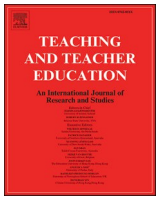
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Research paper



How pre-service physical education teachers' motivational profiles shape their (de)motivating teaching profiles

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ABSTRACT

Following a cross-sectional design with 554 pre-service physical education teachers (M_{age} = 25.03 years-old; *SD* = ± 4.31; 67.8 % male), this study aimed to identify their motivational and teaching profiles and examine the relationships between them. Four distinct motivational profiles and four teaching profiles emerged. More self-determined motivational profiles were associated with more adaptive teaching profiles. Conversely, less self-determined motivational profiles were linked to less adaptive teaching profiles. These findings underscore the importance of fostering self-determined motivation in teacher education programs to promote more motivating teaching approaches and better student outcomes.

1. Introduction

During physical education teacher education (PETE), pre-service physical education (PE) teachers are expected to acquire a set of knowledge and skills that will help them teach in the future (Ferry, 2018; Richards & Templin, 2018). However, in PETE, pre-service PE teachers not only develop knowledge and skills, they also shape their personal motivation to teach (Kaplan & Madjar, 2017; López-García et al., 2023). Some pre-service PE teachers may feel readily passionate about teaching, truly enjoying being able to help their students develop their skills, while others may feel more pressured to do well or to meet the expectations of others. Grounded in Self-Determination Theory (SDT; Ryan & Deci, 2017), recent research highlights the significance of motivational differences in pre-service PE teachers (Mayo-Rota et al., 2025). These differences appear to be crucial not only for teachers' own well-being (Abós et al., 2019; Abós, Haerens, et al., 2018; Van den Berghe et al., 2014), but also for shaping how pre-service teachers interact with their students (Kaplan & Madjar, 2017; Mayo-Rota et al., 2025). For instance, pre-service teachers who truly enjoy teaching appear to interact with students in a more motivating way (Mayo-Rota et al., 2025), a pattern also observed in in-service teachers (García-Cazorla et al., 2024; Slemp et al., 2020).

Evidence suggests that in-service PE teachers exhibit different motivational profiles depending on how they combine various types of motivation towards teaching (Abós et al., 2019; Abós, Haerens, et al., 2018; Van den Berghe et al., 2014). Likewise, they may adopt diverse ways of interacting with their students, resulting in distinct teaching profiles (Burgueño, García-González, et al., 2024; García-González et al., 2023; Haerens et al., 2018). However, such evidence is generally lacking among pre-service teachers. To date, only one study has examined pre-service teachers' motivational profiles (Wang & Liu, 2008) and no studies have explored their teaching profiles. This gap is significant because research on pre-service teachers is highly valuable, not only because their teaching profiles may differ from in-service teachers due to limited classroom experience, but also because this stage is formative, when motivation and teaching styles are still developing and most amenable to change. The present study addresses this gap by examining how combinations of pre-service PE teachers' motivation to teach (i.e., motivational profiles) are related to combinations of their teaching profiles, defined by the extent to which they employ different (de) motivating teaching styles. Expanding research in this area could provide valuable insights to inform and enhance PETE programs, helping to better prepare pre-service teachers for the motivational and pedagogical demands of the profession.

1.1. Motivation to teach

Under the premise of SDT (Ryan & Deci, 2017, 2020), motivation to

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teach is understood as a continuum flowing from greater self-determined forms of motivation (i.e., intrinsic motivation) to less self-determined forms of motivation (i.e., extrinsic motivation) and amotivation. At the most self-determined end lies intrinsic motivation, where pre-service PE teachers engage in teaching because they find it inherently enjoyable and satisfying. Next comes extrinsic motivation, where teaching is performed as a means to an end. Within extrinsic motivation, several regulations reflect different degrees of self-determination. The most self-determined of these is identified regulation, whereby pre-service teachers value teaching and recognize its relevance for their personal or professional growth. Further along the continuum and less self-determined is introjected regulation, in which teaching is driven by internal pressures such as the desire to avoid guilt or to preserve self-worth. This form of motivation reflects partial self-determination but is still experienced as internal pressure. The least self-determined form of extrinsic motivation is external regulation, where teaching is motivated by external rewards or expectations such as salary, vacation benefits, job security, or social approval. Together, intrinsic motivation and identified regulation constitute autonomous motivation, characterized by volition and self-determination. In contrast, introjected and external regulation fall under controlled motivation, as they involve internal or external pressures and reduced self-determination (Ryan & Deci, 2017, 2020). At the opposite end of the continuum is amotivation, characterized by the absence of motivation and lack of commitment and intention to work as a PE teacher. Pre-service PE teachers experiencing amotivation may not see the value in teaching, feel incapable of influencing student outcomes, or lack a clear reason for pursuing the profession.

Previous person-centered studies have shown that both in- and pre-service PE teachers can combine different motivational regulations to teach to different degrees, resulting in diverse motivational profiles (Abós et al., 2019; Abós, Haerens, et al., 2018; Van den Berghe et al., 2014; Wang & Liu, 2008). Among general pre-service teachers, Wang and Liu (2008) identified four motivational profiles ranging from profiles with high intrinsic motivation, identified, and introjected regulations and low levels of external regulation and amotivation to profiles marked by low levels of intrinsic motivation, identified, and introjected regulations and high levels of external regulation and amotivation. This demonstrates that even before entering the profession, pre-service PE teachers show distinct motivational profiles to teach. For in-service general education teachers, Abós, Haerens et al. (2018) found a four-profile solution, varying in the relative combination of autonomous (i.e., intrinsic motivation and identified regulation) and controlled (i.e., introjected and external regulations) motivation and amotivation. Most profiles reflected meaningful differences in the balance between the two forms of motivation, while amotivation levels remained low in three of the four groups. Focusing on in-service PE teachers, Abós et al. (2019) identified four profiles closely resembling those found by Abós, Haerens, et al. (2018). Lastly, although Van den Berghe et al. (2014), did not assess amotivation, they identified four profiles among in-service PE teachers based on intrinsic, identified, introjected, and external regulations, which also aligned closely with the configurations found in both in-service (Abós et al., 2019; Abós, Haerens, et al., 2018) and pre-service (Wang & Liu, 2008) samples.

As shown, the motivational profiles of pre- and in-service PE teachers share similarities, particularly in the diversity of motivation types, such as varying levels of autonomous and controlled motivation (Abós et al., 2019; Abós, Haerens, et al., 2018; Van den Berghe et al., 2014; Wang & Liu, 2008). However, pre-service teachers tend to show higher external regulation and amotivation compared to in-service teachers, who often demonstrate more stable autonomous motivation, likely due to their professional experience (Abós et al., 2019; Abós, Haerens, et al., 2018; Van den Berghe et al., 2014; Wang & Liu, 2008). Importantly, these motivational profiles have been associated with different outcomes for teachers (e.g., engagement, burnout, teaching practices, etc.), including their teaching practices (Abós et al., 2019; Abós, Haerens, et al., 2018; Van den Berghe et al., 2014). Motivational profiles characterized by high autonomous motivation or even high controlled motivation and low motivation tend to be the most adaptive, associated with greater engagement in the teaching profession and more motivating teaching practices for students (Abós et al., 2019; Abós, Haerens, et al., 2018; Van den Berghe et al., 2014; Wang & Liu, 2008). Conversely, profiles marked by low autonomous motivation, moderate-high controlled motivation, and moderate-high amotivation are less adaptive, linked to lower engagement, a higher risk of burnout, and less motivating teaching practices (Abós et al., 2019; Abós, Haerens, et al., 2018; Van den Berghe et al., 2014).

1.2. *Motivating and demotivating teaching styles*

According to SDT (Deci & Ryan, 1985; Ryan & Deci, 2017), teachers, through their teaching style, play a crucial role in shaping the quality of students' motivation by either supporting or thwarting their basic psychological needs (Vasconcellos et al., 2020). These needs encompass autonomy, defined as the experience of acting with a sense of volition, perceived choice, and internal locus of causality; competence, which refers to feelings of effectiveness, achievement, and mastery; and relatedness, defined as the sense of being meaningfully connected to others through mutual care, warmth, and bonding. The recent development of the SDT-based circumplex model (Aelterman et al., 2019; Escriva-Boulley et al., 2021), provides an integrative and detailed perspective of different (de)motivating styles and approaches that explain the way PE teachers teach. This circumplex model is organized around a circle crossed by a horizontal axis (i.e., students' need-support vs need-thwarting) and a vertical axis (i.e., high vs low directiveness), establishing four (de)motivating teaching styles, each divided into two different approaches.

An autonomy-supportive style (i.e., need-support and low directiveness) is characterized by encouraging students' initiative and responsibility. This can be achieved through a participative approach, for which teachers offer students opportunities to make choices and take decisions regarding their learning, and/or an attuning approach, for which teachers emphasize the relevance of learning tasks and adapt to students' interests and preferences (Burgueño, Abós, et al., 2024; Escriva-Boulley et al., 2021). A structuring style (i.e., need-support and high directiveness) is based on supporting and guiding the teaching-learning process and helping students to feel competent. This is accomplished through a guiding approach, which includes providing informative feedback and support for progress, and/or a clarifying approach, which involves clearly outlining expectations and learning objectives (Burgueño, Abós, et al., 2024; Escriva-Boulley et al., 2021).

A controlling style (i.e., low need-support and high directiveness) is defined by pressuring students to think, behave, feel or perform a task in a certain way. This can take the form of a demanding approach, for which teachers rely on threats, sanctions, rewards, and the use of an aggressive tone or language, and/or a domineering approach, which involves inducing feelings of guilt, shame, or anxiety (Burgueño, Abós, et al., 2024; Escriva-Boulley et al., 2021). A chaotic style (i.e., low need-support and low directiveness) is based on indifference and a laissez-faire attitude. This style may involve an abandoning approach, in which teachers ignore students and shift full responsibility for learning onto them, and/or an awaiting approach, where planning is lacking, excessive freedom is granted, and the teacher passively waits to see how situations unfold (Burgueño, Abós, et al., 2024; Escriva-Boulley et al., 2021).

Person-centered studies on teaching profiles provide valuable evidence on how in-service PE teachers combine different teaching styles, based on both students' (Burgueño, García-González, et al., 2024; Diloy-Peña et al., 2025; Fierro-Suero et al., 2024; García-González et al., 2023; Haerens et al., 2018; Leo et al., 2022) and teachers' perspectives (García-Cazorla et al., 2025). For instance, Haerens et al. (2018), identified four teaching profiles based on autonomy support and control,

showing combinations that ranged from highly autonomy-supportive with low control to low autonomy-support with high control. Similarly, Burgueño, García-González, et al. (2024) and Leo et al. (2022) reported four distinct teaching profiles characterized by varying degrees of need-support and need-thwarting (i.e., degrees of support/thwarting of autonomy, competence and, relatedness), ranging from high need-support combined with low need-thwarting to low need-support combined with high need-thwarting profiles. Furthermore, García--González et al. (2023), focused on teacher directiveness (i.e., structuring and controlling styles), thereby identifying profiles that combine different levels of competence support (i.e., structure) with varying levels of control. In a more nuanced six-profile model, Fierro-Suero et al. (2024) combined autonomy-supportive, structuring, and controlling styles, revealing complex combinations, such as high need-support with high control, or low need-support with high control. Using the circumplex model, Diloy-Peña et al. (2025) identified eight student-perceived teaching profiles by crossing high-directiveness (i.e., structure and control) with low-directiveness (i.e., autonomy support and chaos). These profiles ranged from very high structure combined with very high control to very high autonomy-support combined with very low chaos, offering a fine-grained view of how students experience different teaching combinations. From the teachers' perspective, García-Cazorla et al. (2025) reported four self-perceived teaching profiles that blended structuring, autonomy-supportive, and controlling teaching approaches. These ranged from a highly structuring and autonomy-supportive profile with low control, to moderately structuring profiles with varying levels of autonomy support and control. Despite differences in frameworks and terminology, all these studies converge on the idea that motivating and demotivating teaching styles coexist dynamically to different degrees, with many teachers displaying hybrid profiles mixing different (de) motivating teaching styles at different intensities.

These identified teaching profiles not only characterize in-service PE teachers, but also have a significant impact on the motivational outcomes of PE students. Profiles characterized by high levels of need-supportive (including autonomy support or competence support) and low levels of need-thwarting teaching styles (including control) were associated with greater students' need satisfaction, higher autonomous motivation, and lower need frustration, controlled motivation, and amotivation (Burgueño, García-González, et al., 2024; Diloy-Peña et al., 2025; Fierro-Suero et al., 2024; García-González et al., 2023; Haerens et al., 2018; Leo et al., 2022). In contrast, profiles with low levels of need-supportive and high levels of need-thwarting teaching styles showed the opposite pattern, with lower need satisfaction and autonomous motivation, and higher need frustration, controlled motivation, and amotivation (Burgueño, García-González, et al., 2024; Diloy-Peña et al., 2025; Fierro-Suero et al., 2024; García-González et al., 2023; Haerens et al., 2018; Leo et al., 2022). Although the motivational outcomes for PE students have been well documented in relation to these antagonistic teaching profiles, there is no consensus on the teaching profiles that might exist between these opposing poles or their potential impact on students. None of these studies have relied on the eight (de) motivating teaching approaches of the circumplex model (Aelterman et al., 2019; Escriva-Boulley et al., 2021) to examine how teachers combine different teaching styles. Additionally, teaching profiles in pre-service teachers have not been explored, highlighting a current gap in profile analyses using this model in this specific population.

1.3. Associations between motivation to teach PE and (de)motivating teaching styles

Variable-centered research grounded in SDT and the circumplex model among in-service PE teachers has shown that autonomous motivation is positively associated with participative and attuning (i.e., autonomy-supportive style), and guiding and clarifying (i.e., structuring style) approaches, and negatively with abandoning approaches (i.e., chaotic style) (Escriva-Boulley et al., 2021; García-Cazorla et al., 2024; Slemp et al., 2020). In contrast, controlled motivation has been positively associated with demanding and domineering (i.e., controlling style), and abandoning (i.e., chaotic style) approaches (Escriva-Boulley et al., 2021; Vermote et al., 2020), while being negatively associated with participative and attuning approaches (i.e., autonomy-support) (Slemp et al., 2020; Vermote et al., 2020). Similarly, amotivation has been positively related to demanding and domineering (i.e., controlling style) and abandoning (i.e., chaotic style) approaches (Escriva-Boulley et al., 2021; Vermote et al., 2020).

Most of the previously cited studies adopted a conventional variable-centered approach. Although these studies provide valuable insights into the association of autonomous, controlled motivation and amotivation with PE teachers' (de)motivating teaching styles as separate variables, they overlook the dynamic interaction among the various (de) motivating teaching styles. A couple of studies have explored whether teachers' way of interacting with students differ according to their motivational profiles (Abós, Haerens, et al., 2018; Van den Berghe et al., 2014). For instance, Van den Berghe et al. (2014), found that teachers with a motivational profile combining high autonomous and low controlled motivation used more autonomy-supportive and structured teaching styles compared to those with moderate autonomous and low/high controlled motivation. However, no significant differences were observed between the high autonomous and low controlled motivation group and the high autonomous and high controlled motivation. Similarly, the high autonomous and high controlled motivation group showed no significant differences compared to the moderate autonomous and high controlled motivation group and to the moderate autonomous and low controlled motivation group. Notably, teachers in the moderate autonomous and high controlled motivation group exhibited the lowest levels of autonomy-support and structure. Abós, Haerens, et al. (2018), who included amotivation in their analysis, reported similar findings. Teachers combining high autonomous motivation with low amotivation, regardless of their level of controlled motivation, provided more autonomy-support and structure than those combining low autonomous motivation, moderate controlled motivation, and high amotivation. Nevertheless, both studies (Abós, Haerens, et al., 2018; Van den Berghe et al., 2014) highlight the need for further research to investigate the (in)active role of controlled motivation when combined with autonomous motivation on control and chaos, as these studies only focused on autonomy-supportive and structuring styles. In this sense, García-Cazorla et al. (2025) provided novel evidence on the role of controlling teaching approaches by examining differences in teachers' motivation based on their teaching profiles. Specifically, the findings indicate that when teachers adopt high levels of autonomy-supportive and structuring approaches, the simultaneous inclusion of high controlling approaches is associated with increased levels of introjected and external regulations (i.e., controlled motivation) and, notably, higher levels of amotivation. In contrast, profiles characterized by similarly high autonomy-supportive and structuring approaches but low levels of controlling approaches display lower levels of controlled motivation and amotivation. Moreover, while these aspects remain open in in-service teachers, they are entirely unexplored in pre-service teachers.

1.4. The present study

Previous SDT variable-centered studies have highlighted the importance of pre-service PE teachers' motivation to teach for the quality of their teaching (Kaplan & Madjar, 2017; Mayo-Rota et al., 2025). Similarly, person-centered studies demonstrated how motivational profiles of in-service PE teachers show differences in teaching practices (Abós, Haerens, et al., 2018; Van den Berghe et al., 2014). Nevertheless, these studies have examined the relationship between motivational profiles and (de)motivating teaching styles as separate dimensions, without exploring how these aspects might combine in practice. This is particularly relevant considering that teachers often

integrate both motivating and demotivating strategies in their teaching. Therefore, it becomes essential to explore how different motivational profiles relate to specific combinations of (de)motivating teaching approaches, giving rise to distinct teaching profiles. This is particularly relevant during the pre-service stage, as PETE programs have the potential to shape motivation to teach and promote more motivating teaching approaches before these become ingrained. Although person-centered studies with in-service PE teachers have shown the coexistence of multiple (de)motivating teaching styles (Burgueño, García-González, et al., 2024; Diloy-Peña et al., 2025; Fierro-Suero et al., 2024; García-González et al., 2023; Haerens et al., 2018; Leo et al., 2022) no study to date has simultaneously examined motivational and (de)motivating teaching profiles in pre-service PE teachers using a circumplex model approach. Furthermore, no existing research based on the circumplex model has analyzed the eight (de)motivating teaching approaches together. Consequently, research clarifying how pre-service PE teachers' motivational profiles relate to their (de)motivating teaching profiles could contribute to a more accurate and individualized PETE.

To bridge this gap in the scientific literature, this study pursued three main aims. The first aim was to identify the potential combinations of pre-service PE teachers' motivation to teach (i.e., intrinsic motivation, identified regulation, introjected regulation, external regulation, and amotivation). According to previous studies in pre-service (Wang & Liu, 2008) and in-service teachers (Abós et al., 2019; Abós, Haerens, et al., 2018; Van den Berghe et al., 2014), it was hypothesized that four distinct motivational profiles would emerge: (1) good quality motivation (i.e., high intrinsic motivation and identified regulation, low introjected and external regulation, and low amotivation); (2) high quantity motivation (i.e., high intrinsic motivation and identified regulation, high introjected and external regulation, and low amotivation); (3) poor quality motivation (i.e., low intrinsic motivation and identified regulation, high introjected and external regulation, and low amotivation); and (4) lack of motivation (i.e., low intrinsic motivation and identified regulation, low introjected and external regulation, and high amotivation).

The second aim was to determine the combinations of pre-service PE teachers' motivating (i.e., participative, attuning, guiding and clarifying) and demotivating (i.e., demanding, domineering, abandoning and awaiting) teaching approaches. In line with previous studies (Burgueño, García-González, et al., 2024; Fierro-Suero et al., 2024; García-González et al., 2023; Haerens et al., 2018; Leo et al., 2022), it was hypothesized that the combination of teaching approaches would lead to a minimum of four teaching profiles: (1) high need-support and low need-thwarting; (2) low need-support and high need-thwarting; and two (3 and 4) or even three (5) additional profiles with varying levels of need-support, need-thwarting, and directiveness.

The third aim was to explore the relationship between the motivational profiles and the teaching profiles among pre-service PE teachers. In line with SDT-based research (Abós, Haerens, et al., 2018; Van den Berghe et al., 2014), it was hypothesized that profiles marked by high autonomous motivation and low controlled motivation and low amotivation would relate to teaching profiles characterized by high need-support and low need-thwarting. Conversely, profiles marked by high controlled motivation and amotivation were expected to align with teachings profiles characterized by low need-support and high need-thwarting.

2. Method

2.1. Participants and procedures

In the Spanish context, becoming a secondary PE teacher requires first obtaining a Bachelor's Degree in Physical Activity and Sport Sciences, followed by a one-year, 60-credit Master's Degree in PETE. This program combines theoretical and practical training that progresses over two academic semesters. During the first semester, students receive instruction on pedagogical foundations, didactics, and curriculum design. In the second semester, they engage in subject-specific training in PE and complete a mandatory teaching practicum. This practicum lasts approximately seven weeks and takes place in secondary schools, where pre-service teachers teach in real educational settings under the supervision of an in-service teacher and a university tutor.

In the present cross-sectional study, a purposive and non-probabilistic sample of 544 secondary education pre-service PE teachers (M_{age} = 25.03 years-old; $SD = \pm$ 4.31; 67.8 % male) studying the Master's Degree in PETE at 32 different Spanish universities participated. Prior to the study, the principal researcher contacted the coordinators of these 32 Spanish universities to inform them about the study's aim and request their collaboration. Afterward, a Google Forms link to the questionnaire was provided for the coordinators to distribute among their students. The link included a brief explanation of the study's aims, the contact details of the principal researcher, and an informed consent form, emphasizing that participation was voluntary and anonymous. The online questionnaire took approximately 15 min to complete and blank answers were not allowed. Answers were collected after the mandatory practicum period (i.e., internship) of the Master's Degree in PETE, just before the end of the academic year. The study was approved by the Ethics Committee of the University of Zaragoza.

2.2. Instruments

Motivation to teach. The Spanish version of the Motivation Scale for Teaching in Secondary Education (EME-ES; Abós, Sevil, et al., 2018), adapted to the PE teaching context, was used to measure pre-service PE teachers' motivation to teach. This scale begins with the sentence "I get involved in teaching PE, because … " followed by 19 items, which assessed intrinsic motivation (four items: e.g., "teaching is fun"), identified regulation (four items: e.g., "teaching helps me learn new things"), introjected regulation (four items: e.g., "I want to give others the impression that I am a good teacher"), external regulation (four items: e.g., "it is assumed that I should do this"), and amotivation (three items: e.g., "I don't know why I am a PE teacher, it is a useless job"). Answers were provided on a five-point Likert scale, ranging from 1 "strongly disagree" to 5 "strongly agree". The five-factor CFA showed a good fit to the data χ^2 (136, n = 544) = 327.465, $p < .001$; CFI = .930; TLI = .913; SRMR = .053; RMSEA = .051; 90 % CI = .044 - .058. Standardized factor loadings ranged from .58 to .67 for intrinsic motivation, .52 to .75 for identified regulation, .35 to .43 for introjected regulation, .50 to .56 for external regulation, and .60 to .65 for amotivation.

(De)motivating teaching approaches. The Spanish version of the Situations in School Questionnaire-Physical Education (SIS-PE; Burgueño, Abós, et al., 2024) was used to evaluate pre-service PE teachers' perception of their (de)motivating teaching approaches. The SIS-PE includes 12 situations, with four items each (i.e., 48 items in total), that usually occur in the PE lessons. Of the 48 items, four measure participative approaches, eight measure attuning approaches, seven measure guiding approaches, five measure clarifying approaches, seven measure demanding approaches, five measure domineering approaches, eight measure abandoning approaches, and four measure awaiting approaches. An example of a situation is: "In preparing for your class, you develop a lesson plan. Your priority is to …", with four ways of answering: (1) "offer challenges to the best students and provide sufficient support to exceptional students throughout their learning" (i.e., guiding approach); (2) "don't plan the lesson too much. It will unfold on its own" (i.e., awaiting approach); (3) "propose exercises that are pleasant, interesting, or very attractive" (i.e., attuning approach); (4) "propose a lesson plan for all students to follow. There are no exceptions or excuses" (i.e., demanding approach). Answers were recorded on a seven-point Likert scale, ranging from 1 "it does not describe me at all" to 7 "it describes me perfectly". The eight-factor confirmatory factor analysis (CFA) showed a good fit to the data χ^2 (224, n = 544) =

491.634, $p < .001$; CFI = .925; TLI = .907; SRMR = .052; RMSEA = .047; 90 % CI = .041 - .052. Standardized factor loadings ranged from .40 to .56 for the participative approach, .62 to .71 for the attuning approach, .34 to .83 for the guiding approach, .47 to .63 for the clarifying approach, .54 to .68 for the demanding approach, .62 to .76 for the domineering approach, .74 to .83 for the abandoning approach, and .38 to .73 for the awaiting approach.

2.3. Data analysis

Before conducting the main analyses, means, composite reliability (i.e., McDonald's omega ω), Pearson's correlations, and CFAs were calculated for all study variables using SPSS 26.0 and MPLUS 8.0 respectively. For the first two aims, two latent profile analyses (LPAs) were performed: the first to identify potential combinations of the five motivations to teach, and the second to determine potential combinations of the eight (de)motivating teaching approaches. Standardized scores were calculated for each type of motivation and each (de)motivating teaching approach. In both LPAs, the analysis started with a two-profile model, progressively adding profiles up to a total of six. Each model was estimated with 5000 random start values, 1000 iterations, and 200 final optimizations. Notably, gender was included as a covariate (see Tables 7 and 8 of supplementary files). The selection of the best-fitting model was guided by theoretical coherence, interpretability, and widely accepted statistical guidelines (Weller et al., 2020). Specifically, Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC), and Sample-Sized Adjusted Bayesian Information Criterion (SSA-BIC) were used as comparative fit criteria, with lower values indicating better model fit (Weller et al., 2020). In addition, a significant p-value ($p < .05$) from Lo-Mendell-Rubin Likelihood Ratio Test (LMRT), served as a statistical test to assess whether a model with k profiles provided a significantly better fit than a model with k - 1 profiles (Weller et al., 2020). Furthermore, entropy values above .80 were interpreted as indicative of accurate profile classification (Weller et al., 2020). Finally, profiles representing fewer than 5 % of the sample were excluded to avoid the risk of over-extraction and ensure the robustness of the solution (Weller et al., 2020). These analyses were conducted with the robust maximum-likelihood (MLR) estimator in MPLUS 8.0 (Muthén & Muthén, 2017).

For the third aim, to examine whether the profiles of motivation are associated with the (de)motivating teaching profiles, contingency table analyses were performed using adjusted residuals (*AR*), Pearson chi-square test (χ^2), Phi coefficient (φ), and Cramer's V (v) in SPSS 26.0. The statistical significance level was $p < .05$. Adjusted residual above 2 or below −2 indicated an association between the categorical variables. Likewise, Phi coefficient and Cramer's V values above .25 are considered indicative of very strong association values between variables (Agresti, 2013).

3. Results

3.1. Preliminary results

Table 1 reports the descriptive statistics, composite reliability, and Pearson's correlations for the study variables.

3.2. Profiles based on pre-service PE teachers' motivation to teach (Aim 1)

Table 2 reports fit indexes for the different LPA solutions for pre-service PE teachers' motivation to teach. As shown, the 4-profiles solution reported low AIC, BIC, and SSA-BIC values, significance in the LMRT, entropy values above .80, and none of its four profiles included less than 5 % of participants. Consequently, the 4-profiles solution was retained for further analysis.

The configuration of the 4-profiles solution is shown in Fig. 1 and detailed in Table 3. Profile 1 (n = 229; 42.10 %), labelled as "good quality motivation", included those pre-service PE teachers with above-average scores in intrinsic motivation and identified regulation, and the lowest scores on introjected regulation, external regulation, and amotivation. Profile 2 (n = 180; 33.09 %), termed "high quantity motivation", comprised pre-service PE teachers with the highest scores in intrinsic motivation, identified, introjected, and external regulations, alongside slightly below-average scores in amotivation. Profile 3 (n = 78; 14.34 %), labelled as "low quantity motivation", included pre-service PE teachers with the lowest scores in intrinsic motivation and identified regulation, as well as below-average scores in introjected and external regulations, and amotivation. Finally, profile 4 (n = 57; 10.48 %), described as "poor quality", consisted of pre-service PE teachers with the lowest levels of intrinsic motivation, below-average levels of identified regulation, slightly above-average levels of introjected regulation, and the highest levels of external regulation and amotivation.

3.3. Profiles based on pre-service PE teachers' (de)motivating approaches (Aim 2)

Table 4 reports fit indices for the different LPA solutions for pre-service PE teachers' perception of their (de)motivating teaching approaches. As observed, the 4-profiles solution exhibited low AIC, BIC, and SSA-BIC values, significance in the LMRT, entropy values above .80, and none of its four profiles included less than 5 % of participants. Consequently, the 4-profiles solution was retained for further analysis.

Configuration of the 4-profiles solution is shown in Fig. 2 and described in Table 5. Profile 1 (n = 128, 23.53 %), labelled as "purely

Table 1
Descriptive statics, standard deviations, reliability, and bivariate correlations between the study variables.

Variables	M (SD)	(ω)	1	2	3	4	5	6	7	8	9	10	11	12
Motivation to teach (range: 1–5)														
1. Intrinsic	4.47 (.54)	.81	–											
2. Identified	4.48 (.56)	.77	.62***	–										
3. Introjected	2.85 (.99)	.60	.14**	.23***	–									
4. External	2.02 (.79)	.63	−.04	.01	.59***	–								
5. Amotivation	1.16 (.34)	.64	−.36***	−.31***	.13**	.36***	–							
(De)motivating teaching approaches (range: 1–7)														
6. Participative	5.15 (.88)	.44	.21***	.18***	−.01	−.06	−.05	–						
7. Attuning	5.90 (.60)	.72	.38***	.38***	−.01	−.09*	−.33***	.46***	–					
8. Guiding	5.93 (.60)	.69	.30***	.29***	.06	−.07	−.27***	.26***	.59***	–				
9. Clarifying	5.55 (.75)	.61	.25***	.27***	.18***	.12**	−.08	.14***	.39***	.45***	–			
10. Demanding	3.62 (.92)	.66	−.06	−.04	.24***	.32***	.25***	−.15***	−.13**	−.01	.31***	–		
11. Domineering	2.69 (1.07)	.72	−.10*	−.06	.27***	.43***	.32***	−.17***	−.23***	−.13**	.21***	.65***	–	
12. Abandoning	1.67 (.67)	.79	−.23***	−.24***	.13***	.32***	.45***	−.18***	−.49***	−.41***	−.14***	.37***	.53***	–
13. Awaiting	2.46 (.89)	.56	−.13**	−.18***	.05	.12**	.26***	.11***	−.29***	−.27***	−.16***	.21***	.33***	.49***

Note: Correlations were significant at the ***$p < .001$, **$p < .01$, *$p < .05$.

Table 2
Fit indexes, entropy, and model comparisons for pre-service motivation to tech latent profiles.

Model	AIC	BIC	SSA-BIC	LMRT(*p*)	Entropy	Participants by profile	Np<5 %
2 profiles	6786.43	6859.51	6805.55	.002	.990	477; 67	0
3 profiles	6539.45	6642.62	6566.44	.028	.823	66; 294; 184	0
4 profiles	***6330.14***	***6463.41***	***6365.00***	***.003***	***.828***	***229; 180; 78; 57***	***0***
5 profiles	6063.63	6226.99	6106.37	<.001	.893	66; 262; 149; 14; 53	1
6 profiles	5978.95	6172.40	6029.55	.115	.864	52; 66; 208; 53; 151; 14	1

Note: AIC: Akaike Information Criterion; BIC: Bayesian Information Criterion; SSA-BIC: Sample-Size Adjusted BIC; LMRT: Lo–Mendell– Rubin Likelihood Ratio Test; Np < 5 %: number of profiles with <5 % of participants. Analyses controlled by gender.

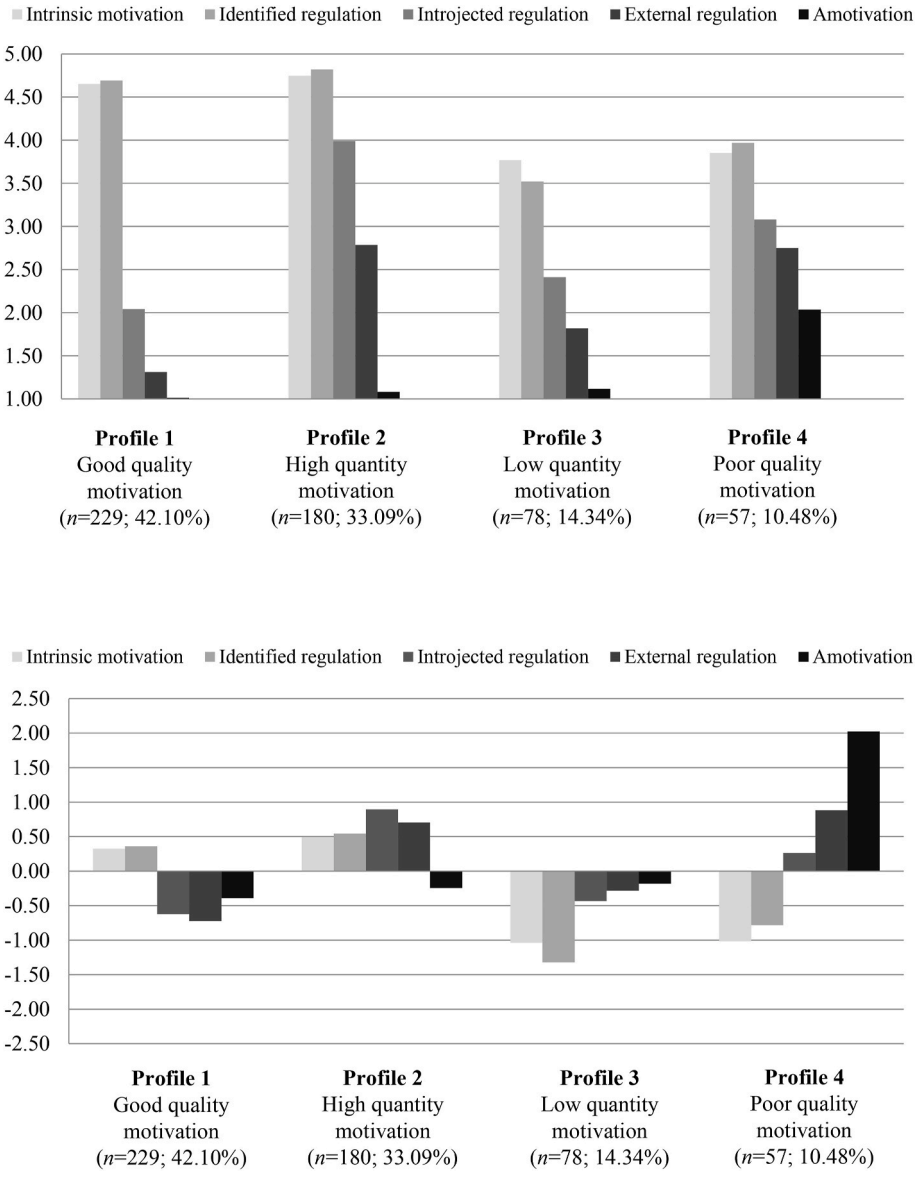


Fig. 1. Description of the four latent profiles of motivation to teach based on raw (upper panel) and standardized scores (lower panel).

need-supportive", included pre-service PE teachers with the highest scores in participative, attuning and guiding approaches, as well as the lowest in demanding, domineering, abandoning, and awaiting approaches. Profile 2 (n = 159, 29.23 %), labelled as "high need-supportive - high directiveness", comprised pre-service PE teachers with average scores in participative approach, above-average scores in attuning and guiding, the highest scores in clarifying, demanding, and domineering approaches, and below-average scores in abandoning and awaiting approaches. Profile 3 (n = 162, 29.78 %), labelled as "moderate need-supportive - moderate directiveness", included pre-service PE teachers with below-average scores in participative, attuning, guiding, clarifying, demanding, domineering, and abandoning approaches, and average scores in awaiting approach. Finally, Profile 4 (n = 95, 17.46 %), termed "high need-thwarting", included pre-service PE teachers

Table 3
Mean differences of preservice PE teachers' motivation to teach latent profiles.

	Profile 1 (n = 229) (42.10 %) Good quality motivation	**Profile 2** (n = 180) (33.09 %) High quantity motivation	**Profile 3** (n = 78) (14.34 %) Low quantity motivation	**Profile 4** (n = 57) (10.48 %) Poor quality motivation
Motivation to teach				
Autonomous motivation				
Intrinsic motivation				
Raw scores (1–5)	4.65 (.03)^{2c3a4a}	4.75 (.03)^{1c3a4a}	3.77 (.06)^{1a2a}	3.85 (.07)^{1a2a}
Z–scores	0.33 (.07)^{2c3a4a}	0.49 (.06)^{1c3a4a}	−1.04 (.12)^{1a2a}	−1.02 (.17)^{1a2a}
Identified regulation				
Raw scores (1–5)	4.69 (.03)^{2b3a4a}	4.82 (.03)^{1b3a4a}	3.52 (.06)^{1a2a4a}	3.97 (.08)^{1a2a3a}
Z–scores	0.36 (.05)^{2b3a4a}	0.54 (.05)^{1b3a4a}	−1.32 (.15)^{1a2a4a}	−0.78 (.17)^{1a2a3a}
Controlled motivation				
Introjected regulation				
Raw scores (1–5)	2.04 (.06)^{2a3a4a}	3.99 (.06)^{1a3a4a}	2.41 (.09)^{1a2a4a}	3.08 (.05)^{1a2a3a}
Z–scores	−0.63 (.11)^{2a3a4a}	0.89 (.09)^{1a3a4a}	−0.43 (.10)^{1a2a4a}	0.26 (.10)^{1a2a3a}
External regulation				
Raw scores (1–5)	1.31 (.04)^{2a3a4a}	2.79 (.06)^{1a3a}	1.82 (.06)^{1a2a4a}	2.75 (.08)^{1a3a}
Z–scores	−0.72 (.07)^{2a3a4a}	0.70 (.13)^{1a3a}	−0.28 (.09)^{1a2a4a}	0.88 (.11)^{1a3a}
Amotivation				
Raw scores (1–5)	1.01 (.01)^{2a3a4a}	1.08 (.02)^{1a4a}	1.12 (.02)^{1a4a}	2.04 (.04)^{1a2a3a}
Z–scores	−0.39 (.02)^{2a3a4a}	−0.25 (.05)^{1a4a}	−0.18 (.06)^{1a4a}	2.02 (.15)^{1a2a3a}

Note: Numbers in superscript indicate significant profile differences: $^{a}p < .001$, $^{b}p < .01$, $^{c}p < .05$.

with the lowest scores in participative, attuning, guiding and clarifying approaches, and the highest scores in demanding, domineering, abandoning and awaiting approaches.

3.4. Associations between pre-service PE teachers' motivation to teach profiles and (de)motivating teaching profiles (Aim 3)

Overall, the Pearson chi-square test ($\chi^2 = 121.74$; $p < .001$), Phi coefficient ($\varphi = .473$; $p < .001$), and Cramer's V ($v = .273$; $p < .001$) revealed a significant association between pre-service PE teachers' motivational profiles and their profiles of (de)motivating teaching approaches.

The pairwise comparisons of the profiles are presented in Table 6. Specifically, pre-service teachers in motivational profile 1 (i.e., good quality motivation) were more likely to display teaching profile 1 (i.e., purely need-supportive; $AR = 4.9$), and less likely to belong to teaching profile 4 (i.e., high need-thwarting; $AR = -4.1$). Second, motivational profile 2 (i.e., high quantity motivation) was positively associated with teaching profile 2 (i.e., high need-supportive - high directiveness; $AR = 4.9$) and negatively associated with teaching profile 3 (i.e., moderate need-supportive - moderate directiveness; $AR = -2.5$), and profile 4 (i.e., high need-thwarting; $AR = -2.3$). Third, motivational profile 3 (i.e., low quantity motivation) was negatively associated with teaching profile 1 (i.e., purely need-supportive; $AR = -2.7$) and profile 2 (i.e., high need-supportive - high directiveness; $AR = -2.9$), but positively associated with teaching profile 3 (i.e., moderate need-supportive - moderate directiveness; $AR = 4.0$). Finally, motivational profile 4 (i.e., poor quality motivation) was negatively associated with teaching profile 1 (i.e., purely need-supportive; $AR = -4.1$) and profile 2 (i.e., high need-supportive - high directiveness; $AR = -2.0$), while being positively associated with teaching profile 4 (i.e., high need-thwarting; $AR = 8.1$).

4. Discussion

The present study, grounded in SDT (Ryan & Deci, 2017) and the circumplex model of teaching styles (Aelterman et al., 2019; Escriva--Boulley et al., 2021), identified four motivational profiles (Aim 1) and four (de)motivating teaching profiles (Aim 2) among pre-service PE teachers. Motivational profiles and teaching profiles were associated with each other in theoretically meaningful ways, suggesting that pre-service teachers' motivation to teach may be associated with how they interact with their students (Aim 3).

4.1. To what extent do pre-service PE teachers combine distinct types of motivation to teach? (Aim 1)

In relation to the first aim, four motivational profiles emerged from the LPA, aligning with the hypothesis and previous studies on in-service PE teachers (Abós et al., 2019; Van den Berghe et al., 2014) and pre-service teachers (Wang & Liu, 2008). It is promising that a large group of pre-service teachers (42.10 %) displayed a self-determined motivational profile (i.e., good quality motivation), a proportion considerably higher than the 26.5 % identified by Wang and Liu (2008) for a similar profile. This finding is encouraging, as it suggests that a significant proportion of pre-service PE teachers are entering the profession with personally endorsed and meaningful reasons for teaching. Based on previous literature, pre-service PE teachers with this profile may be less likely to experience burnout in the future and could be more engaged in their work, experiencing greater job satisfaction, feeling more energized, and being more involved in their tasks (Abós, Haerens, et al., 2018; Van den Berghe et al., 2014). In the second most prevalent profile (33.09 %), pre-service PE teachers combined a strong interest and enjoyment in teaching with high internal and external pressures to

Table 4
Fit indexes, entropy, and model comparisons for pre-service motivating approaches latent profiles.

Model	AIC	BIC	SSA-BIC	LMRT(p)	Entropy	Participants by profile	Np<5 %
2 profiles	11499.31	11611.09	11528.55	<.001	.842	410; 134	0
3 profiles	11258.67	11413.04	1398.76	.035	.771	250; 116; 178	0
4 profiles	***11008.65***	***11206.40***	***11060.38***	***<.001***	***.801***	***128; 159; 162; 95***	***0***
5 profiles	10902.09	11142.83	10965.07	.211	.831	150; 15; 120; 162; 97	1
6 profiles	10807.96	11091.69	10882.18	.185	.829	130; 113; 154; 25; 111; 11	2

Note: AIC: Akaike Information Criterion; BIC: Bayesian Information Criterion; SSA-BIC: Sample-Size Adjusted BIC; LMRT: Lo–Mendell–Rubin Likelihood Ratio Test; Np < 5 %: number of profiles with <5 % of participants. Analyses controlled by gender.

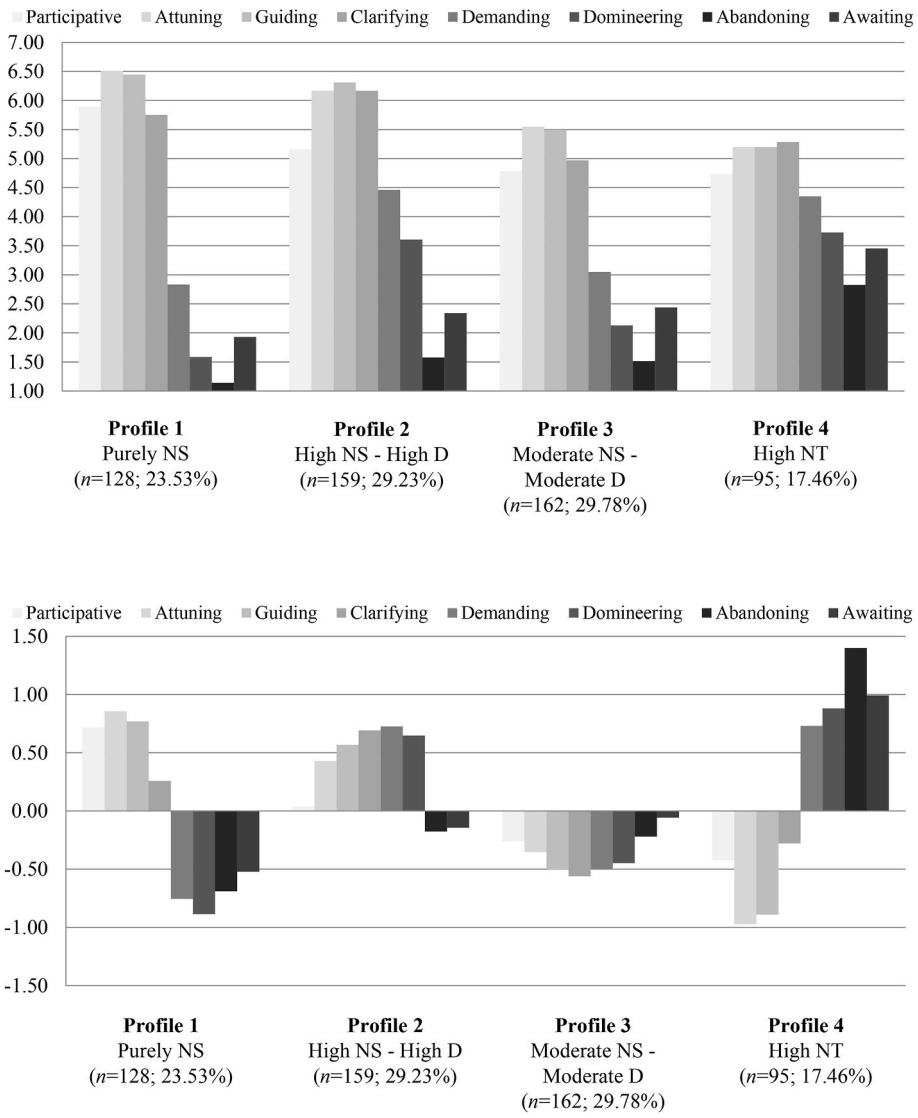


Fig. 2. Description of the four (de)motivating teaching approaches latent profiles based on raw (upper panel) and standardized scores (lower panel). Note: NS = need-supportive; D = directiveness; NT = need-thwarting.

excel as PE teachers (i.e., high quantity motivation). This configuration echoes the "high autonomous-high controlled motivation-low amotivation" profiles reported by Abós et al. (2019), Abós, Haerens, et al. (2018), and Wang and Liu (2008), and reflects a motivational pattern that may yield both adaptive and maladaptive outcomes. On the one hand, it could foster sustained effort and investment in the profession, but on the other hand, it may heighten vulnerability to stress and burnout if internal pressures are not adequately regulated (Abós et al., 2019; Abós, Haerens, et al., 2018; Van den Berghe et al., 2014). Therefore, while motivationally rich in quantity, this profile signals the importance of preparing pre-service teachers to manage performance pressure and to internalize professional values in a more autonomous manner. Together, these two profiles (i.e., profile 1 and 2) accounted for 75 % of the sample and were consistent with previous findings in in-service teachers (Abós et al., 2019; Abós, Haerens, et al., 2018; Van den Berghe et al., 2014).

The third motivational profile (14.3 %) consisted of pre-service PE teachers who neither find personal meaning in teaching, nor feel significant external pressure to pursue it. This low quantity motivation profile was not hypothesized a priori, as most previous studies had identified a different configuration, typically characterized by low autonomous motivation combined with high controlled motivation and low amotivation (Abós et al., 2019; Van den Berghe et al., 2014; Wang & Liu, 2008). However, it aligns with the findings of Abós, Haerens, et al. (2018), who also identified a profile similar to the one found here. The absence of strong motivation, whether self-determined or externally driven, may place this group at risk of disengagement, professional doubt, and long-term dissatisfaction with the teaching profession (Abós et al., 2019; Van den Berghe et al., 2014). These findings highlight the importance of detecting early signs of motivational detachment during PETE and offering strategies to foster meaningful engagement. Finally, in line with the hypothesis and previous research on both in-service teachers (Abós et al., 2019; Abós, Haerens, et al., 2018) and pre-service teachers (Wang & Liu, 2008), the fourth profile was characterized by pre-service PE teachers (10.5 %) who were not interested in teaching, perceived teaching as unbeneficial, yet still felt pressured by external factors such as family or friends to become PE teachers (i.e., poor quality motivation). Pre-service PE teachers within this poor quality motivation profile may show lower engagement with the profession in the future and may suffer from burnout (Abós, Haerens, et al., 2018; Wang & Liu, 2008). This reinforces the need for PETE programs to address not only the development of pedagogical skills but also the motivational regulations of becoming a teacher. Interestingly, the hypothesized profile characterized by a lack of motivation towards

Table 5
Mean differences of preservice PE teachers' (de)motivating approaches latent profiles.

	Profile 1 (n = 128) (23.53 %) Purely NS	**Profile 2** (n = 159) (29.23 %) High NS - High D	**Profile 3** (n = 162) (29.78 %) Mod NS -Mod D	**Profile 4** (n = 95) (17.46 %) High NT
(De)motivating approaches				
Participative approach				
Raw scores (1–7)	5.89 (.08)^{2a3a4a}	5.16 (.07)^{1a3a4a}	4.78 (.07)^{1a2a}	4.73 (.08)^{1a2a}
Z–scores	0.72 (.09)^{2a3a4a}	0.03 (.09)^{1a3a4a}	−0.26 (.09)^{1a2a}	−0.42 (.09)^{1a2a}
Attuning approach				
Raw scores (1–7)	6.51 (.04)^{2a3a4a}	6.17 (.04)^{1a3a4a}	5.55 (.04)^{1a2a4a}	5.20 (.06)^{1a2a3a}
Z–scores	0.86 (.08)^{2a3a4a}	0.43 (.08)^{1a3a4a}	−0.35 (.07)^{1a2a4a}	−0.97 (.12)^{1a2a3a}
Guiding approach				
Raw scores (1–7)	6.51 (.04)^{2b3a4a}	6.45 (.04)^{1b3a4a}	5.50 (.04)^{1a2a4b}	5.20 (.05)^{1a2a3b}
Z–scores	0.77 (.08)^{2b3a4a}	0.57 (.09)^{1b3a4a}	−0.51 (.08)^{1a2a4b}	−0.89 (.10)^{1a2a3b}
Clarifying approach				
Raw scores (1–7)	5.75 (.07)^{2a3a4a}	6.17 (.05)^{1a3a4a}	4.97 (.06)^{1a2a4a}	5.29 (.07)^{1a2a3a}
Z–scores	0.26 (.13)^{2a3a4a}	0.69 (.08)^{1a3a4a}	−0.56 (.11)^{1a2a4a}	−0.28 (.10)^{1a2a3a}
Demanding approach				
Raw scores (1–7)	2.83 (.07)^{2a3c4a}	4.46 (.06)^{1a3a}	3.05 (.06)^{1c2a4a}	4.35 (.07)^{1a3a}
Z–scores	−0.76 (.11)^{2a3c4a}	0.73 (.08)^{1a3a}	−0.50 (.11)^{1c2a4a}	0.73 (.10)^{1a3a}
Domineering approach				
Raw scores (1–7)	1.59 (.06)^{2a3a4a}	3.61 (.08)^{1a3a}	2.13 (.06)^{1a2a4a}	3.73 (.08)^{1a3a}
Z–scores	−0.89 (.07)^{2a3a4a}	0.65 (.11)^{1a3a}	−0.45 (.10)^{1a2a4a}	0.88 (.09)^{1a3a}
Abandoning approach				
Raw scores (1–7)	1.14 (.03)^{2a3a4a}	1.58 (.04)^{1a4a}	1.51 (.03)^{1a4a}	2.83 (.07)^{1a2a3a}
Z–scores	−0.69 (.04)^{2a3a4a}	−0.17 (.07)^{1a4a}	−0.23 (.07)^{1a4a}	1.35 (.14)^{1a2a3a}
Awaiting approach				
Raw scores (1–7)	1.93 (.07)^{2a3a4a}	2.34 (.08)^{1a4a}	2.44 (.06)^{1a4a}	3.45 (.09)^{1a2a3a}
Z–scores	−0.52 (.08)^{2a3a4a}	−0.14 (.10)^{1a4a}	−0.06 (.09)^{1a4a}	0.99 (.11)^{1a2a3a}

Note: Numbers in superscript indicate significant profile differences: $^{a}p < .001$, $^{b}p < .01$, $^{c}p < .05$. NS = need-supportive; D = directiveness; NT = need-thwarting.

Table 6
Contingency table of pre-service PE teachers' motivation to teach and (de)motivating teaching latent profiles.

Motivation to teach profiles		(De)motivating teaching profiles				
		Profile 1 Purely NS	Profile 2 High NS - High D	Profile 3 Mod. NS - Mod. D	Profile 4 High NT	Total
Profile 1	Raw (n)	78	60	69	22	229
Good quality motivation	Expected (n)	53.9	66.9	68.2	40.0	229.0
	Row %	34.1 %	26.2 %	30.1 %	9.6 %	100.0 %
	Column %	60.9 %	37.7 %	42.6 %	23.2 %	42.1 %
	Total %	14.3 %	11.0 %	12.7 %	4.0 %	42.1 %
	AR	4.9	−1.3	0.2	−4.1	
Profile 2	Raw (n)	40	77	41	22	180
High quantity motivation	Expected (n)	42.4	52.6	53.6	31.4	180.0
	Row %	22.2 %	42.8 %	22.8 %	12.2 %	100.0 %
	Column %	31.3 %	48.4 %	25.3 %	23.2 %	33.1 %
	Total %	7.4 %	14.2 %	7.5 %	4.0 %	33.1 %
	AR	−0.5	4.9	−2.5	−2.3	
Profile 3	Raw (n)	9	12	38	19	78
Low quantity motivation	Expected (n)	18.4	22.8	23.2	13.6	78.0
	Row %	11.5 %	15.4 %	48.7 %	24.4 %	100.0 %
	Column %	7.0 %	7.5 %	23.5 %	20.0 %	14.3 %
	Total %	1.7 %	2.2 %	7.0 %	3.5 %	14.3 %
	AR	−2.7	−2.9	4.0	1.7	
Profile 4	Raw (n)	1	10	14	32	57
Poor quality motivation	Expected(n)	13.4	16.7	17.0	10.0	57.0
	Row %	1.8 %	17.5 %	24.6 %	56.1 %	100.0 %
	Column %	0.8 %	6.3 %	8.6 %	33.7 %	10.5 %
	Total %	0.2 %	1.8 %	2.6 %	5.9 %	10.5 %
	AR	−4.1	−2.0	−0.9	8.1	
Total	Raw (n)	128	159	162	95	544
	Expected (n)	128.0	159.0	162.0	95.0	544.0
	Row %	23.5 %	29.2 %	29.8 %	17.5 %	100.0 %
	Column %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %
	Total %	23.5 %	29.2 %	29.8 %	17.5 %	100.0 %

Note: Mod. = Moderate. *AR* = adjusted residual; NS = need-supportive; D = directiveness NT = need-thwarting.

teaching PE (i.e., low autonomous and controlled motivation, and high amotivation) did not emerge. This may be due to the fact that the sample is composed of pre-service PE teachers, who still intend to pursue a teaching career, even if only to satisfy external pressures.

4.2. To what extent do pre-service PE teachers combine (de)motivating approaches into teaching profiles? (Aim 2)

In relation to the second aim, and consistent with the hypothesis and previous studies (Burgueño, García-González, et al., 2024;

García-Cazorla et al., 2025; García-González et al., 2023; Haerens et al., 2018; Leo et al., 2022), four teaching profiles emerged from the combinations of (de)motivating teaching approaches. The first and most optimal profile, comprising 23.5 % of the sample, was characterized by high need-supportive and low need-thwarting approaches, thus forming a purely need-supportive style. This profile closely aligns with those found in previous research on in-service teachers (Burgueño, García--González, et al., 2024; García-Cazorla et al., 2025; Haerens et al., 2018), suggesting that even without extensive classroom experience, about one fourth of the pre-service PE teachers already perceived themselves as fostering positive classroom environments, encouraging participation, self-expression, and a sense of competence among students. This would enhance students' autonomous motivation, directly impacting their enjoyment of PE classes and increasing their intention to be more physically active outside of school (Vasconcellos et al., 2020). This profile also demonstrates that it is possible to offer high levels of autonomy-support and structure without resorting to a controlling or chaotic style. However, despite being the most optimal for students, it was not the most prevalent profile, neither among in-service teachers in previous studies, nor among the pre-service PE teachers in the present sample (Burgueño, García-González, et al., 2024; García-Cazorla et al., 2025; Haerens et al., 2018). This limited prevalence may be explained by motivational limitations, deeply rooted beliefs about the necessity of maintaining control in teaching, or perceived challenges in effectively managing the classroom through autonomy-supportive and structuring approaches alone (García-Cazorla et al., 2025).

Following the hypothesis, the second most prevalent profile (i.e., profile 2), representing 29.2 % of the sample, was characterized by a combination of high autonomy-supportive and structuring approaches alongside high levels of control and low levels of chaos. This dual-profile, combining simultaneously need-supportive and controlling approaches has also been identified as one of the most common among in-service PE teachers in previous studies (Fierro-Suero et al., 2024; García-Cazorla et al., 2025; Haerens et al., 2018), and emerges as the second frequent profile in the present sample of pre-service teachers as well. This consistency suggests that, for a significant number of in-service and pre-service PE teachers, there is a natural synergy between providing structure and both autonomy-support and control. This can be explained through SDT and the circumplex model, as structure-based approaches lie between autonomy-support and control (Aelterman et al., 2019; Burgueño, Abós, et al., 2024). As found in other studies (Aelterman et al., 2019; Burgueño, Abós, et al., 2024), the adjacent attuning-guiding (i.e., $r = .59$, $p < .001$) and clarifying-demanding approaches (i.e., $r = .31$, $p < .001$), correlate positively and significantly. In this teaching profile, according to Wallace et al. (2014), pre-service PE teachers were willing to adapt class activities to students' preferences (i.e., attuning approach) and provide support for students' progress (i.e., guiding and clarifying approaches). However, they intended to do so with a tone of pressure, ordering students to act in a certain way, using sanctions (i.e., demanding approach) or even resorting to personal attacks (i.e., domineering approach). The combination of controlling approaches with autonomy-supportive and structuring approaches may pose challenges. Even when these controlling approaches are paired with motivating approaches (i.e., autonomy-supportive and structuring), they could result in increased levels of need frustration, controlled motivation, amotivation, and oppositional defiance among PE students, in contrast to the first profile, which is purely need-supportive (García-González et al., 2023).

In line with the hypothesis, the third and most prevalent profile, comprising 29.8 % of the sample, was characterized by self-reported moderate scores on both need-supportive and moderate directive teaching approaches. This profile reflects an inconsistent implementation of teaching styles in which pre-service PE teachers occasionally supported students' needs, by allowing limited decision-making or offering intermittent feedback, but also alternated between controlling approaches and moments of chaos. Similar mixed profiles have been found among in-service PE teachers (Burgueño, García-González, et al., 2024; Haerens et al., 2018), suggesting a recurring tendency across teaching experience levels. This could be explained by motivational limitations or by difficulties in effectively knowing how and when to apply different teaching approaches to manage the classroom. This inconsistent profile may reduce the likelihood of negative motivational experiences among students compared to a highly need-thwarting profile, yet it would still provide limited support for students' needs, potentially resulting in lower levels of autonomous motivation and a less enriching experience for PE students over time (Burgueño, García--González, et al., 2024). Finally, consistent with the hypothesis, a fourth and clearly maladaptive profile emerged, representing 17.5 % of the sample. This profile closely resembles the "low need-supportive and high need-thwarting" profile identified in earlier studies with in-service PE teachers (Burgueño, García-González, et al., 2024; Haerens et al., 2018), demonstrating that the coexistence of overcontrol (i.e., controlling approaches) and lack of guidance (i.e., chaotic approaches) reflects a demotivating teaching profile that may lead to feelings of need frustration among PE students, resulting in decreased motivation in PE and, consequently, lower levels of learning and intention to be physically active (Vasconcellos et al., 2020). Although this profile was the least prevalent, its presence among pre-service teachers is concerning, as it suggests the persistence of maladaptive teaching approaches that may have been internalized through prior educational experiences or stem from a lack of confidence in managing the classroom through need-supportive approaches (García-Cazorla et al., 2025).

Taken together, these findings suggest that the teaching profiles typically found among in-service PE teachers are already evident during initial teacher education. The emergence of these distinct profiles, ranging from purely need-supportive to clearly need-thwarting, among pre-service teachers, despite their limited teaching experience, indicate that some motivational and pedagogical tendencies begin to consolidate even before formal entry into the profession. Given that most pre-service teachers in this study had only completed a short practicum, the presence of stable teaching profiles implies that these patterns are likely shaped not only by direct teaching experience, but also by the influence of PETE programs in developing their motivational regulations and teaching approaches.

4.3. Do pre-service PE teachers' motivational profiles shape their (de) motivating teaching profiles? (Aim 3)

Building on these findings, the third aim explored whether pre-service PE teachers' motivational profiles were associated with their reported teaching profiles. Despite limited teaching experience, clear patterns emerged, suggesting pre-service teachers' combinations of motivation to teach may already shape the way they combine different (de)motivating teaching approaches. Thus, following the hypothesis, pre-service PE teachers who enjoyed teaching PE and clearly saw the personal value it brings to them and their students (i.e., profile 1: good quality motivation profile), were more likely to display a motivating teaching profile (i.e., profile 1: purely need-supportive profile). Those teachers engaged more frequently in dialogue with their students, involving them in their classes, adapting to their interests, providing help and assistance when needed, and communicating their expectations and objectives to them. Moreover, the pre-service PE teachers were not likely to force students to behave as they command through threats and/or personal attacks, nor were they likely to ignore them and give them full initiative in their learning. This pattern mirrors previous findings with in-service teachers (Abós, Haerens, et al., 2018; García--Cazorla et al., 2025; Van den Berghe et al., 2014) and suggests that pre-service teachers with a strong self-determined motivational profile may be more likely to develop a coherent, purely need-supportive teaching profile.

Pre-service PE teachers whose motivational profile was characterized by a combination of passion for teaching PE, which is an important

goal in their lives, with internal pressure and external pressure to be a (good) PE teacher (i.e., profile 2: high quantity motivation), were likely to teach in a more controlling way (i.e., profile 2: high need-supportive - high need-thwarting). It is likely that they transfer these pressured motives to the students, using a tone of discipline and exerting excessive power over them (Abós, Haerens, et al., 2018; García-Cazorla et al., 2025). These pre-service PE teachers understood students' perspectives and provided meaningful explanations, helping them reflect on mistakes and improve, while clearly stating their expectations and goals. However, they combined this with excessive control, using strong language or guilt and shame to compel students to comply. Moreover, it could be stated that pre-service teachers with a motivational profile characterized by high quantity motivation would not exhibit a moderate need-supportive - moderate directiveness profile (i.e., profile 3) or a high need-thwarting profile (i.e., profile 4). These results demonstrate that controlled motivation (i.e., introjected and external regulation) and controlling teaching styles are closely associated, such that low controlled motivation prevents the use of controlling teaching approaches. Therefore, this research complements previous person-centered approach studies (Abós, Haerens, et al., 2018; Van den Berghe et al., 2014), that included only autonomy-support and structure as outcomes. However, it diverges from the findings of García-Cazorla et al. (2025), where a combination of high controlled motivation and amotivation was found to underlie a more controlling teaching profile. In contrast, the present study indicates that high levels of controlled motivation alone with low levels of amotivation are associated with greater controlling teaching approaches. This suggests that the differences between a motivational profile characterized by high autonomous motivation and low levels of controlled motivation and amotivation, and those combining high autonomous and controlled motivation with low amotivation, become particularly evident in the demotivating side of teaching.

Furthermore, pre-service PE teachers who were uncertain or unclear about why they had chosen to study to become PE teachers (i.e., profile 3: low quantity motivation) were likely to engage in a little bit of everything, yet to a moderate degree (i.e., profile 3: moderate need-supportive - moderate directiveness). They indicated to sometimes recognize students' interests and preferences and encourage participation in class activities. Occasionally, they provided strategies, help, and assistance to help students feel competent. They also sometimes pressured students to behave a certain way, regardless of their thoughts, or ignored them, leaving students confused and hindering their skill development. Additionally, those teachers in motivational profile 3 would not be teachers who highly support students' needs, even if it were along the need-support axis (i.e., teaching profile 1), or along the axis of directiveness (i.e., teaching profile 2). In this case, as seen in previous studies with in-service teachers, it seems that a very low autonomous motivation towards teaching PE would mean that those pre-service PE teachers would not be able to effectively implement autonomy-supportive and structuring approaches, even though their controlled motivation and amotivation is not high either (Abós, Haerens, et al., 2018; García-Cazorla et al., 2025). Thus, apathy and indifference towards the importance of the profession appear to be also a determinant factor in the deployment of an adaptive teaching style.

Finally, as hypothesized, PE teachers who felt externally obligated to teach and saw teacher training as a waste of time (i.e., profile 4: poor quality motivation) were unlikely to consider students' interests, adjust activities based on their suggestions, provide constructive feedback, or track progress. Instead, they tended to rely on rewards, punishments, guilt, and intimidation to control behavior, eventually adopting a laissez-faire attitude, giving up after intervening, and waiting to see how students reacted (i.e., profile 4: high need-thwarting). These findings align with previous studies on in-service PE teachers (Abós, Haerens, et al., 2018), showing that a motivational profile with low autonomous motivation, moderate controlled motivation, and high amotivation tends to provide less autonomy-support. Similarly, Van den Berghe et al. (2014) found that low autonomous and high controlled motivation were linked to less autonomy-support and structure. Pre-service PE teachers who lack value, interest, and energy towards teaching PE are likely to struggle in fostering environments conducive to student learning (Abós, Haerens, et al., 2018; García-Cazorla et al., 2025). The present study shows that pre-service PE teachers characterized by this motivational profile were not only less autonomy-supportive or structuring, but they were also likely to force students to act according to their own requirements, and when students did not meet their expectations, they would give up on their students and their learning.

The divergence observed between pre-service PE teachers' motivational profiles and their teaching profiles invites critical reflection on the pedagogical function of PETE programs. While nearly half of the participants (i.e., 42.1 %) reported an optimal motivational profile characterized by high autonomous motivation and low controlled motivation and amotivation, only a quarter (i.e., 23.5 %) adopted a purely need-supportive teaching profile. This notable discrepancy highlights a developmental gap between self-determined motivation to teach and the capacity to implement consistently motivating teaching approaches. It suggests that PETE programs may succeed in cultivating why future teachers want to teach, but fall short in preparing them for how to teach in ways that align with their motivational values. From a SDT perspective, aligning motivational regulations with the application of (de)motivating teaching approaches is essential for fostering both teacher well-being and student motivation and engagement. Therefore, specific interventions such as those designed to improve in-service PE teachers (Reeve & Cheon, 2021) and pre-service teachers (Groβmann et al., 2023; Perlman, 2015; Perlman & Piletic, 2012) motivating teaching approaches could be interesting and useful to implement during PETE.

5. Practical implications

In this regard, the present findings further reveal that, by the end of PETE, pre-service PE teachers may exhibit four distinct motivational and teaching profiles, which appear to be meaningfully interrelated. Identifying the motivational and teaching profiles of PETE program students could facilitate the individualization of initial teacher education. Following the motivational process of pre-service PE teachers, in which the perception of competence, through the quality of motivation toward teaching, may influence teaching style (Mayo-Rota et al., 2025), PETE programs could include interventions that provide resources and strategies to support students' needs and enhance pre-service teachers' perception of competence. This, in turn, could directly impact their motivational and teaching profiles. Such programs would aim to foster a high-quality motivational profile that leads to an adaptive need-supportive teaching style. To this end, it seems important not only that pre-service PE teachers receive theoretical instructions on how to support the needs of students (Groβmann et al., 2023; Perlman, 2015; Perlman & Piletic, 2012), but it also seems important to put them into practice. This latter aspect is often the most challenging part of PETE programs. Therefore, it seems essential to conduct practical sessions in which pre-service teachers are given the opportunity to teach (Aelterman et al., 2013; Perlman, 2015) and record them in order to reflect on the (de)motivating teaching approaches used by them (Bouten et al., 2023).

6. Limitations and future directions

First, consistent with previous research based on the circumplex model (Burgueño, Abós, et al., 2024; Escriva-Boulley et al., 2021), certain approaches exhibited relatively low reliability values (Katz, 2006). While these values may be attributed to the limited number of items for specific variables (i.e., four for participative and awaiting approaches) (Dunn et al., 2014), it is essential to interpret these results carefully. Second, the cross-sectional nature of this study limits the

ability to draw causal inferences. Longitudinal studies would provide valuable insights by tracking the evolution of motivational and teaching profiles throughout PE teacher education. Moreover, although SDT's motivational sequence suggests a directional relationship where motivation influences (de)motivating teaching styles of pre-service PE teachers (Mayo-Rota et al., 2025; Ryan & Deci, 2017), the cross-sectional design and reliance on association analysis leave room for interpreting these relationships bidirectionally. Additionally, while the sample size was relatively large for this population, it was derived through non-probabilistic sampling, which limits generalizability. Future research should prioritize probability sampling methods to enhance the robustness of findings. Finally, data collection relied exclusively on self-reported questionnaires. These responses may have been influenced by the limited teaching experience of pre-service PE teachers, whose practical exposure was restricted to the Master's Degree practicum. To address this limitation, future studies could incorporate complementary methodologies, such as qualitative interviews or observational techniques (Van Doren et al., 2023). These approaches would provide additional insights and a broader understanding of the motivational and teaching profiles of pre-service PE teachers.

7. Conclusion

This study reinforces the idea that pre-service PE teachers' motivation to teach may play a central role in shaping their (de)motivating teaching approaches, even at an early stage of professional development. The associations observed between motivational and teaching profiles suggest that combinations of intrinsic motivation, identified, introjected, and external regulations, as well as amotivation influence not only how future teachers conceptualize their professional role, but also how they teach, relate to, and interact with their students. While most pre-service PE teachers exhibited an optimal motivational profile, less than one in four adopted a purely need-supportive teaching style. This discrepancy may reflect a gap between self-determined motivation and the capacity to consistently implement motivating teaching approaches in practice. It highlights the need to strengthen PETE programs by not only fostering self-determined motivation to teach, but also ensuring that pedagogical training is explicitly aligned with that motivation. Such integration is essential to prepare pre-service PE teachers to create meaningful, engaging, and need-supportive learning environments that benefit both their students and their own professional fulfillment.

CRediT authorship contribution statement

Carlos Mayo-Rota: Writing – review & editing, Writing – original draft, Investigation, Formal analysis, Data curation. **Ángel Abós:** Writing – review & editing, Supervision, Investigation, Data curation. **Leen Haerens:** Writing – review & editing, Methodology, Conceptualization. **Katrien De Cocker:** Writing – review & editing, Methodology, Conceptualization. **Luis García-González:** Writing – review & editing, Supervision, Investigation, Data curation.

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.tate.2025.105168.

Data availability

Data will be made available on request.

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