors

The current academic context highlights the need for students to be motivated during the teaching–learning process, as well as the importance of their perceiving that what they learn is relevant and useful so they will apply it in their everyday life (Behzadnia et al., 2018). Hence, teaching behaviors are essential to generate these positive experiences for student learning (Haerens et al., 2015). The teacher-generated classroom atmosphere can produce a series of interpersonal and multidirectional teacher–student and student–student interactions, leading to the appearance of adaptive or maladaptive consequences in the students (Vasconcellos et al., 2020). Focusing on the teacher–student relationship, students' perceptions of the interpersonal teaching style could explain the existence of these outcomes (Ryan & Deci, 2020).

Based on the self-determination theory (SDT) (Ryan & Deci, 2017), teachers' need-supportive (autonomy-, competence-, and relatedness-support) versus need-thwarting (autonomy-, competence-, and relatedness-thwarting) styles are important interpersonal behaviors that lead to different student outcomes either in school (Cheon et al., 2016; Haerens et al., 2015) or out of school (Leo, Mouratidis, et al., 2022). Nevertheless, most of the previous research only focused on teachers' autonomy-supportive (e.g., providing students with choices) and autonomy-thwarting styles (e.g., pressuring students to behave in certain ways; Cheon et al., 2016; Haerens et al., 2015). Recent research has also shown that competence- (Fransen et al., 2018) and relatedness-supportive (Sparks et al., 2016) behaviors are good predictors of students' school program variables. However, the relationship between competence- and relatedness-thwarting styles with out-of-school program variables, such as intention to do physical activity (PA), has received less attention.

Although previous research has underlined the association between teachers' interpersonal styles and students' motivation (Vasconcellos et al., 2020), less is known about the direct relationship between teachers' interpersonal styles and relevant outcomes. Students' perceptions of teachers' interpersonal styles would predict important out-of-school outcomes (intention to practice PA and the importance and usefulness of physical education [PE]) while simultaneously controlling for the effects of teachers' styles on student outcomes in school (motivational regulations). Therefore, a significant challenge arose concerning how teachers' interpersonal behaviors directly affect students' outcomes and motivations in PE programs. Considering the SDT (Ryan & Deci, 2017), this study examines how teachers' need-supportive and need-thwarting styles predict students' important outcomes in school (motivational regulations) and out of school (PE importance and usefulness, and the intention to practice PA).

Interpersonal Teaching Style From SDT

Based on SDT (Ryan & Deci, 2017), all human beings have three basic psychological needs: a need for autonomy (sense of ownership and volition in one's action), a need for competence (feeling of efficacy and capability), and a need for relatedness (sense of positive integration with others), which are essential nutrients for development, greater well-being, and performance, regardless of age, gender, and socioeconomic status. When individuals

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experience the satisfaction of basic needs, they are intrinsically motivated toward activity and this leads to adaptive behavioral and educational outcomes. In contrast, the frustration of the basic needs leads to amotivation and negative outcomes (Vansteenkiste et al., 2020). The social context of teachers' interpersonal behaviors are essential determinants of students' experience of need satisfaction and need frustration, as well as their motivations and significant outcomes (Behzadnia, 2021; Leo, Mouratidis, et al., 2022; Ryan & Deci, 2020).

Teachers can adopt a positive interpersonal style to support students' basic psychological needs or, on the contrary, they can use a negative interpersonal style that thwarts students' basic psychological needs (Vasconcellos et al., 2020). Autonomy-supportive teaching styles involve strategies that encourage democratic leadership (Haerens et al., 2015). In this atmosphere, students can feel themselves to be the protagonists of the activity they perform, not only while performing the activity, but also during the decision-making and supervision processes (Reeve, 2009). Competence-supportive teaching styles provide students with challenging activities that match their ability level, express confidence in their capacity to engage in the activity effectively, or show effective models before task participation (Jang et al., 2010). Competence support also refers to providing encouragement and specific help while engaging in the activity, offering positive feedback and sincere praise after successful task completion, while refraining from critical and demeaning feedback after poor performance or mistakes (Jang et al., 2010). Finally, relatedness-supportive teaching strategies are defined by the level of empathy shown in the teacher–student relationship (Leo, Mouratidis, et al., 2022). Teachers should try to help students feel socially connected and fully internalize the value of their behaviors (Van den Berghe et al., 2013).

On the other hand, autonomy-thwarting teaching behavior is characterized by frequently using directive and intimidating behaviors. Teachers can also adopt a position of authority when the desired attributes or behaviors are not displayed by the students, using excessive personal control when supervising tasks, and peremptorily pressuring students to perform certain skills or abilities (Assor et al., 2005; Reeve, 2009). Competence-thwarting teaching behavior refers to the use of public critical feedback, normative and externally referenced comparison, activities that prevent the students from setting individualized and attainable goals that stimulate their personal self-improvement and foster progress, and generating a chaotic class climate where objectives, expectations, and rules are unclear (Van den Berghe et al., 2016). Finally, teachers can thwart students' need for relatedness through unfriendly behaviors or even by rejecting and excluding students and producing an emotionally cold environment (De Meyer et al., 2014).

Consequences of Interpersonal Teaching Style

School Outcomes

The SDT research has shown how important teachers' interpersonal style can be for the students' benefits (Vasconcellos et al., 2020). Specifically, several works have associated teachers' interpersonal style with different types of student motivation in PE (Assor et al., 2005; Haerens et al., 2015). SDT includes different motivational regulations that range from behaviors considered implicit to a person's traits and personality (autonomous motivation, made up of intrinsic and identified regulation) to behaviors that are defined as external to a person (controlled motivation composed of introjected and external regulation), as well as not finding any reason to continue performing the activity (amotivation; Deci & Ryan, 2000). Research has shown that students' perceptions of need-supportive teaching style (i.e., included as a global factor) are positively related to autonomous regulation (Leo, Mouratidis, et al., 2022; Sánchez-Oliva et al., 2020), whereas students' perceptions of a need-thwarting teaching style (i.e., also as a global factor) are associated with controlled regulation and amotivation in PE (Assor et al., 2005; De Meyer et al., 2014; Haerens et al., 2015; Leo, Mouratidis, et al., 2022; Van den Berghe et al., 2016).

Out-of-School Outcomes

Another series of consequences are related to out-of-school aspects such as intentions to practice PA and students' perception of the importance and usefulness of PE (Moreno et al., 2008; Sánchez-Oliva et al., 2020). One of the essential objectives in PE is to internalize the practice of PA and sports in the students' daily lives (Chatzisarantis & Hagger, 2009; Jang et al., 2016). For this purpose, it is fundamental that what they learn in the school context is perceived as useful for their out-of-school lives (Tilga et al., 2019). In addition, the teaching behaviors in PE will not only determine the students' motivation, but also can generate a higher perception of the usefulness of PA and stronger intentions to perform it (Behzadnia et al., 2018; Hagger et al., 2005; Sánchez-Oliva et al., 2014). When students can make decisions on how to perform activities or which games to play, teachers constantly reinforce their abilities in certain tasks, and the students can share these moments with other classmates, then they may generate stronger intentions to extrapolate these activities outside of school, and they could perceive more usefulness of what they learned in PE class (Chatzisarantis & Hagger, 2009; Sánchez-Oliva et al., 2014).

Some research has corroborated these postulates. First, students who are taught by autonomy-supportive teachers report stronger intentions to exercise during leisure time and participate more frequently in leisure-time physical activities (Chatzisarantis & Hagger, 2009). Likewise, previous studies have shown direct (Sánchez-Oliva et al., 2020) and indirect (Sánchez-Oliva et al., 2014) positive associations between need-supportive teaching style and intentions to practice PA out of school. On the contrary, Leo, Mouratidis, et al. (2022) showed that need-thwarting teaching style is indirectly related to lower intentions to practice PA. Second, students' motivational processes are relevant to their perception of the greater importance and usefulness of PE in the curriculum (Granero-Gallegos et al., 2012; Moreno et al., 2009). Therefore, teaching behaviors associated with generating better motivational processes can help PE become more relevant (Moreno et al., 2013). For instance, Sánchez-Oliva et al. (2014) found that the students' perceptions of a need-supportive teaching style were strongly and indirectly associated (via need satisfaction) with the perceived importance and usefulness of PE. Moreover, when students are aware of the importance and usefulness of the course activities, this helps them better perceive the value of the course (Ryan & Deci, 2017).

There has been a recent call to examine further the specific types of need-supportive and need-thwarting instructional styles that PE teachers use and how each of the instructional styles explains students' outcomes (see Haerens et al., 2018; Leo, Pulido, et al., 2022). This study addressed this issue by focusing on the specific factors of need-supportive and need-thwarting PE teacher behaviors as perceived by their students. Specifically, the

main aim of the study was to analyze what kind of teachers' interpersonal need-supportive style (i.e., autonomy-, competence-, or relatedness-support) and need-thwarting style (i.e., autonomy-, competence-, or relatedness-thwarting) are associated with greater benefits in PE classes (the types of motivation in PE), and outside of PE classes (students' perceptions of the importance and usefulness of PE and their intention to practice PA out of school). Instead of focusing on a link between need-supportive/need-thwarting teaching styles and needs satisfaction/frustration (see Vasconcellos et al., 2020), and considering the evidence in the literature showing strong correlations between the two concepts (Haerens et al., 2015; Leo, Mouratidis, et al., 2022), we focused on more distant outcomes. Numerous studies have examined the SDT sequence (i.e., motivations and outcomes). For instance, more autonomous motivations are expected to be related to better outcomes (Behzadnia, 2021; Leo, Mouratidis, et al., 2022; Ryan & Deci, 2020). In addition, recent research has shown that teachers' interpersonal teaching styles did not relate to students' outcomes through the mediators of basic needs satisfaction, frustration, and motivations (Behzadnia, Rezaei, & Salehi, 2022). Depending on the situation, teachers' interpersonal styles are not essential for predicting students' motivational regulation (Behzadnia, Alizadeh, et al., 2022). Therefore, it is crucial to examine how teachers' behaviors directly determine students' outcomes. Rather than seeking mediating relationships, the direct role of teachers' interpersonal styles concerning students' outcomes should be examined. For this purpose, we wished to determine the connections between the social environment (i.e., six types of teachers' interpersonal styles) and outcomes within and outside of the PE classes. We also wished to avoid the statistical problems (nonconvergence) found in previous research on complex models (Leo, Mouratidis, et al., 2022; Sánchez-Oliva et al., 2020). Furthermore, we aimed to analyze these relationships through multilevel analyses to statistically control for the shared variance of students' perceptions of their PE teachers' interpersonal behavior. This issue is important because students from the same PE class are exposed to the same teaching behaviors and, thus, their reports may violate the assumption of independence of observations to some degree (Raudenbush & Bryk, 2002).

Based on this aim and the aforementioned literature in the educational context (Assor et al., 2005; Haerens et al., 2015; Leo, Mouratidis, et al., 2022; Sánchez-Oliva et al., 2014), we hypothesized that: (a) Students' perception of the three types of need-supportive style in PE teachers (i.e., autonomy-, competence-, and relatedness-supportive) would positively predict their autonomous motivation, perception of PE importance and usefulness, and intentions to do PA, and would negatively predict their controlled motivation and amotivation at both levels (i.e., individual and class level) and (b) students' perception of the three kinds of need-thwarting style in PE teachers (i.e., autonomy-, competence-, and relatedness-thwarting) would negatively predict their autonomous motivation, perception of PE importance and usefulness, and their PA intentions to do PA, and would positively predict their controlled motivation and amotivation at both levels (see Supplementary Figure S1 [available online]).

Method

Participants

Participants were 654 students with a mean age of 11.96 years ($SD = 1.95$; range = 10–16 years old; 317 boys and 337 girls) of White ethnicity and from middle and lower–middle socioeconomic status. The students were nested in 28 classes and from eight primary ($n = 385$) and secondary ($n = 269$) public schools (from fifth to 11th grade) in south-western Spain. Class sizes ranged from 16 to 28 students per class, and all PE lessons conducted were based on the current educational law. The students were taught by 21 PE teachers aged between 31 and 57 years ($M_{age} = 45.61$, $SD = 6.07$; 11 females), who taught in a range of 1–2 classes. All participating teachers were full-time PE teachers certified at the university, with a degree in Sport Sciences (including an academic master's degree in teacher education), or in Primary Education specialized in PE. They had an average of 15.90 years of teaching experience ($SD = 13.19$, range = 3–34). Participants were chosen based on their commitment to collaborate in the current study and their geographical location in the region (north–south gradient to be representative). From an original sample of 662 questionnaires collected, eight (<2%) were excluded because they were incomplete.

Procedure

The study received ethical approval from the first author' university. All participants were treated according to the American Psychological Association ethical guidelines regarding consent, confidentiality, and anonymity of responses. A cross-sectional design was carried out, taking a measurement in the last third of the academic year to ensure that the students had enough time to form a stable opinion of the variables. Data were collected through an action protocol, so obtention was similar across all participants. The teachers were informed about the aims and the purpose of the study. Likewise, a letter of consent was sent to the participants' parents or guardians, who had to return it signed to authorize collaboration in the study. The students were informed that their participation was voluntary and anonymous, that they should complete the questionnaire package in the same order, individually, and that there was no time limit. Then, they completed the paper-and-pencil questionnaires in a PE class, in a suitable environment with no distractions. A research assistant was present to attend to any questions that might arise. Questionnaire completion took approximately 10–12 min.

Instruments

Perceived Teacher Behavior

Perceived teacher behavior was measured using the Teaching Interpersonal Style Questionnaire in Physical Education, developed by Leo, Sánchez-Oliva, et al. (2022). This questionnaire begins with the stem phrase: "In Physical Education lessons, my teacher . . . ," followed by 24 items corresponding to six factors. Specifically, four items per subscale to measure autonomy support (e.g., ". . . tries to give us a choice when performing the activities"), competence support (e.g., ". . . favors learning and content improvement"), relatedness support (e.g., ". . . encourages good relations between classmates at all times"), autonomy thwarting (e.g., ". . . requires me to do things in a certain way"), competence thwarting (e.g., ". . . sets up situations that make me feel incapable"), and relatedness thwarting (e.g., ". . . sometimes rejects me"). Responses were rated on a 5-point scale ranging from 1 (*Strongly disagree*) to 5 (*Strongly agree*). Confirmatory factorial analysis was performed to verify that the model fit was appropriate for the six-factor structure: $\chi^2 = 470.705$, $df = 245$, $p < .001$, comparative-fit index = .957, Tucker–Lewis index = .952, root mean square

error of approximation = .038 (95% confidence interval [CI] [.032, .043]), standardized root mean square residual = .042. Moreover, this scale showed acceptable levels of internal consistency in all dimensions (autonomy support, $\alpha = .81/\omega = .81$; competence support, $\alpha = .78/\omega = .79$; relatedness support, $\alpha = .83/\omega = .82$; autonomy thwarting, $\alpha = .82/\omega = .82$; competence thwarting, $\alpha = .80/\omega = .80$; and relatedness thwarting, $\alpha = .84/\omega = .84$).

Motivation

The Questionnaire of Motivation in Physical Education Classes (Sánchez-Oliva et al., 2012) assessed students' motivation. This questionnaire starts with a stem phrase, "I take part in this Physical Education class . . . " and has a total of 20 items representing five kinds of regulation (i.e., intrinsic, identified, introjected and external regulation, and amotivation) grouped into three main factors: autonomous motivation (eight items, e.g., "because Physical Education is fun"), controlled motivation (eight items, e.g., "because I want the teacher to think that I am a good student"), and amotivation (four items, e.g., "but I think that I'm wasting my time with this subject"). Responses were rated on a 5-point scale ranging from 1 (*Strongly disagree*) to 5 (*Strongly agree*). The confirmatory factorial analysis of the data offered support for this factor structure, showing acceptable model fit: $\chi^2 = 455.986$, $df = 131$, comparative-fit index = .926, Tucker–Lewis index = .913, root mean square error of approximation = .055 (95% CI [.049, .060]), standardized root mean square residual = .044. Furthermore, this instrument showed acceptable levels of internal consistency for each dimension (autonomous motivation, $\alpha = .88/\omega = .88$; controlled motivation, $\alpha = .83/\omega = .82$; and amotivation, $\alpha = .73/\omega = .73$).

PE Importance and Usefulness

The perceived importance of physical education scale (Moreno et al., 2008) was used to assess the importance and usefulness of PE from the students' perspective. The scale includes three items (e.g., "I think it is important to receive physical education classes") that were rated on a 5-point scale ranging from 1 (*Strongly disagree*) to 5 (*Strongly agree*). Cronbach's alpha value was .81, and the omega value was .82. Furthermore, previous studies revealed the internal reliability of the instrument among Spanish PE students (Granero-Gallegos et al., 2012; Moreno et al., 2013; Sánchez-Oliva et al., 2014).

PA Intentions

One item was included to measure students' intention to do PA outside of the school curriculum: "In the coming years, I intend to participate in sport/physical activity." The questionnaire specified that "sport participation" referred to participating in PA or a sport on a regular basis (at least twice a week). Responses were rated on a 5-point scale ranging from 1 (*Strongly disagree*) to 5 (*Strongly agree*). Previous research has implemented single-item scales effectively (Ntoumanis, 2001; Sánchez-Oliva et al., 2014, 2017, 2020).

Data Analysis

Mplus (version 7.3; Muthén & Muthén, 1998–2019) software was used to analyze the data. First, data cleaning procedures were conducted according to prior exclusion criteria, and preliminary analyses were performed to test the validity and reliability of the data. Second, we calculated the descriptive statistics and Pearson correlations between the target variables. Third, the intraclass correlation coefficients were analyzed to verify the variability between classes. Intraclass correlation coefficient values greater than 10% indicate variability in the data, showing that multilevel analysis is required (Hox et al., 2017). Fourth, multilevel models were developed for the main analysis (Heck et al., 2013), as the study participants were nested in groups (Chou et al., 2009).

Two separate models were configured for model parsimony and computational efficiency, one for each independent variable (i.e., interpersonal need-supportive and need-thwarting teaching styles) at two different levels (i.e., individual and class level) with random slopes. These random effects reveal the variability of the slopes within groups (i.e., individual level) or between groups (i.e., class level). Therefore, we tested the degree to which need-supportive (Model 1) and need-thwarting (Model 2) teaching styles could predict the outcome variables.[1] At the individual level, we included the individual scores of the dependent and independent variables centered at the mean of each class (i.e., group-mean centered) and, at the class level, we included the aggregated scores of the independent variables (i.e., need-supportive/need-thwarting teaching styles factors) in both models.

Results

Descriptive Statistics, Internal Consistency, and Bivariate Correlations

Descriptive statistics, internal consistency, and bivariate correlations are presented in Table 1. Self-reported measures showed acceptable levels of reliability, exceeding Nunnally's (1978) criterion of 0.70. In general, the participants selected scores above the midpoint in need-supportive factors, autonomous motivation, controlled motivation, importance and usefulness of PE, and PA intentions, and below the midpoint in the need-thwarting factors and amotivation. In addition, as shown, perceived need support, autonomous and controlled motivation, and the importance and usefulness of PE and PA intentions were all positively intercorrelated. They were all negatively related to perceived need-thwarting behaviors and amotivation, except for controlled motivation. In addition, perceived need-thwarting styles and controlled motivation were positively related to amotivation.

Main Analysis Statistics

Need-Supportive Teaching Style

Regarding students' perception of need-supportive behaviors in PE teachers', the results are shown in Table 2. At the individual level, autonomy-, competence-, and relatedness-supportive behaviors were positively related to autonomous motivation ($\beta_{\text{autonomy-support}} = 0.16$, $p < .001$, 95% CI [0.08, 0.24]; $\beta_{\text{competence-support}} = 0.16$, $p = .01$, 95% CI [0.03, 0.29]; $\beta_{\text{relatedness-support}} = 0.11$, $p = .02$, 95% CI [0.02, 0.21]). By contrast, only the autonomy-supportive style positively predicted controlled motivation ($\beta = 0.13$, $p = .01$, 95% CI [0.03, 0.23]), and only the competence-supportive style negatively predicted amotivation ($\beta = -0.02$, $p = .04$, 95% CI [−0.36, −0.01]). Finally, the competence-supportive style was positively associated with PA intentions ($\beta = 0.35$, $p = .02$, 95% CI [0.02, 0.27]) and, together with the autonomy-supportive style, it was positively associated with PE importance and usefulness ($\beta_{\text{competence-support}} = 0.23$, $p = .005$, 95% CI [0.07, 0.39]; $\beta_{\text{autonomy-support}} = 0.15$, $p < .001$, 95% CI [0.20, 0.50]). At the class level, the perceived competence-supportive style positively predicted autonomous motivation ($\beta = 0.86$, $p = .008$, 95% CI [0.22, 1.50]) and

Table 1 Means, *SD*s, Reliability Analysis, and Bivariate Correlations of the Target Variables

	n	*M*	*SD*	α/ω	1	2	3	4	5	6	7	8	9	10
1. Autonomy support	654	3.37	1.08	.81/.81	—									
2. Competence support	654	3.99	0.93	.78/.79	.65***	—								
3. Relatedness support	654	4.00	1.01	.83/.82	.62***	.74***	—							
4. Autonomy thwarting	654	2.10	1.03	.82/.82	−.26***	−.24***	−.28***	—						
5. Competence thwarting	654	1.58	0.77	.80/.80	−.29***	−.34***	−.36***	.51***	—					
6. Relatedness thwarting	654	1.51	0.82	.84/.84	−.27***	−.37***	−.36***	.49***	.81***	—				
7. Autonomous motivation	654	3.95	0.94	.88/.88	.47***	.51***	.49***	−.19***	−.31***	−.26***	—			
8. Controlled motivation	654	3.17	0.99	.83/.82	.21***	.20***	.21***	−.02	.01	.03	.46***	—		
9. Amotivation	654	1.92	1.04	.73/.73	−.21***	−.27***	−.22***	.18***	.35***	.34***	−.37***	.08*	—	
10. PE importance and usefulness	654	3.89	1.06	.81/.82	.40***	.43***	.38***	−.14***	−.18***	−.15***	.68***	.41***	−.21***	—
11. Physical activity intention	654	4.31	1.12	—	.14***	.22***	.12**	−.04	−.10**	−.11**	.38***	.23***	−.19***	.40***

Note. PE = physical education.
*$p < .05$. **$p < .01$. ***$p < .001$.

Table 2 Regression Coefficients and *SE*s of the Multilevel Model With Support Style as Independent Variable

	Autonomous motivation	Controlled motivation	Amotivation	PE importance and usefulness	Physical activity intention
Fixed effects					
Intercept	4.11*** (0.10)	3.35*** (0.14)	1.97*** (0.14)	3.99*** (0.08)	4.35*** (0.12)
Individual-level predictors					
Sex	−0.06 (0.07)	−0.12 (0.07)	−0.06 (0.08)	−0.03 (0.05)	−0.01 (0.06)
Autonomy support	0.16*** (0.04)	0.13** (0.05)	−0.05 (0.06)	0.15* (0.06)	0.02 (0.05)
Competence support	0.16* (0.07)	0.02 (0.07)	−0.02* (0.09)	0.23** (0.08)	0.35*** (0.08)
Relatedness support	0.11* (0.05)	0.08 (0.06)	−0.00 (0.07)	−0.01 (0.08)	−0.10 (0.08)
Class-level predictors					
Autonomy support	−0.01 (0.15)	0.20 (0.29)	0.26 (0.21)	0.20 (0.16)	0.01 (0.21)
Competence support	0.86** (0.33)	0.13 (0.54)	−0.99* (0.42)	0.15 (0.08)	0.50 (0.30)
Relatedness support	0.10 (0.23)	0.41 (0.32)	0.15 (0.38)	0.53** (0.16)	−0.29 (0.26)
Random effects					
Individual-level variance	0.52*** (0.07)	0.78*** (0.04)	0.86*** (0.10)	0.76*** (0.08)	1.15*** (0.10)
Class-level variance	0.00 (0.02)	0.14* (0.07)	0.08** (0.03)	0.04 (0.05)	0.03 (0.03)
Autonomy support slope	0.01 (0.01)	0.00 (0.01)	0.00 (0.02)	0.00 (0.01)	0.00 (0.05)
Competence support slope	0.04 (0.03)	0.01 (0.02)	0.01 (0.02)	0.03 (0.02)	0.00 (0.01)
Relatedness support slope	0.00 (0.00)	0.00 (0.01)	0.04 (0.03)	0.02 (0.02)	0.00 (0.02)
ICCs	.29	.17	.15	.23	.03

Note. SE between quotation marks. PE = physical education; ICC = intraclass correlation coefficient.
*$p < .05$. **$p < .01$. ***$p < .001$.

negatively predicted amotivation (β = –0.99, p = .02, 95% CI [–1.83, 0.16]), and only the relatedness-supportive style positively predicted PE importance and usefulness at the class level (β = 0.53, p = .01, 95% CI [0.21, 0.85]).

Need-Thwarting Teaching Style

Regarding students' perception of need-thwarting style in PE teachers, the results are shown in Table 3. At the individual level, the competence-thwarting style was negatively related to autonomous motivation (β = –0.25, p = .02, 95% CI [–0.46, –0.05]), and, together with relatedness-thwarting behavior, it was positively related to amotivation ($\beta_{competence\text{-}thwarting}$ = 0.25, p = .006, 95% CI [0.07, 0.43]; $\beta_{relatedness\text{-}thwarting}$ = 0.23, p = .03, 95% CI [0.03, 0.43]). At the class level, only the perceived competence-thwarting style negatively predicted autonomous motivation (β = –1.73, p = .03, 95% CI [–3.28, –0.18]).

Discussion

The general purpose of our study was to examine which type of teachers' interpersonal need-supportive style (i.e., autonomy-, competence-, or relatedness-support), and interpersonal need-thwarting behaviors (i.e., autonomy-, competence-, or relatedness-thwarting) were associated with greater benefits in PE classes, represented by students' type of motivation for PE and the perceived importance and usefulness of PE; and outside PE classes, represented by their intention to practice extracurricular PA. Overall, we observed a consistent positive association between students' perception of teachers' autonomy-, competence-, and relatedness-supportive styles and autonomous motivation, PE importance and usefulness, and intentions to practice PA. By contrast, students' perception of teachers' competence- and relatedness-thwarting styles was positively related to amotivation, and teachers' competence-thwarting behavior was negatively associated with autonomous motivation.

As excepted (Hypothesis a), teachers' need-supportive (all three types of need support) teaching style positively predicted students' autonomous motivation at the individual level. Aligned with previous research and SDT, teachers' autonomy-supportive behavior is related to students' autonomous motivation toward activities in PE programs (Leo, Mouratidis, et al., 2022; Vasconcellos et al., 2020). Autonomy-supportive behaviors also positively predicted students' controlled motivation. Controlled motivation refers to both introjected regulation and external regulation. Additional analyses showed that students' perceptions of their teachers' autonomy-supportive behaviors were more strongly related to students' introjection (r = .36, p < .001) than to external regulation (r = .12, p = .01). This reflects students' internal control to avoid feelings of pride and may be related to pleasing PE teachers by participating in PE activities as a result of autonomy support. Based on SDT (Ryan & Deci, 2017), influencing teachers' behaviors on students' introjection consider the first step toward internalization of external behaviors that would result in finding more importance toward doing the activities over time. Surprisingly, the results also showed that the autonomy-supportive teaching style was related to students' external regulation. This might reflect students' previous experience of external regulation in PE programs that were carried out in controlling teaching climates. However, further studies are required, perhaps through longitudinal or experimental research designs, as competence- and relatedness-supportive styles did not show such relations.

Furthermore, the competence-supportive style positively predicted autonomous motivation at the class level, and negatively predicted amotivation at both levels (i.e., individual and class level). This means that when teachers support students' competence, students find PE activities more interesting and valuable, and their amotivation toward PE activities decreases. This finding confirms the importance of teachers' competence-supportive behaviors for students' autonomous motivation (Mouratidis et al., 2022) and amotivation in PE classes. The results also showed that, unexpectedly and in contrast to Sparks et al. (2016), relatedness-supportive behaviors did not predict either controlled motivation or amotivation. Students may be used to more directive instructions from their teachers (Cothran et al., 2005; Syrmpas et al., 2017), in which the teachers do not consider the bi-directionality of teacher–student or student–student interactions. Therefore, although students may not perceive that their teacher supports social interactions, this does not imply an increase in controlled motivation and amotivation. Moreover, these results suggest that strategies only to support students' relatedness may be insufficient to decrease controlled motivation and amotivation in PE classes. Thus, more studies are needed to understand the role of relatedness support in the educational context (Sparks et al., 2016; Xiang et al., 2017).

Regarding need-thwarting behaviors (Hypothesis b), the results showed that only competence-thwarting behaviors negatively predicted autonomous motivation at the individual and class levels, and competence- and relatedness-thwarting styles both positively predicted amotivation at the individual level. These results show that students should not perceive teacher competence-thwarting behaviors if we wish to improve motivational processes in PE classes. In contrast, even if students report that their teachers thwart their needs for autonomy or relatedness, their levels of motivation are not modified. A possible explanation is that PE teachers may have difficulty sharing their authority with their students (Leo, Pulido, et al., 2022; Van den Berghe et al., 2013). The students may also be more comfortable with this more controlling teaching style (Cothran et al., 2005; Syrmpas et al., 2017) because it does not seem to affect their autonomous motivation in PE classes. Thus, when students perceive that their teachers do not allow enough time to do the tasks, do not help them overcome the challenges, or they make them feel incapable, then their levels of more self-determined motivation decrease and their amotivation increases. This is reinforced by relatedness-thwarting behaviors—that is, when students feel that their relationship with the teacher is cold and negative and they cannot communicate with their classmates, then they feel no motivation to attend PE classes. Previously, Leo, Pulido, et al. (2022) revealed the relevance of competence and relatedness support in PE class. Specifically, they found teacher profiles with high competence- and relatedness-supportive behaviors and high autonomy-thwarting style who achieved high levels of student engagement in PE. These results are in line with the current study, granting less importance to the autonomy-thwarting style in relation to the students' motivational processes.

Interestingly, somewhat aligned with our expectation (Hypothesis a), we found that teachers' autonomy-supportive behaviors positively predicted students' perceptions of PE importance and usefulness at the individual level. We also observed that relatedness-supportive behaviors positively predicted PE importance and usefulness at the class level. Furthermore, competence-supportive behaviors predicted out-of-school outcomes, PE importance and usefulness, and intention to practice PA. These findings are aligned with previous research, where positive relations were found

Table 3 Regression Coefficients and *SE*s of the Multilevel Model With Thwarting Style as Independent Variable

	Autonomous motivation	Controlled motivation	Amotivation	PE importance and usefulness	Physical activity intentions
Fixed effects					
Intercept	4.07*** (0.15)	3.32*** (0.14)	1.95*** (0.17)	3.96*** (0.14)	4.32*** (0.14)
Individual-level predictors					
Sex	–0.04 (0.12)	–0.10 (0.08)	–0.05 (0.08)	–0.02 (0.09)	–0.01 (0.08)
Autonomy thwarting	0.01 (0.08)	–0.01 (0.04)	0.01 (0.06)	0.03 (0.06)	–0.01 (0.06)
Competence thwarting	–0.25* (0.11)	–0.04 (0.11)	0.25** (0.09)	–0.10 (0.13)	–0.07 (0.12)
Relatedness thwarting	0.04 (0.08)	0.12 (0.18)	0.23* (0.10)	–0.04 (0.10)	–0.13 (0.11)
Class-level predictors					
Autonomy thwarting	0.15 (0.28)	0.18 (0.29)	–0.25 (0.30)	–0.08 (0.40)	0.13 (0.27)
Competence thwarting	–1.73* (0.79)	–0.07 (1.61)	1.35 (0.90)	–1.87 (2.34)	–0.55 (0.61)
Relatedness thwarting	0.27 (0.86)	0.15 (1.48)	–0.44 (0.82)	0.76 (2.39)	0.27 (0.60)
Random effects					
Individual-level variance	0.60*** (0.10)	0.82*** (0.14)	0.80*** (0.10)	0.86*** (0.09)	1.16*** (0.11)
Class-level variance	0.11 (0.10)	0.16** (0.06)	0.12* (0.06)	0.12 (0.37)	0.04 (0.03)
Autonomy thwarting slope	0.00 (0.05)	0.00 (0.04)	0.00 (0.01)	0.00 (0.08)	0.02 (0.04)
Competence thwarting slope	0.00 (0.02)	0.00 (0.01)	0.00 (0.24)	0.02 (0.04)	0.01 (0.05)
Relatedness thwarting slope	0.00 (0.03)	0.00 (0.02)	0.00 (0.09)	0.01 (0.05)	0.00 (0.05)
ICCs	.29	.17	.15	.23	.03

Note. *SE* between quotation marks. PE = physical education; ICC = intraclass correlation coefficient.
*$p < .05$. **$p < .01$. ***$p < .001$.

between the three need-supportive styles and out-of-school outcomes (see Vasconcellos et al., 2020). When teachers promote their students' responsibility to play a leading role in their learning, this helps them perceive that PE is useful (Sánchez-Oliva et al., 2020). Moreover, it is important for the teachers to support the social relationship with all the students in the same class (Sparks et al., 2016). When all students perceive this support and not just some students, the learning makes sense, and they perceive its usefulness outside of PE. Finally, based on the results, the role of competence-supportive behaviors in students' out-of-school programs may be the most important—that is, teachers' competence-supportive behaviors not only relate to students' outcomes in school, but also to their out-of-school outcomes. If students feel that their teachers support their competence, their perception of PE importance and usefulness increases, and more importantly, they tend to be more willing to engage in extracurricular PA. Thus, teachers' need-supportive behaviors (mainly competence support) are relevant aspects of obtaining benefits outside of PE, extrapolating what they learn in PE classes to their daily lives (Hagger et al., 2005; Tilga et al., 2019).

In contrast (Hypothesis b), need-thwarting teaching behaviors did not predict students' out-of-school outcomes, either individually or at the class level. This implies that a need-thwarting teaching style in PE may not cause students to perceive less importance and usefulness of PE or perform lower levels of extracurricular PA. This result aligns with Behzadnia et al. (2018), who found non-significant indirect relations between controlling behaviors and PA intentions through students' controlled motivation. However, Leo, Mouratidis, et al. (2022) showed that the more students perceived a need-thwarting teaching style in their PE teacher, the less likely they were to report PA intentions in the following years (via motivational processes). Given the scarcity of current results (see Vasconcellos et al., 2020), more studies are needed to understand the impact of teachers' need-thwarting behaviors in PE and in out-of-school consequences.

Limitations and Future Directions

With regard to the limitations of the study, there are some issues that should be considered for future research. First, the present work was cross-sectional, and data were collected through self-report measures. Hence, it is not possible to infer causality between the studied variables. Therefore, longitudinal, and experimental studies are needed to corroborate the results presented herein. Research should examine how the relationships between the interpersonal teaching style and positive (or negative) consequences can fluctuate across an academic year, how to establish training programs for teachers to optimize their interpersonal style and, in turn, increase the students' benefits in and out of PE classes. Second, we note that intentions were assessed with a single item, which may decrease the reliability of the measure. Therefore, future studies should analyze intentions or PA levels objectively. Third, some of our expectations were not supported in this study. When investigating the effects of teachers' interpersonal styles on students' outcomes in PE programs, students' sports and PA background should be controlled for as they might moderate relations between variables (Behzadnia, Alizadeh, et al., 2022). That is, students' PA background might affect their PA programs both in school and out of school, and their perceptions of teacher interpersonal behaviors. Therefore, future research is recommended to consider students' sports backgrounds when testing the relationships. In this regard, the teacher's background is also relevant to observe whether teaching behavior antecedents (see Pelletier et al., 2002) can determine their interpersonal style. Fourth, we must also assume that the study included few classes, which may have influenced the low effects obtained at the class level. Future research using a multilevel perspective could increase the number of groups. Finally, due to the complexity of the model and the few classes, we could not test types of motivation (e.g., intrinsic motivation and identified regulation) when verifying the hypotheses. We recommend future research to specifically test the effects of different teaching styles on students' different types of motivation.

Conclusions and Practical Implications

The main conclusion of this research is that teachers' need-supportive behaviors (all three types of needs) are essential for students' autonomous motivation toward PE activities, the importance and usefulness of PE, and the intention to continue PA. Need-supportive behaviors help students to autonomously regulate their behaviors and increase their intention to continue the activities (Behzadnia et al., 2018). They also help students to perceive the importance of PE activities (Sánchez-Oliva et al., 2014). Specifically, the competence-supportive style seems to be the most relevant type of need-supportive behavior to achieve better motivational processes at the class level and better benefits outside PE classes at the individual level (Leo, Pulido, et al., 2022). Likewise, avoiding competence-thwarting behaviors is essential to achieve better motivation in PE (Leo, Pulido, et al., 2022).

The present findings can also be extended from a practical perspective. Many strategies can develop specific need-supportive teaching behaviors and reduce specific forms of need-thwarting teaching styles (Cheon et al., 2019; Escriva-Boulley et al., 2018), especially, satisfying the need for competence and reducing competence-thwarting behaviors. Teachers can provide strategies designed to satisfy students' need for competence, adjusting the tasks to each student's ability, creating challenging activities, and expressing confidence in the students' capacity to effectively engage in the activity, or showing effective models before task participation. Teachers could also increase the students' ability to make decisions and take responsibility for the tasks that are designed and developed in PE. In addition, teachers can show empathy in the relationship with their students, promoting cooperative objectives within PE. At the same time, teachers should decrease thwarting behaviors such as using demanding language, directive and negative feedback, and ignoring students' negative feelings in the class. All these strategies can increase students' motivation. Specifically, supportive behaviors would lead to a better perception of the importance and usefulness of PE, and to students' stronger intentions to practice more extracurricular PA.

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Note

1. Types of motivation, PE importance and usefulness, and PA intentions were established as outcome variables at the same level, with the aim of determining the direct relationship between teachers' interpersonal teaching styles and students' consequences in and out of school.

References

Assor, A., Kaplan, H., Kanat-Maymon, Y., & Roth, G. (2005). Directly controlling teacher behaviors as predictors of poor motivation and engagement in girls and boys: The role of anger and anxiety. *Learning and Instruction, 15*(5), 397–413. https://doi.org/10.1016/j.learninstruc.2005.07.008

Behzadnia, B. (2021). The relations between students' causality orientations and teachers' interpersonal behaviors with students' basic need satisfaction and frustration, intention to physical activity, and well-being. *Physical Education and Sport Pedagogy, 26*(6), 613–632. https://doi.org/10.1080/17408989.2020.1849085

Behzadnia, B., Adachi, P.J.C., Deci, E.L., & Mohammadzadeh, H. (2018). Associations between students' perceptions of physical education teachers' interpersonal styles and students' wellness, knowledge, performance, and intentions to persist at physical activity: A self-determination theory approach. *Psychology of Sport and Exercise, 39,* 10–19. https://doi.org/10.1016/J.PSYCHSPORT.2018.07.003

Behzadnia, B., Alizadeh, E., Haerens, L., & Aghdasi, M.T. (2022). Changes in students' goal pursuits and motivational regulations toward healthy behaviors during the pandemic: A self-determination theory perspective. *Psychology of Sport and Exercise, 59,* 102131. https://doi.org/10.1016/j.psychsport.2021.102131

Behzadnia, B., Rezaei, F., & Salehi, M. (2022). A need-supportive teaching approach among students with intellectual disability in physical education. *Psychology of Sport and Exercise, 60,* 102156. https://doi.org/10.1016/j.psychsport.2022.102156

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

Cheon, S.H., Reeve, J., & Song, Y.G. (2016). A teacher-focused intervention to decrease PE students' amotivation by increasing need satisfaction and decreasing need frustration. *Journal of Sport and Exercise Psychology, 38*(3), 217–235. https://doi.org/10.1123/JSEP.2015-0236

Cheon, S.H., Reeve, J., & Song, Y.-G. (2019). Recommending goals and supporting needs: An intervention to help physical education teachers communicate their expectations while supporting students' psychological needs. *Psychology of Sport and Exercise, 41,* 107–118. https://doi.org/10.1016/j.psychsport.2018.12.008

Chou, C.P., Bentler, P.M., & Pentz, M.A. (2009). Comparisons of two statistical approaches to study growth curves: The multi-level model and the latent curve analysis. *Structural Equation Modeling: A Multidisciplinary Journal, 5*(3), 247–266. https://doi.org/10.1080/10705519809540104

Cothran, D.J., Kulinna, P.H., Banville, D., Choi, E., Amade-Escot, C., MacPhail, A., Macdonald, D., Richard, J.F., Sarmento, P., & Kirk, D. (2005). A cross-cultural investigation of the use of teaching styles. *Research Quarterly for Exercise and Sport, 76*(2), 193–201. https://doi.org/10.1080/02701367.2005.10599280

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

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

Escriva-Boulley, G., Tessier, D., Ntoumanis, N., & Sarrazin, P. (2018). Need-supportive professional development in elementary school physical education: Effects of a cluster-randomized control trial on teachers' motivating style and student physical activity. *Sport, Exercise, and Performance Psychology, 7*(2), 218–234. https://doi.org/10.1037/spy0000119

Fransen, K., Vansteenkiste, M., Vande Broek, G., & Boen, F. (2018). The competence-supportive and competence-thwarting role of athlete leaders: An experimental test in a soccer context. *PLoS One, 13*(7), e0200480. https://doi.org/10.1371/journal.pone.0200480

Granero-Gallegos, A., Baena-Extremera, A., Pérez-Quero, F.J., Ortiz-Camacho, M.M., & Bracho-Amador, C. (2012). Analysis of motivational profiles of satisfaction and importance of physical education in high school adolescents. *Journal of Sports Science and Medicine, 11*(4), 614–623.

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

Haerens, L., Vansteenkiste, M., De Meester, A., Delrue, J., Tallir, I., Vande Broek, G., Goris, W., & Aelterman, N. (2018). Different combinations of perceived autonomy support and control: Identifying the most optimal motivating style. *Physical Education and Sport Pedagogy, 23*(1), 16–36. https://doi.org/10.1080/17408989.2017.1346070

Hagger, M.S., Chatzisarantis, N.L.D., Barkoukis, V., Wang, C.K.J., & Baranowski, J. (2005). Perceived autonomy support in physical education and leisure-time physical activity: A cross-cultural evaluation of the trans-contextual model. *Journal of Educational Psychology, 97*(3), 376–390. https://doi.org/10.1037/0022-0663.97.3.376

Heck, R.H., Thomas, S.L., & Tabata, L.N. (2013). *Multi-level and longitudinal modeling with IBM SPSS* (2nd ed.). Routledge.

Hox, J.J., Moerbeek, M., & Van de Schoot, R. (2017). *Multi-level analysis: Techniques and applications*. Routledge.

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

Jang, H., Reeve, J., & Halusic, M. (2016). A new autonomy-supportive way of teaching that increases conceptual learning: Teaching in students' preferred ways. *The Journal of Experimental Education, 84*(4), 686–701. https://doi.org/10.1080/00220973.2015.1083522

Leo, F.M., Mouratidis, A., Pulido, J.J., López-Gajardo, M.A., & Sánchez-Oliva, D. (2022). Perceived teachers' behavior and students' engagement in physical education: The mediating role of basic psychological needs and self-determined motivation. *Physical Education and Sport Pedagogy, 27*(1), 59–76. https://doi.org/10.1080/17408989.2020.1850667

Leo, F.M., Pulido, J.J., Sánchez-Oliva, D., López-Gajardo, M.A., & Mouratidis, A. (2022). See the forest by looking at the trees: Physical education teachers' interpersonal style profiles and students' engagement. *European Physical Education Review, 28*(3), 720–738. https://doi.org/10.1177/1356336X221075501

Leo, F.M., Sánchez-Oliva, D., Fernández-Rio, J., López-Gajardo, M.A., & Pulido, J.J. (2022). Validation of the teaching interpersonal style questionnaire in physical education. *Revista Mexicana de Psicologia, 39*(1), 1–15.

Moreno, J.A., Coll, D., & Pérez, L.M.R. (2009). Self-determined motivation and physical education importance. *Human Movement, 10*(1), 5–11. https://doi.org/10.2478/v10038-008-0022-7

Moreno, J.A., De Oliveira, L.M.M., Zomeño Álvarez, T., Ruiz Pérez, L.M., & CervellóGimeno, E. (2013). Percepción de la utilidad e importancia de la educación física según la motivación generada

por el docente. *Revista de Educacion, 362,* 380–401. https://doi.org/10.4438/1988-592X-RE-2011-362-165

Moreno, J.A., González-Cutre, D., Garzón, M.C., & Rojas, N.P. (2008). Adaptación a la educación física de la escala de las necesidades psicológicas básicas en el ejercicio. *Revista Mexicana de Psicologia, 25*(2), 295–303.

Mouratidis, A., Michou, A., Telli, S., Maulana, R., & Helms-Lorenz, M. (2022). No aspect of structure should be left behind in relation to student autonomous motivation. *British Journal of Educational Psychology,* e12489. https://doi.org/10.1111/bjep.12489

Muthén, L., & Muthén, B. (1998–2019). *Mplus statistical modeling software 1998–2019*. Muthén & Muthén.

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

Nunnally, N.R. (1978). Stream renovation: An alternative to channelization. *Environmental Management, 2*(5), 403–411. https://doi.org/10.1007/BF01872915

Pelletier, L.G., Séguin-Lévesque, C., & Legault, L. (2002). Pressure from above and pressure from below as determinants of teachers' motivation and teaching behaviors. *Journal of Educational Psychology, 94*(1), 186–196. https://doi.org/10.1037/00220663.94.1.186

Raudenbush, S.W., & Bryk, A.S. (2002). *Hierarchical linear models: Applications and data analysis methods* (2nd ed.). SAGE Publications.

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

Ryan, R.M., & Deci, E.L. (2017). *Self-determination theory: Basic psychological needs in motivation, development, and wellness*. Guilford.

Ryan, R.M., & Deci, E.L. (2020). Intrinsic and extrinsic motivation from a self-determination theory perspective: Definitions, theory, practices, and future directions. *Contemporary Educational Psychology, 61,* 101860. https://doi.org/10.1016/j.cedpsych.2020.101860

Sánchez-Oliva, D., Leo, F.M., Amado, D., González-Ponce, I., & García-Calvo, T. (2012). Develop of a questionnaire to assess the motivation in physical education. *Ibero-American Journal of Exercise and Sports Psychology, 7,* 227–250.

Sánchez-Oliva, D., Mouratidis, A., Leo, F.M., Chamorro, J.L., Pulido, J.J., & García-Calvo, T. (2020). Understanding physical activity intentions in physical education context: A multi-level analysis from the self-determination theory. *International Journal of Environmental Research and Public Health, 17*(3), 799. https://doi.org/10.3390/ijerph17030799

Sánchez-Oliva, D., Pulido, J.J., Leo, F.M., González-Ponce, I., & García-Calvo, T. (2017). Effects of an intervention with teachers in the physical education context: A self-determination theory approach. *PLoS One, 12*(12), e0189986. https://doi.org/10.1371/JOURNAL.PONE.0189986

Sánchez-Oliva, D., Sánchez-Miguel, P.A., Kinnafick, F.-E., Leo, F.M., & García-Calvo, T. (2014). Physical education lessons and physical activity intentions within Spanish secondary schools: A self-determination perspective. *Journal of Teaching in Physical Education, 33,* 232–249. https://doi.org/10.1123/jtpe.2013-0043

Sparks, C., Dimmock, J., Lonsdale, C., & Jackson, B. (2016). Modeling indicators and outcomes of students' perceived teacher relatedness support in high school physical education. *Psychology of Sport and Exercise, 26,* 71–82. https://doi.org/10.1016/J.PSYCHSPORT.2016.06.004

Syrmpas, I., Digelidis, N., Watt, A., & Vicars, M. (2017). Physical education teachers' experiences and beliefs of production and reproduction teaching approaches. *Teaching and Teacher Education, 66,* 184–194. https://doi.org/10.1016/j.tate.2017.04.013

Tilga, H., Hein, V., Koka, A., Hamilton, K., & Hagger, M.S. (2019). The role of teachers' controlling behaviour in physical education on adolescents' health-related quality of life: Test of a conditional process model. *Educational Psychology, 39*(7), 862–880. https://doi.org/10.1080/01443410.2018.1546830

Van den Berghe, L., Cardon, G., Tallir, I., Kirk, D., & Haerens, L. (2016). Dynamics of need-supportive and need-thwarting teaching behavior: The bidirectional relationship with student engagement and disengagement in the beginning of a lesson. *Physical Education and Sport Pedagogy, 21*(6), 653–670. https://doi.org/10.1080/17408989.2015.1115008

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

Vansteenkiste, M., Ryan, R.M., & Soenens, B. (2020). Basic psychological need theory: Advancements, critical themes, and future directions. *Motivation and Emotion, 44*(1), 1–31. https://doi.org/10.1007/s11031-019-09818-1

Vasconcellos, D., Parker, P.D., Hilland, T., Cinelli, R., Owen, K.B., Kapsal, N., Lee, J., Antczak, D., & Ntoumanis, N. (2020). Self-determination theory applied to physical education: A systematic review and meta-analysis. *Journal of Educational Psychology, 112*(7), 1444–1469. https://doi.org/10.1037/edu0000420

Xiang, P., Ağbuğa, B., Liu, J., & McBride, R.E. (2017). Relatedness need satisfaction, intrinsic motivation, and engagement in secondary school physical education. *Journal of Teaching in Physical Education, 36*(3), 340–352. https://doi.org/10.1123/jtpe.2017-0034