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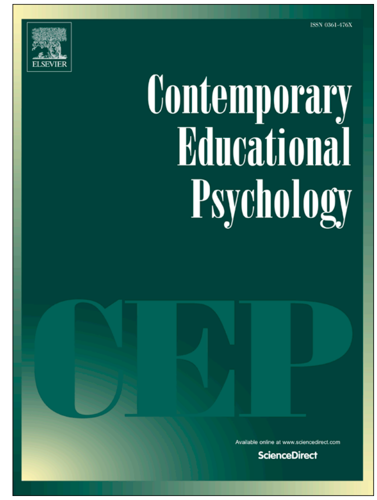

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An Integrative Framework to validate the Need-Supportive Teaching Style Scale (NSTSS) in secondary teachers through exploratory structural equation modeling

Abstract

Grounded in self-determination theory and achievement goal theory, the objective of this study was to validate the Need-Supportive Teaching Style Scale (NSTSS) to evaluate teachers' perception of their interpersonal styles. Using an adaptation to teachers of the items of the Motivational Climate in Physical Education Scale (MCPES) validated in students, the NSTSS proposed a four-factor structure, made up of task climate support, ego climate support, autonomy support and relatedness support. With a sample of 584 secondary teachers, the results obtained from the confirmatory factor analysis (CFA) and from the exploratory structural equation modeling (ESEM) supported the four-factor structure for the NSTSS. The results also supported composite reliability, measurement invariance across gender and type of school (public or private), as well as nomological validity (in relation to measures of motivation to teach, engagement at work and burnout at work) of NSTSS ratings. The results are discussed by arguing the importance that creating a scale to evaluate teachers' perception of their need-supportive teaching styles using an integrative approach may have, discussing theoretical, methodological and practical contributions.

Keywords: Validity; Secondary Education; Teaching style; Teacher outcomes; ESEM.

1. Introduction

Following from Reeve (2009), interpersonal teaching styles can be defined as strategies that teachers adopt to stimulate their students' learning process, motivation and personal development. Thus, self-determination theory (SDT; Deci & Ryan, 1985; Ryan & Deci, 2000) and achievement goal theory (AGT; Nicholls, 1989) have become consolidated as two of the most commonly used theoretical frameworks to explain the importance of an interpersonal teaching style in the classroom (e.g., Aelterman, Vanteenkiste, Van den Berghe, De Meyer, & Haerens, 2014; Butler, 2007; Cheon, Reeve, Yu, & Jang, 2014; Han, Yin, & Wang, 2016).

Recent studies, based on both theoretical frameworks, have shown that student perception of teachers' interpersonal styles was positively related to student motivation (e.g., Cheon, Reeve, & Song, 2016). Moreover, previous studies have shown that teachers' perception of their interpersonal styles was positively related to their motivation (e.g., Jang, Kim, & Reeve, 2012; Reeve, 2013), as well as to other outcomes associated with teachers' work (e.g., burnout, engagement, interest in teaching; Cheon et al., 2014; Han et al., 2016; Retelsdorf, Butler, Streblow, & Schiefele, 2010; Van den Berghe et al., 2014). This is where the classroom emerges as a key element of reciprocity, becoming a shared social context where both students' and teachers' attitudes converge. Thus, Pelletier, Séguin-Lévesque, & Legault (2002) suggested that the motivation and outcomes that teachers generate in their own students could also have a reciprocal influence on teaching motivation, providing feedback for their interpersonal styles (see Fig.1). This hypothetical sequence was later empirically demonstrated in the educational context (Jang et al., 2012; Reeve, 2013) and extended by Pelletier & Rocchi (2015, p. 112), always under SDT framework (Deci & Ryan, 1985). Therefore, the present study suggests the integration of AGT (Nicholls, 1989) into the aforementioned theoretical sequence (see Fig. 1), to increase knowledge about the importance that an interpersonal teaching style could have on the actual teachers as well as on the students.

<INSERT FIGURE 1 ABOUT HERE>

This article seeks to fill this gap in literature, adapting a scale that accurately examines teachers' perspection of their interpersonal teaching styles. Previous studies have assessed the interpersonal teaching style using an integrated theoretical framework (i.e., SDT and AGT), but focusing exclusively on the student perspective. Thus, Soini, Liukkonen, Watt, Yli-Piipari and Jaakkola (2014) developed and validated the Motivational Climate in the Physical Education Scale (MCPES) that assesses the interpersonal teaching style of physical education teachers from the student perspective. Using the items and the four-factor structure based on the integrated theoretical framework (i.e., SDT and AGT) proposed in MCPES, the present study aims to adapt the items to teachers, and validate the Need-Supportive Teaching Style Scale (NSTSS). This scale could provide some advances in the optimization of work and study environments in schools. For instance, an effective evaluation of interpersonal teaching styles could help to design specific strategies to support autonomy, retatedness and a task climate towards students. This could have an impact on students' academic achievement and discipline (e.g., Taylor & Ntoumanis, 2007) and on teachers' motivation and well-being (e.g., Cheon et al., 2014; Reeve 2013), which has been so affected in recent years (Anaya & López, 2014).

1.1. Self-determination theory

SDT proposes that people have innate psychological needs (autonomy, relatedness and competence), which, when supported, are associated with motivation, engagement and well-being (Deci & Ryan, 1985; Ryan & Deci, 2000). Autonomy satisfaction refers to people's need to feel they are the causal agents of their actions. Relatedness satisfaction refers to people's need to belong to a group of peers and to have positive interpersonal relationships. Competence satisfaction refers to people's need to believe they are effective faced with a situation in a certain context.

In the educational context, following from SDT, need-supportive teaching style involves the provision of autonomy support, relatedness and competence (Van den Berghe, Cardon, Tallir, Kirk, & Haerens, 2016; Tessier, Sarrazin, & Ntoumanis, 2010). Firstly, in a school context, teachers can support autonomy by involving students in decision-making and showing interest in their feelings and preferences (Reeve, 1998). Likewise, encouraging students to freely express their feelings, allowing criticism and accepting it, even when this is negative, is typical of a teacher who supports autonomy (Cheon & Reeve, 2015). Secondly, teachers can support their students' relatedness through tasks that facilitate cooperation and by organizing heterogeneous groups of students (Aelterman et al., 2014). Likewise, relatedness support is characterized by an environment where teachers work closely with their students, showing personal concern and interest in them (Tessier et al., 2010). Finally, teachers can support their students' competence in the classroom by using positive and interrogative feedback focused on personal progress (Jang, Reeve, & Deci, 2010). Competence support is also fostered through a structured learning environment where tasks are adapted to the students' level of skill (Jang et al., 2010). In this regard, many studies in line with SDT have shown a positive relationship between need-supportive teaching style and autonomous motivation in students (Ntoumanis, 2005; Taylor & Ntoumanis, 2007), which, in turn, is positively related to more adaptive outcomes in students (e.g., behavioral engagement, interest; Aelterman et al., 2014; Cheon & Reeve, 2015; Cheon et al., 2016; Jang et al., 2010; Van den Berghe et al., 2016).

1.2. Achievement goal theory

AGT was initially developed by Nicholls (1984) to assess individuals´ goals in achievement situations, based on a dichotomous model. This initial model was comprised of two qualitatively distinct types of competence: mastery/task (i.e., to demonstrate competence relative to oneself) and performance/ego (i.e., to demonstrate ability relative to others; for further information, see Ames, 1992; Nicholls, 1989). Elliot and Harackiewicz (1996) and Elliot and McGregor (2001) extended this dichotomous model to a trichotomous model by bifurcating the performance/ego goal into two different constructs (i.e., performance-approach and performance-avoidance; for further information, see Elliot & Harackiewicz, 1996), and then to a 2 × 2 model (i.e., performance-approach, performance-avoidance, mastery-approach, and mastery-avoidance; for further information, see Elliot & McGregor, 2001). Over the last few years, the 2 x 2 model has been extended to a 3 × 2 model by bifurcating mastery/task goals into separate task-based and self-based categories (for further information, see Elliot, Murayama, & Pekrun, 2011). Although numerous studies had assessed students' perception of the motivational climate developed by teachers, research on teachers' perspective of their teaching style is still fairly scarce (Butler, 2014). For a first approximation to the integration of both theoretical frameworks in terms of teachers' perspective (i.e., AGT and SDT), in this study, we propose an integrative model that is comprised of the dichotomous model (i.e., mastery/task vs performance/ego) and two dimensions of the interpersonal teaching style through the tenets of SDT.

Grounded in the dichotomous model proposed by AGT (Nicholls, 1989), an individual's main motive is to demonstrate competence or ability when involved in an achievement context (e.g., classroom). The AGT includes two main elements: goal orientation (i.e., perception of an individual's competence towards an activity) and motivational climate (i.e., perception of social environment). Thus, depending on how success is defined by the social context, to achieve a certain activity, an individual's orientation can be modified (i.e., mastery/task-oriented vs performance/ego-oriented). In the school context, teachers can emerge as decisive social agents in managing their students' orientations by creating a certain motivational climate (i.e., mastery or task-involving climate vs performance or ego-involving climate; Senko, Hulleman, & Harackiewicz, 2011). Teachers can also generate a task-involving climate when they manage, reinforce and evaluate student success in terms of effort and individual achievement and improvement. In this vein, different studies in the educational context have shown a positive association between task-involving climate and students' autonomous motivation, engagement and responsibility (Fernández-Río, Méndez-Giménez, & Cecchini, 2014; Han et al., 2016). In contrast, teachers can generate an ego-involving climate when they manage, reinforce and evaluate their students' success in comparison with the performance of other students. Consequently, in the school context, ego-involving climate has been associated with controlled motivation, boredom and lack of discipline of students in class (Fernández-Río et al., 2014; Moreno, Jiménez, Gil, Aspano, & Torrero, 2011).

1.3. A theoretically integrated and motivational teaching environment

The dimensions of the interpersonal teaching style proposed by SDT (i.e., autonomy support, relatedness support and competence support) and AGT (i.e., task climate support and ego climate support) have been studied independently for many years (Morgan, 2016). Yet, recent studies in the educational context have started to integrate both theoretical frameworks (i.e., SDT and AGT) for a better understanding of student motivation (e.g., Abós, Sevil, Julián, Abarca-Sos, & García-González, 2016; Jaakkola, Wang, Soini, & Liukkonen, 2015; Sevil, Abós, Aibar, Julián, & García-González, 2016; Soini et al., 2014). The integration of these two theoretical frameworks could increase the understanding of the repercussions that an interpersonal teaching style may have on student motivation and on the motivation of the teachers themselves (Morgan, 2016). However, for an acceptable integration, it is important to identify some constructs that have different nuances depending on the theory.

Related to the above, to explain motivational processes, both SDT and AGT are based on perceived competence (although SDT also includes autonomy and relatedness; Jaakkola et al., 2015; Soini et al., 2014). However, while the AGT differentiates the way of understanding perceived competence in a certain activity, depending on the motivational climate created in a certain context (i.e., task = competence is to better oneself; ego = competence is to be better than the rest), SDT does not establish this difference. This could be a key aspect to motivate students and the teachers themselves (Morgan, 2016; Soini et al., 2014). To illustrate this, teachers can place emphasis on effort and personal improvement (e.g., you must improve your own skills) or on normative comparisons between students (e.g., you must be better than your peers) in the lessons. If competence is supported by focusing student achievement on individual improvement, the outcomes in terms of school environment could be very different than when teachers support student competence by guiding their achievements to surpass other peers.

As observed in Fig. 1, integrating AGT into the motivational sequence of SDT (Pelletier et al., 2002; Pelletier & Rocchi, 2015), to analyze reciprocity between teacher motivation and student motivation, could provide a better understanding of the mechanisms involved in the class: (a) teachers who develop a task climate can foster positive and adaptive outcomes in their students (e.g., enjoyment, predisposition towards the teaching unit; Abós et al., 2016; Jaakkola et al., 2015), which, since they occur in the classroom, could increase teachers' motivation and reinforce their interpersonal teaching styles (Reeve, 2013); (b) teachers who develop an ego climate may trigger negative and disadaptive outcomes in the classroom (e.g., amotivation, boredom; Abós et al., 2016; Sevil et al., 2016), which, in turn, could cause less self-determined motivation in teachers (Fernet, Guay, Senécal, & Austin, 2012). Thus, the complementary nature of these two theoretical frameworks may provide a breakthrough in the evaluation of teacher perception of the need-supportive style based on a multidimensional and integrated approach (Morgan, 2016).

1.4. The present study

Grounded in SDT, there are no self-reported instruments that evaluate teachers' perception of their interpersonal teaching styles. Regarding AGT, there are only two instruments that evaluate teacher perception of goal orientations for teaching (Goal Orientations for Teaching, see further information Butler, 2007; and Achievement Goal Questionnaire for Teachers, for further information, see Mascret, Elliot, & Cury, 2015). However, there are no instruments, either, that evaluate the teachers' perception of the interpersonal styles they generate in the classroom, following a theoretical framework that integrates both theories. Therefore, based on the perspective of an integrated theoretical framework (i.e., SDT and AGT), and using and adapting the items of the MCPES to the teaching context, the objective of this study was to validate the Need-

Supportive Teaching Style Scale (NSTSS) to evaluate teachers' perception of their interpersonal styles. Importantly, an effective evaluation of the interpersonal teaching style through the NSTSS could indentify some teaching shortcomings of secondary teachers, and design more specific strategies to improve their performance in the classroom. First, this could affect students' motivation and their discipline in the classroom. Second, this may reciprocally affect teachers' well-being at work and their motivation to teach, converting schools into a friendlier environment to study and work.

1.4.1. Four-factor structure

Recently, Soini et al. (2014) have developed the MCPES, which evaluates student perception of the need-supportive teaching style, based on the integration of SDT and AGT. Soini et al. (2014) selected and adapted items from the Learning and Performance Orientations in Physical Education Classes Questionnaire (LAPOPEQ; Papaioannou, 1994) and the Perceived Motivational Climate in Sport Questionnaire (PMCSQ; Seifriz, Duda, & Chi, 1992; Walling, Duda, & Chi, 1993). The LAPOPEQ (Papaioannou, 1994) revealed a two factor-structure called Learning (task-orientation) and Performance dimension (ego-orientation). The PMCSQ (Seifriz et al., 1992; Walling et al., 1993) revealed two predominant dimensions named Mastery climate (task-involving) and Performance climate (ego-involving). As a result, Soini et al. (2014) proposed a four-factor structure with 18 items, representing perceived autonomy support, relatedness support, task climate and ego climate. The last two factors reflected perceived support to the perception of competence that integrates the SDT. Although the structure of the items of the MCPES may be the same in teachers, some of the items may have to be adapted for this specific context. Therefore, the items of the MCPES were adapted to teachers to validate the NSTSS proposed in the present study (for further information, see Need-Supportive Teaching Style section). Thus, following from

Soini et al. (2014), the first hypothesis suggests that a four-factor structure (i.e., task climate support, ego climate support, autonomy support and relatedness support) will emerge for the secondary teachers' responses to the NSTSS, showing acceptable psychometric properties.

1.4.2. Generalizability of the NSTSS structure across gender and type of school

Previous scales, which assessed student perception of the interpersonal teaching style (i.e., MCPES; Soini et al., 2014), did not examine measurement invariance. Furthermore, in the scales used to develop the MCPES (i.e., LAPOPEQ and PMCSQ) measurement invariance was not evaluated, either. Yet, it is well known that a key condition to ensure an acceptable psychometric validation of a scale is to show the extent to which the psychometric properties found in a sample can be generalized to other subgroups (Millsap, 2011). Thus, some authors suggest carrying out systematic tests of measurement invariance conducted across predetermined and meaningful subgroups of participants (Millsap, 2011; Morin, Meyer, Creusier, & Biétry, 2015). In this sense, recent studies recommend reporting invariance in factors such as gender, age or other sociodemographic characteristics, one of which could be the type of school (i.e., public or private) (e.g., Ayman & Korabik, 2010; Lukaszewski & Stone, 2012). Indeed, a meta-analysis reported that females tended to adopt a more democratic or participatory style and a less autocratic or directive style than males (Van Engen & Willemsen, 2004). Likewise, a recent study showed that female teachers reported higher scores in the autonomy-supportive style, and lower scores in the controlling style than their male counterparts (Reeve et al., 2014). Further, the type of school (i.e., state or private) could affect teachers' motivational processes and consequently their interpersonal teaching styles, especially in Spain (Gil-Flores, 2016; Latorre & Sáez, 2009). Teachers working in public schools report less social recognition than teachers working in private schools (Latorre & Sáez, 2009). Yet, a larger number of teaching subjects and longer working hours could negatively determine the interpersonal teaching styles of teachers who work in private schools (Latorre & Sáez, 2009). Therefore, to be able to effectively diagnose possible differences between groups (i.e., gender, type of school) that affect teachers' interpersonal teaching styles, it is advisable to firstly develop invariant scales across these factors. Consequently, the second hypothesis suggests that the NSTSS will remain invariant regardless of the teachers' gender or type of school.

1.4.3. Nomological validity of the NSTSS

Research in SDT has suggested that the interpersonal teaching style adopted in the classroom can be influenced by teacher motivation (Pelletier et al., 2002). According to SDT, teachers could have different reasons to engage in their work. Some teachers may experience satisfaction in the tasks they carry out and think that their work could be important for their personal development and for the development of their students (autonomous motivation; comprised of intrinsic motivation and identified regulation). Other teachers may teach to seek social approval or to avoid feelings of blame (controlled motivation; comprised of introjected and external regulation). Finally, teachers may not understand why they teach given that they believe that their work falls on deaf ears (amotivation) (Ryan & Deci, 2000). Recent studies have indicated how the interpersonal teaching style can be related to teacher behavior outcomes, such as engagement (i.e., teachers who show a high level of energy and identification with their work) and burnout (i.e., teachers who show severe exhaustion caused by chronic exposure to stress at work), (e.g., Cheon et al., 2014; Parker, Martin, Colmar, & Liem, 2012), which can fully illustrate their occupational well-being (Van den Broeck, Ferris, Chang, & Rosen, 2016).

Consequently, two hypotheses were proposed to verify the nomological validity of the NSTSS with different variables that have an influence on teachers' interpersonal styles (see further information Pelletier et al., 2002; Pelletier & Rocchi, 2015). Consistent with previous studies, the third hypothesis proposes that teacher perception of task climate support, autonomy support and relatedness support will be significantly and positively related to autonomous motivation and engagement, and significantly and negatively related to controlled motivation, amotivation and burnout of teachers at work. Finally, the fourth hypothesis suggests that teacher perception of ego climate support will be significantly and positively related to controlled motivation, amotivation and burnout, and significantly and negatively related to autonomous motivation and engagement of teachers at work.

2. Method

2.1. Participants and Procedures

An instrumental quantitative study was conducted following the guidelines of the Declaration of Helsinki (2013) with respect to consent and the confidentiality of answers. Data were compiled over an online platform that was active for 30 days. All secondary teachers (i.e., 6393) working during the 2014/2015 academic year in Aragon region (Spain) were sent an e-mail with access details, together with a brief explanation of the study and the contact data of the main researcher in case they wanted to obtain more information. The response rate was 10% (i.e., 584 Spanish secondary teachers). The total study sample included exactly the same percentage of teachers of both genders (43% males, 57% females) as samples that include all secondary teachers of Aragon region. Further, the study sample represented a wide variety of ages (25 to 66; M = 45.04), and ranges of teaching experience (1 to 45 years; M = 17.55). Finally, most of the teachers from the study sample worked in public schools (71%), but teachers who worked in private schools (29%) were also represented. These percentages are the same for the sample that includes all secondary teachers of Aragon region. These statistics were provided by the Ministry of Education, Culture and Sport (for further information, see http://www.mecd.gob.es).

As testing the integrity of these two theoretical frameworks to assess teachers' perception of their interpersonal teaching styles was something new, a preliminary study was performed (Morin & Maïano, 2011). Thus, approximately 33% of the teachers were randomly selected using the SPSS software. The percentages, in terms of gender and school type of the total sample of secondary teachers in Aragon, were also taken into account. As a result, 184 teachers (88 males, 96 females), 140 of whom worked at public schools, formed part of the preliminary study. The other 400 teachers (166 males, 234 females), 276 of whom worked at public schools, comprised the sample of the main study. Approval for this study was obtained from the University's research ethics committee.

2.2. Measures

2.2.1. Need-Supportive Teaching Style.

The Need-Supportive Teaching Style Scale (NSTSS) was drawn up based on the four-factor structure with 18 items proposed by Soini et al. (2014) to evaluate teachers' perception of their interpersonal styles. The steps below were followed to construct the NSTSS: (1) translation into Spanish, (2) adaptation to the teacher work context; (3) preliminary study; and (4) definite version.

Firstly, the procedures of the International Test Commission (Muñiz, Elosua, & Hambleton, 2013) were followed to translate the original version of the MCPES into Spanish. Thus, the original 18 items were translated independently by two bilingual experts. Any discrepancies in the translation between the two versions were discussed to develop an initial Spanish version of the MCPES. Then, a third bilingual translator, who did not participate in the first translation, translated the initial Spanish version of the MCPES back into English again. This back-translated version was compared with the original version of the MCPES, eliminating any inconsistencies that had arisen to obtain two identical versions.

Secondly, after obtaining the definite version of the MCPES in Spanish, the items were subject to a contextual adaptation to evaluate teachers' perception of their interpersonal teaching styles. A group of four expert researchers with extensive training in the theoretical frameworks of the NSTSS (i.e., SDT and AGT) were involved in this process. Two of the experts had at least twenty years' teaching experience in Physical Education and Sport Pedagogy, having published a large body of research related to both frameworks. One of the experts had published the validation of several instruments related to both frameworks. Finally, one of the researchers was an expert in the PE curriculum in Spain and was qualified in the design of instruments to identify strategies associated with motivational climates created by teachers. One of the four expert researchers conducted a first adaptation of the items to the Secondary Education teaching context. To do so, students' perception of the interpersonal teaching style (e.g., MCPES: Students have significant freedom to make choices during lessons; Learning new things makes me want to learn more) was slightly transformed to convert it into teachers' perception of their interpersonal teaching styles (e.g., NSTSS: My students have significant freedom to make choices during my lessons; I try to get my students to learn new things, so they want to learn more). Then, a second expert carefully read the items and made slight modifications in agreement with the first expert. Finally, the other two experts separately classified the items into the constructs that they referred to. The degree of agreement between them was 100%. After obtaining the approval of the four experts, a first version of the NSTSS, which maintained the four-factor structure (i.e., task climate support, ego climate support, autonomy support and relatedness support) and number of items (i.e., 18) of the MCPES (Soini et al., 2014) was obtained, but translated into Spanish and adapted to the teacher working context.

Thirdly, as described below in the results section, this first 18-item version was evaluated in a preliminary study with 184 secondary teachers, obtaining some limited factor loadings in three of the items (see Table 2), which were finally eliminated. As a final step, the NSTSS was once again evaluated with a sample of 400 teachers, obtaining satisfactory results, which are described below. Thus, the definite version of the NSTSS (see Table 1) was comprised of 15 items that measured task climate support (items 1 to 5), ego climate support (items 6 to 8), autonomy support (items 9 to 12), and relatedness support (items 12 to 15). Responses were provided on a 5-point Likert-type scale ranging from 1 (“Strongly Disagree”) to 5 (“Strongly Agree”).

<INSERT TABLE 1 ABOUT HERE>

2.2.2. *Motivation to teach*

Autonomous motivation, controlled motivation and amotivation were measured. An adaptation of the Self-Regulation Questionnaire–Academic (Ryan & Connell, 1989) to the teaching context, carried out by Soenens, Sierens, Vansteenkiste, Dochy, & Goossens (2012) was used to measure autonomous motivation and controlled motivation. This adaptation to the teaching context, carried out by Soenens et al. (2012), showed adequate psychometric properties with 317 Belgian teachers. This scale includes 16 items that assess teacher autonomous motivation (eight items; e.g., “I am very interested in teaching”) and controlled motivation (eight items; e.g., “I want others to think I'm a good teacher”). In addition, three items from the Work Extrinsic and Intrinsic Motivation Scale (Tremblay, Blanchard, Taylor, Pelletier, & Villeneuve, 2009) were used to measure amotivation (e.g., “I don't know, I feel like I'm wasting time when I teach”). These three items were slightly adapted to the teaching context (i.e., substituting the word "work" for "teach"). The stem for this set of items (i.e., autonomous motivation, controlled motivation and amotivation) was “I get involved in teaching...” and responses were provided on a 5-point Likert-type scale ranging from 1 (“Strongly Disagree”) to 5 (“Strongly Agree”). A CFA was performed showing adequate goodness-of-fit ($\chi2/df = 5.48$, $p <. 001$; CFI = 0.961; TLI = 0.958; RMSEA = 0.080). The composite reliability analysis of the study sample obtained omega (ω) values of .92 for autonomous motivation, .84 for controlled motivation and .88 for amotivation. All items were translated from English to Spanish, the participants’ mother tongue, using the same procedure as the above instrument (Muñiz et al., 2013).

2.2.3. Engagement at work

Vigor, dedication, and absorption were measured using the Spanish version (Schaufeli, Martínez, Marques-Pinto, Salanova, & Bakker, 2002) of the Utrecht Work Engagement Scale (Schaufeli, Salanova, González-Romá, & Bakker, 2002). This scale includes 17 items assessing respondents’ vigor (six items; e.g., “When working I feel strong and vigorous”), dedication (five items; e.g., “I am enthusiastic about my work”) and absorption (six items, e.g., “When I am working, I forget everything else around me”). Responses were provided on a 6-point Likert-type scale ranging from 0 (Never) to 6 (Always). This scale showed adequate psychometric properties in previous studies with teachers (Nerstard, Richardsen, & Martinussen, 2010). In this study, a CFA was performed indicating adequate goodness-of-fit ($\chi2/df = 4.12$, $p < .001$; CFI = 0.967; TLI = 0.963), except for RMSEA (= 0.010) that was close to recommendations, similarly to the results of Nerstad et al. (2010). However, the composite reliability analysis of the study sample obtained omega (ω) values of .88 for vigor, .92 for dedication and .86 for absorption

2.2.4. Burnout at work

Overload, lack of development and neglect were measured using the Spanish version of the Burnout Clinical Subtype Questionnaire (BCSQ-12; Montero-Marín, Skapinakis, Araya, Gili, & García-Campayo, 2011) validated with 826 university workers. This questionnaire comprises 12 items and is distributed into three factors with four items each one: overload (e.g., "I overlook my own needs to fulfill work demands"), lack of development (e.g., "My work does not offer me opportunities to develop my skills") and neglect (e.g., "I give up in response to difficulties in my work"). Responses are registered on a 7-point Likert scale ranging from 1 (Totally disagree) to 7 (Totally agree). This scale showed adequate psychometric properties in previous studies with secondary teachers (Abós, Sevil, Julián, Martín-Albo, & García-González, 2017). In the present study, a CFA was performed showing adequate goodness-of-fit ($\chi 2/df = 2.94$, $p <. 001$; RMSEA = 0.058; CFI = 0.994; TLI = 0.993). The composite reliability analysis of the study sample obtained omega (ω) values of .90 for overload, .92 for lack of development and .92 for neglect.

2.3. Data analysis

2.3.1. Model estimation

Confirmatory Factor Analysis (CFA) and Exploratory Structural Equation Modelings (ESEM) were calculated with Mplus 7.3 (Muthén & Muthén, 2016). The distribution of the item responses was previously tested to correctly choose the estimator. Because all the items recorded all possible responses (i.e., 1, 2, 3, 4 or 5), data were treated as continuous. Thus, Robust Maximum Likelihood (MLR), which provides fit indices and standard errors that are robust to non-normality and to the Likert nature of items including five or more response categories, was chosen as the estimator (Finney & DiStefano, 2013). CFA models were estimated according to the independent cluster model, with each item being allowed to load on a single factor, and all four factors being allowed to correlate (Sánchez-Oliva et al., 2016). The ESEM models were estimated with an oblique target rotation (Asparouhov & Muthén, 2009), which allows specifying target and non-target factor loadings in a confirmatory manner. All cross-loadings were specified to be close to zero, while all main loadings were freely estimated (Morin et al., 2015). Standardized factor loadings (λ) and the uniquenesses (δ) of each item were reported for all models. On the other hand, scale score reliability estimates were computed using McDonald's (1970) $\omega = (\Sigma|\lambda i|)^2 / ([\Sigma|\lambda i|]^2 + \Sigma\delta ii)$ where λi are the standardized factor loadings, and δii the standardized item uniquenesses. In comparison with traditional scale score reliability estimates, such as Cronbach's alpha, ω has the advantage of considering the strength of association between items and constructs (λi), as well as item-specific measurement errors (δii) (Dunn, Baguley, & Brunsden, 2014).

2.3.2. Measurement invariance

Measurement invariance of the NSTSS was conducted in the next sequence to verify the presence of different types of measurement biases in the group context (i.e., gender and type of school) comparisons (Guay, Morin, Litalien, Valois, & Vallerand, 2015; Sánchez-Oliva et al., 2016): (1) configural invariance indicates whether the same factor model (i.e., with the same pattern of free/fixed parameters) is supported across groups, before adding constraints; (2) weak invariance (i.e., factor loadings/cross-loadings) assesses whether the latent constructs are defined in the same manner by their items across groups. Therefore, weak invariance is assessed by adding equality constraints to the factor loadings across groups; (3) strong invariance (i.e., factor loadings/cross-loadings, and intercepts) assesses whether mean differences in observed scores can be explained by mean differences at construct level. Adding equality constraints to all thresholds across groups assesses this assumption. Strong invariance represents a prerequisite to the full comparison of latent means across groups; (4) strict invariance (i.e., factor loadings/cross-loadings, intercepts, and uniquenesses) assesses whether item-level measurement errors are comparable across groups. Adding equality constraints to item uniquenesses across groups tests this assumption (i.e., fixing them to one in all groups). In each sequence of invariance, the preceding model served as reference. The aforementioned four steps assess the presence of different types of measurement biases and are sufficient to accept that the measurement properties of an instrument are the same across groups (Guay et al., 2015).

Further, the next two steps can be useful to identify the presence of meaningful and unbiased group differences that occur at latent variance, covariance and mean level (Sánchez-Oliva et al., 2016): (5) latent variance-covariance invariance (i.e., factor loadings/cross-loadings, intercepts, uniquenesses, and latent variances-covariances) assesses whether the full variance/covariance matrix is also invariant across groups. Adding equality constraints to the factor covariances and fixing all factor variances to one in all groups tests this assumption; (6) latent means invariance (i.e., factor loadings/cross-loadings, intercepts, uniquenesses, latent variances-covariances, and latent means) represents the last step to assume complete measurement invariance. The latent means estimated in the comparison group represent mean-level differences between groups (because the latent means were fixed to zero in the reference group in the previous models). Therefore, the significance test associated with these latent means indicates whether they differ significantly from the other group (Guay et al., 2015).

2.3.3. *Nomological validity*

An analysis of latent correlations was conducted to evaluate the nomological validity of the NSTSS. This was done by using the final model of the NSTSS and adding latent CFA factors that referred to motivation for teaching (i.e., autonomous motivation, controlled motivation and amotivation), to engagement at work (i.e., vigor, dedication and absorption), and to burnout at work (i.e., overload, lack of development and neglect).

2.3.4. *Goodness-of-fit assessment*

The assessment of the models (CFA and ESEM) was based on the following goodness-of-fit indices: chi-square statistics (χ^2), comparative fit index (CFI), Tucker-Lewis Index (TLI) and the root mean square error of approximation (RMSEA). Regarding χ^2, non-significant values are considered as adequate. It is important to keep in mind that χ^2 tends to be oversensitive to sample size and minor model misspecifications. Further, values of 0.08 and 0.06 or less for RMSEA are considered, respectively, as adequate and excellent (Marsh, Hau, & Wen, 2004), while for CFI and TLI, values of over 0.90 and 0.95 indicate adequate and excellent fit indices of the model, respectively (Marsh et al., 2004). Regarding the evaluation of the invariance models, each model was compared with its previous step by considering the changes (Δ) in the fit indices. The χ^2 difference tests[1] ($p < .05$), decreases of more than 0.010 in CFI and TLI, and increases of over 0.015 in RMSEA indicate that the hypothesis of invariance should be rejected (Chen, 2007). Importantly, χ^2 tests tend to be even more

[1] The scaling correction composite needed to be considered in the calculation of chi-square difference tests because the present study used MLR as estimator (Morin & Maïano, 2011). The difference in the log likelihood of the nested models was interpreted as chi-square with the same degrees of freedom as the difference in free parameters among models. Then, the difference was divided by its scaling correction composite, *cd*, where: (i) cd = (*p0* x *c0* x *p1* x *c1*) / (*p0* x *p1*) (ii) *p0* and *p1* were the number of free parameters in the nested and comparison models; and (iii) *c0* and *c1* were the scaling correction factors for the nested and comparison models.

problematic than the χ^2 itself. We reported both because they can provide additional and useful information. Yet, it is advisable to predominantly focus on independent sample size indices (i.e., CFI, TLI, RMSEA) to judge measurement invariance models (Chen, 2007; Cheung & Rensvold, 2002). Furthermore, it should be indicated that parsimony fit indices such as TLI and RMSEA could improve in more restricted models. In conjunction, when MLR is used as an estimator, χ^2 and CFI may improve in the more restricted models when the MLR correction factors differ. However, these improvements must be considered as random (Sánchez-Oliva et al., 2016).

2.4. Preliminary findings

To eliminate any errors that might arise in the NSTSS validation process, a preliminary factorial study was performed with a sample of 184 secondary teachers. Following the recommendations of Marsh et al. (2009), first, a CFA was conducted to verify the advisability of the hypothetical four-factor and 18-item structure, which was hoped to be obtained from the teachers' answers to the NSTSS. As observed in Table 2, the preliminary CFA model showed factor loadings (λ) of over 0.50 in most of the items (except in items 7, 11 and 15). However, the fit indices of the preliminary CFA model were not acceptable (χ^2 = 648.21, p <.001; CFI = 0.812; TLI = 0.777; RMSEA = 0.093).

Consequently, an ESEM was decided upon as this type of analysis may be helpful to understand certain parametric misfits that could remain hidden if only a CFA were carried out (Guay et al., 2015; Morin, Marsh, & Nagengast, 2013). Thus, from an exploratory approach, the ESEM provides cross-loadings that permit observing the least significant or most problematic items (Asparouhov & Muthén, 2009). In this sense, although the results of the preliminary ESEM model showed a better fit in comparison with the previous preliminary CFA model, acceptable values were only obtained in the CFI (0.926) and in the RMSEA (0.063) indices. The values obtained in the TLI (0.870) were unacceptable. Consequently, to identify any problematic items that might be affecting the fit of the NSTSS, two criteria were taken into account (Appleton, Ntoumanis, Quested, Viladrich, & Duda, 2016): (a) eliminating items with low factor loading (i.e., $\lambda < 0.40$), and (b) eliminating items with a higher cross loading than that obtained in its own factor (i.e., $|\lambda| > \lambda$). In agreement with both criteria, items 7, 11 and 15, corresponding to the factors of ego climate support, autonomy support and relatedness support, respectively, were eliminated. Item 7 ($\lambda_7 = 0.34$; i.e., “During lessons, students mainly compare their performance with that of others”) was eliminated as it showed a factor loading (λ) of less than 0.40. In conjunction, items ($\lambda_{11} = 0.19 < |\lambda_{11Tcs}| = 0.41$; i.e., “I give students the opportunity to affect the way lessons are run”) and 15 ($\lambda_{15} = 0.03 < |\lambda_{15As}| = 0.21 < |\lambda_{15Tcs}| = 0.52$; i.e., “I try to get my students to have a good sense of integration”) represented the two elimination criteria (i.e., $\lambda < 0.40$ and $\lambda < |\lambda|$). In this sense, the cross-loadings obtained in items 11 and 15 could suggest their inclusion in the task climate support factor. However, after analyzing their wording, it was decided to eliminate them as the factor loading fell on other constructs that did not fully include their real meaning.

<INSERT TABLE 2 ABOUT HERE>

2.5. Factor structure and reliability

Based on the final four-factor and 15-item model, factorial structure, reliability, measurement invariance and nomological validity of the NSTSS were evaluated with a second sample of 400 secondary teachers. The descriptive statistics and correlations of the 15 items can be observed in Table 3.

<INSERT TABLE 3 ABOUT HERE>

The goodness-of-fit indices of the estimated alternative measurement models, based on these answers, are presented in Table 4. Overall, the definite CFA and ESEM models showed an adequate level of fit (CFI and TLI ≥ 0.900; RMSEA ≤ 0.080). As observed in Table 4, the comparison between the CFA and ESEM models was very similar. However, to ensure the best choice of model, it is advisable to complement the fit indices with a comparison of the estimated parameters (Sánchez-Oliva et al., 2016). Thus, the factor loadings (λ), uniquenesses (δ) and composite reliability (ω) of the factors, respect to the CFA and ESEM models, can be observed in Table 5. In the CFA model, all the factors were well-defined, showing high and significant factor loadings (λ = 0.50–0.80; M = 0.67; p < 0.01). Further, because the purpose of using the NSTSS was to discover the influence that teachers' perception of their interpersonal teaching styles has on their motivational process and their well-being, and not to evaluate high-stakes testing (e.g., psychological illness) or teacher employment decisions (e.g., dismissals of teachers), the composite reliability coefficients were considered as adequate (ω = 0.75–0.92; M = 0.80), providing the NSTSS with acceptable confirmatory robustness.

<INSERT TABLE 4 ABOUT HERE>

Consistent with these results, the ESEM model revealed high and significant factor loadings in all items. Furthermore, the cross-loadings were not greater than 0.15 in any of the three factors, mainly showing a non-significant value. Thus, it can be observed how the task climate support factor seems to be globally well-defined (λ = 0.46–0.75; M = 0.67; p < 0.01) showing considerable superiority with respect to the cross-loadings ($|\lambda|$ = -0.15–0.09; M = 0.05). In this regard, although items 1 ($|\lambda_{Autonomy\ support}|$ = - 0.09) and 5 ($|\lambda_{Ego\ climate\ support}|$ = - 0.15) showed significant cross-loadings in other factors, both can be considered weak. With respect to ego climate support factor loadings (λ = 0.48–0.78; M = 0.68; $p < 0.01$), the results were very similar to task climate. In conjunction, the factor loadings obtained very low values ($|\lambda|$ = - 0.08–0.14; M = 0.05), and only item 8 showed a significant value in another factor ($|\lambda_{Autonomy\ support}|$ = 0.14), although with a very low weight. The autonomy support factor, although showing slightly lower factor loadings than the rest of the factors (λ = 0.57–0.71; M = 0.63; $p < 0.01$), was very well-defined as it did not show significant cross-loadings in any of the other factors. Finally, the relatedness support factor revealed high and significant factor loadings (λ = 0.49–0.93; M = 0.68; p < 0.01) and weak cross-loadings ($|\lambda|$ = - 0.08 to 0.12; M = 0.06). In this sense, only item 13 showed significant values in other factors ($|\lambda_{Task\ climate\ support}|$ = 0.10; $|\lambda_{Autonomy\ support}|$ = 0.12) although with weak cross-loadings. Thus, the final 15-item version of the NSTSS seems to support the four-factor structure of the scale. Consistent with these results, the ESEM model showed excellent composite reliability for task climate support (ω = 0.93), and acceptable composite reliability for ego climate support (ω = 0.75), autonomy support (ω = 0.75) and relatedness support (ω = 0.78), slightly improving the indices revealed by the CFA model. Finally, the latent correlations of the CFA and ESEM models are reported in the bottom section of Table 5.

<INSERT TABLE 5 ABOUT HERE>

In this sense, although the use of the ESEM (when CFA and ESEM reveal similar fit indexes) seems to be less advantageous because the ESEM model is less parsimonious than the CFA model, the ESEM model can provide a more exact representation of the factor loadings, contributing to a better interpretation of the construct (Morin et al., 2013). Thus, the subsequent steps (i.e., measurement invariance and nomological validity) to validate the NSTSS were taken using the ESEM model, based on a confirmatory approach and following the recommendations of Guay et al. (2015).

2.6. Measurement invariance

To ensure that between-group NSTSS-based comparisons are meaningful, it needs to be shown that the measurement scales are psychometrically equivalent across different subsamples (Millsap, 2011). To this end, based on the ESEM solution, a series of measurement invariance tests were conducted across gender (166 males, 234 females; models M3 to M8) and type of school (276 public, 124 private; models M9 to M14). The findings from these models are reported in the bottom section of Table 4. Results from the measurement invariance tests conducted according to teacher gender and type of school were extremely similar and showed that: (1) some of the χ^2 difference tests were non-significant; (2) the CFI, TLI, and RMSEA showed adequate model fit in all models; (3) the ΔCFI and ΔTLI never indicated a decrease of more than 0.010; (4) the ΔRMSEA never showed an increase of more than 0.015; (5) the fit indices that control model parsimony were better at the end of the sequence than at the beginning (gender: TLI = 0.900 to 0.938, RMSEA = 0.049 to 0.048; type of school: TLI = 0.939 to 0.953, RMSEA = 0.047 to 0.042). It should be noted that some changes in χ^2 tests were significant. However, the remaining changes in the CFI, TLI and RMSEA indices, which are considered more adequate to evaluate measurement invariance models because they are independent of sample size and minor model misspecifications, were considered acceptable. These results clearly confirm the complete measurement invariance of the NSTSS across gender and type of school.

2.7. Nomological validity

As a final step, and based on the ESEM model, the nomological validity of the NSTSS was evaluated with respect to the variables of motivation to teach, engagement at work and burnout. So, to obtain the latent variable correlations, the CFAs of these variables were added to the ESEM model. These latent correlations are reported in Table 6. Firstly, task climate support, autonomy support and relatedness support were significantly and positively correlated with autonomous motivation, and significantly and negatively correlated with amotivation. Furthermore, ego climate support was significantly and negatively correlated with autonomous motivation, and significantly and positively correlated with teachers' controlled motivation and amotivation. Secondly, task climate support, autonomy support and relatedness support were significantly and positively correlated with the three engagement-at-work factors (i.e., vigor, dedication and absorption). In contrast, ego climate support was only significantly and negatively correlated with teachers' dedication. Finally, task climate support, autonomy support and relatedness support were significantly and negatively correlated with teachers' lack of development and neglect. In conjunction, ego climate support was significantly and positively correlated with the three teacher burnout factors (i.e., overload, lack of development and neglect). Altogether, these results support the nomological validity of the NSTSS.

<INSERT TABLE 6 ABOUT HERE>

3. Discussion

The well-being and job satisfaction of secondary teachers has sharply decreased in recent years (Anaya & López, 2014). Intervention programs aimed at improving need-supportive teaching styles in the classroom could not just improve student motivation (e.g., Cheon & Reeve, 2015; Ntoumanis, 2005), but also the school environment (e.g., Fernández-Río et al., 2014), teacher well-being and motivation to teach (e.g., Jan et al., 2012). To design effective professional development programs, aimed at enhancing teachers' need-supportive teaching styles, it seems necessary to evaluate a valid and reliable scale to capture a supportive teaching style. Thus far, there are no instruments that evaluate teachers' perception of the interpersonal style they develop in the classroom in agreement with a theoretical framework that integrates the tenets of SDT and AGT. Therefore, the aim of this study, after adapting the items of the MCPES to the teaching context, was to validate the NSTSS to evaluate teachers' perception of their interpersonal styles. To do so, four hypotheses were proposed, related to the factorial structure and reliability, measurement invariance and the nomological validity of the NSTSS.

3.1.1. Four-factor structure and reliability (Hypohesis 1)

Firstly, considering the validation carried out by Soini et al. (2014) of the MCPES in students, the first hypothesis suggested that a four-factor structure (i.e., task climate support, ego climate support, autonomy support and relatedness support) could also emerge based on teachers' answers to the NSTSS. The results of the preliminary study suggested eliminating three items as the factor loadings were too low or because they had very high cross-loadings. So, after eliminating these items in the preliminary study, the CFA and ESEM models of the final sample of teachers (n = 400) showed acceptable values of goodness-of-fit indices, indicating satisfactory construct validity of the four-factor model of the NSTSS in line with the previous validation in students (i.e., MCPES; Soini et al., 2014). The results of the factor loadings of the CFA model showed high values ($\lambda > 0.50$) supporting the relationship of each item with its previously hypothesized latent factor. These results were reinforced with those found in the ESEM model. Thus, in the ESEM model, all items showed high factor loadings with their relative latent factor. Furthermore, the observation of cross-loadings suggested that none of the items could be loading on the other latent factors. In most of the cases, the cross-loadings were low and not significant. At a methodological level, the use of the ESEM to evaluate the four-factor structure of the NSTSS, which is strongly emerging in social and educational sciences (Mauro, Gomes, Almeida, & Núnez, 2017), could contribute to guiding future validation studies with teachers.

Likewise, considering the main objective of the NSTSS, the reliability results were acceptable for all latent factors. Social science studies usually report the reliability of their instruments based on Cronbach's alpha (e.g., Soini et al., 2014), which can be biased by the number of items that make up each latent factor (Dunn et al., 2014). In this sense, recent studies have argued the possible superiority of calculating the omega index (ω), supporting its use in validation studies (e.g., Sanchez-Oliva et al., 2016). The methodological contribution of the present study, in terms of composite reliability, is also important to note, and this is something that future validation research studies should adopt. Overall, the 15 items of the NSTSS adequately explain the meaning of the latent factor they belong to, supporting the four-factor structure of the scale and its reliability. This further provides a specific and useful scale to capture a supportive (i.e., task climate support, autonomy support and relatedness support) as well as a thwarting interpersonal behaviour (i.e., ego climate support).

3.1.2. Measurement invariance of the NSTSS (Hypohesis 2)

Secondly, following the recommendations made in organizational literature to improve the generalizability of the instruments (e.g., Ayman & Korabik, 2010; Lukaszewski & Stone, 2012), the second hypothesis of this study suggested that the NSTSS would be invariant to teachers' answers, regardless of their gender (i.e., male or female), and type of school (i.e., public or private). The results found supported the complete invariance of NSTSS across gender and type of school. This could represent a theoretical and methodological advance in the development of the scale to evaluate teachers' perception of their interpersonal styles (i.e., NSTSS), because in the initial validation of student perception of teachers' interpersonal styles (i.e., MCPES; Soini et al., 2014), measurement invariance was not examined. Furthermore, these findings must be highlighted because of the influence that both gender and type of school may have on the development of teachers' motivational processes and, therefore, on their interpersonal teaching styles (Gil-Flores, 2016; Latorre & Sáez, 2009; Reeve et al., 2014). Importantly, if we want to examine teachers' interpersonal styles to evaluate their influence on their motivation to teach, the first step is to do it with invariant scales across teacher gender and type of school, such as the NSTSS.

3.1.3. Nomological validity of the NSTSS (Hypoheses 3 and 4)

Thirdly, to evaluate the nomological validity of the scale, the third and fourth hypotheses purported to show the relationship of the four factors of the NSTSS with motivation to teaching, as well as with teacher engagement and burnout at work. Regarding the third hypothesis, the results of this study indicated that task climate, autonomy and relatedness support were positively related to autonomous motivation and to teacher engagement. Overall, these three interpersonal teaching style factors were negatively related to teacher amotivation and burnout. These results are in line with previous studies that have indicated the positive relationship of teacher task climate support with interest in teaching and teacher engagement (Butler & Shibaz, 2014; Han et al., 2016; Parker et al., 2012), and the negative relationship with teacher burnout (Parker et al., 2012). However, to date, no studies have analyzed the direct relationship between teacher perception of task climate support and motivation to teaching. As a theoretical contribution, the creation of a scale based on an integrated theoretical framework (i.e., SDT & AGT) such as the NSTSS may help study this relationship and its direction. This could be relevant to improve the understanding of both teacher and student motivation processes. Nonetheless, although there is no previous evidence, these results could be explained by following the integrated sequence proposed in Fig. 1. Thus, task climate support, as it generates positive outcomes in students, could reciprocally influence teaching motivation, as well as other behavioral outcomes such as interpersonal style, which could be associated with psychological behaviors related to well-being (i.e., engagement and burnout; Pelletier & Rocchi, 2015). This again emphasizes the importance that the NSTSS could have to improve school environments.

The results of this study are also in line with other previous studies which, grounded in SDT, have indicated the positive relationship between autonomy support and relatedness support, and the autonomous motivation of teachers (Cheon et al., 2014; Pelletier et al., 2002; Taylor, Ntoumanis, & Standage, 2008; Van den Berghe et al., 2014). Consistent with these results, several studies (Cheon et al., 2014; Van den Berghe et al., 2014) have shown a negative relationship between a need-supportive teaching style and teacher burnout. A possible justification of the results found is that a need-supportive teaching style can generate greater motivation and positive outcomes in students (Abós et al., 2016). At the same time, teachers themselves should benefit because a reciprocal relationship between students and teachers in classroom functioning and outcomes has been empirically confirmed (Jang et al., 2012; Reeve, 2013). This highlights the relevance that the evaluation, through the NSTSS, of teacher interpersonal styles could have in preventing negative outcomes both in students and in teachers. In addition, consistent with past work (Van den Berghe et al., 2014), controlled motivation was not significantly related to task climate, autonomy or relatedness support. A potential explanation for these results could be that supportive-teaching styles would reciprocally influence teachers' autonomous motivation, but would not cause the emergence of external reasons to put an effort into teaching (i.e., controlled motivation). Likewise, the significant and negative correlations found in this study between amotivation and task climate, autonomy and relatedness support, suggest the importance that autonomous motivation may have on avoiding teaching styles that may have a negative impact on student motivation as well as on the motivation of the teachers themselves.

Finally, regarding the fourth hypothesis, the results of this study also showed that ego climate support was negatively related to teachers' autonomous motivation. Regarding engagement factors, while ego climate support was negatively related to dedication at work, no relationships between ego climate support and vigor and absorption were found. These findings suggest, according to past studies centered on the analysis of work engagement (e.g., Bakker & Demerouti, 2008), that the adoption of an interpersonal teaching style focused on student success compared with other students' performance (i.e., ego climate support) could frustrate teachers' challenges and their feelings of enthusiasm (i.e., dedication). However, the adoption of an ego climate support would not affect teachers' energy (i.e., vigor) or their concentration (i.e., absorption) on developing teaching tasks. Furthermore, consistent with previous works (Papaioannou & Christodoulidis, 2007; Parker et al., 2012; Retelsdorf et al., 2010) ego climate support was positively related to teachers' controlled motivation, amotivation and burnout. One possible justification of the results found is that, if teachers encourage interpersonal competition and comparisons in the classroom, this may generate more negative outcomes in students (Abós et al., 2016; Fernández-Río et al., 2014; Moreno et al., 2011; Sevil et al., 2016). Reciprocally, these maladaptive outcomes in students may give rise to lower autonomous motivation and more controlled motivation and amotivation of teachers, as well as outcomes such as burnout and exhaustion (Fernet et al., 2012; Van den Berghe, et al., 2014). Consequently, the results of this study sustain the nomological validity of the NSTSS, showing a significant relationship with three variables (i.e., motivation to teaching, engagement and burnout at work), which, according to scientific literature, are considered to have a considerable influence on teacher well-being (e.g., Han & Yin, 2016; Viseu et al., 2016).

4. Limitations and directions for future research

Some limitations must be borne in mind when the results of this study are considered. First, this study was based on a sample of Spanish secondary teachers, which restricts the generalizability of the results to other languages. Therefore, future studies should test the theoretical structure of the NSTSS at other teaching levels and in other countries with different languages. Thus, cross-cultural studies could be conducted that would test the invariance of interpersonal teaching styles in different cultures. Second, the low response rate (i.e., 10%) can introduce bias which may reduce generalizability of the results. A possible explanation of the low rates found in our study could be the question types asked in the questionnaire or the moment when we collected the information (i.e., the third semester of the academic year). Future studies should take these limitations into account in order to obtain a more representative sample size of the population to thus increase the generalizability of the NSTSS, verifying the evidence found in the present study. Third, this study only evaluates teacher perception of task climate support, ego climate support, autonomy support, and relatedness support. Future research studies could design a questionnaire to perform the complementary evaluation of the controlling style and thwarting of relatedness. Likewise, including the perspective of avoidance derived from AGT (i.e., 2 x 2 or 3 x 2 model; Elliot & McGregor, 2001; Mascret et al., 2015) could be a new and interesting avenue of research. Moreover, it could be interesting to complement teachers' perception of their need-supportive behavior (i.e., NSTSS) with students' perception of teachers' need-supportive behavior (e.g., Soini et al., 2014), as well as observational measures to compare the differences between different instruments (e.g., Smith et al., 2015). Fourth, this study only analyzed the relationship between interpersonal teaching style and teacher motivation, engagement and burnout. Future studies should verify the sequence proposed in Fig. 1 by examining the relationship between NSTSS and student motivation and outcomes. In addition, all measures to examine the nomological validity (i.e., motivation, engagement and burnout) of the NSTSS come from self-report questionnaires. This could lead to a mono-method bias that measures response style characteristics rather than expected relationships between constructs. Introducing other types of measures could be a new avenue of research. Last, but not least, due to the cross-sectional nature of the study, it was not possible to determine the direction of causality between the NSTSS and the converging measures. As a result, it seems important that future studies that use the NSTSS should be able to evaluate, by means of longitudinal designs, the extent to which teachers' answers to the NSTSS may show fluctuations with the passage of time.

5. Conclusion

To conclude, this study proposes a valid and reliable scale to assess teachers' perception of their interpersonal teaching styles in a sample of secondary teachers using an integrated theoretical framework. Likewise, at a theoretical level, the results of this study contribute to the integration of SDT and AGT to capture a supportive and thwarting interpersonal behavior. Further, results of the measurement invariance indicate that the NSTSS could be used across teachers of different genders and from different types of school. The nomological validity findings of this study support the use of the NSTSS as an instrument to predict teacher motivation, engagement and burnout at the workplace. In addition, this study may increase knowledge about the relevance of interpersonal teaching styles in teacher motivation and in psychological outcomes related to well-being at work, such as engagement and burnout.

Secondary school policy-makers should consider designing continuous professional development programs that focus on training need-supportive teaching. This could have an impact on students' and teachers' motivation, fostering student and teacher engagement at school, and on learning.

Conflict of Interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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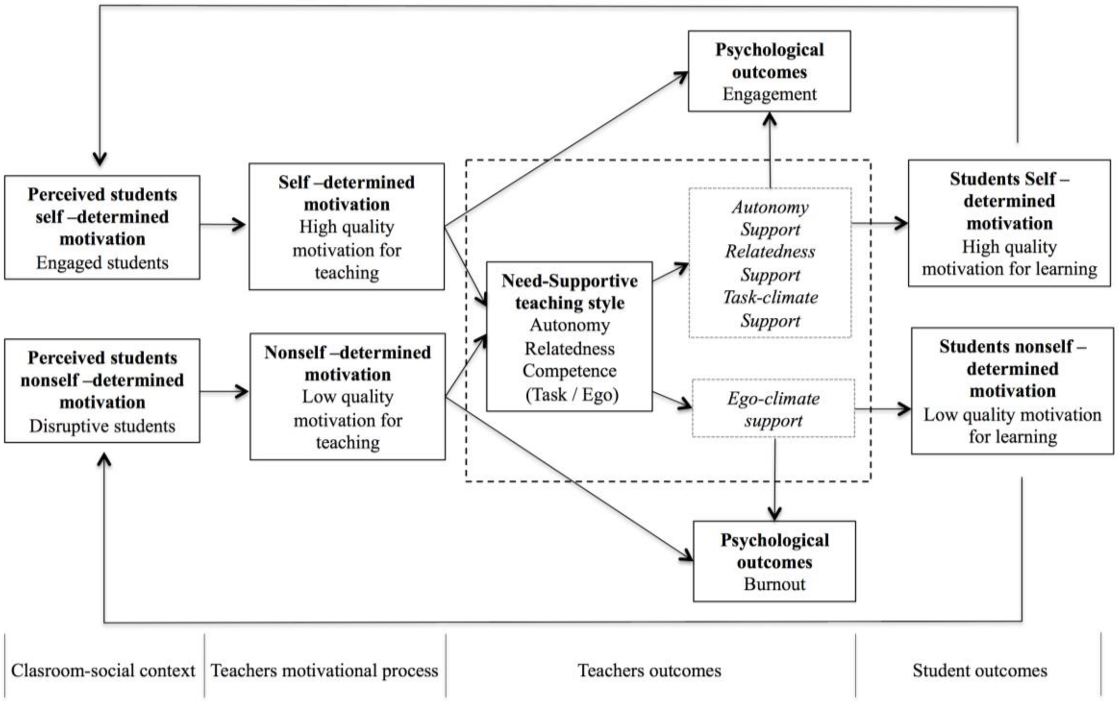

Fig. 1. A process model of the effects of the classroom as a social context on teachers' motivation, need-supportive teaching style, teachers' psychological outcomes and students' outcomes: integration of AGT into the SDT framework suggested by Pelletier et al. (2002) and extended by Pelletier & Rocchi (2015).

Table 1
Spanish and English versions of the Need-Supportive Teaching Style Scale.

Spanish version (NSTSS)	English version (NSTSS)*
1. Para mí es importante que los estudiantes lo hagan lo mejor posible durante las clases.	1. For me, it is important for students to try their best during lessons.
2. Intento que mis alumnos aprendan cosas nuevas para que quieran aprender más.	2. I try to get my students to learn new things so they want to learn more.
3. Lo más importante es que mis alumnos progresen cada año en sus propias destrezas.	3. What's most important is for my students to progress every year in their own skills.
4. Es importante para mí que los estudiantes traten de mejorar sus propias destrezas.	4. For me, it is important for students try to improve their own skills.
5. Trato de que los estudiantes sigan intentándolo a pesar de que cometan errores.	5. I try to get students to keep trying even though they make mistakes.
6. Es importante para mí que mis estudiantes demuestren que son mejores unos que otros en mi clase.	6. For me, it is important for students to show that they are better than others in my class.
7. Trato de que mis estudiantes lo hagan mejor que sus otros compañeros/as.	7. I try to get my students to do better than their other classmates.
8. Intento que mis estudiantes compitan entre sí para hacerlo mejor durante las clases.	8. I try to get my students to compete with each other to do it better during classes.
9. Mis estudiantes tienen un papel importante en la toma de decisiones en mis clases.	9. My students have a significant role in decision making in my classes.
10. Mis estudiantes tienen la libertad de tomar decisiones durante mis clases.	10. My students have significant freedom to make choices during my lessons
11. Doy la oportunidad a los estudiantes de seleccionar las actividades de acuerdo a sus propios intereses.	11. I give students the opportunity to select activities according to their own interests.
12. Es importante para mi que mis estudiantes puedan participar en el desarrollo de la clase (organizativo, elección de tareas. etc.).	12. It is important for me for my students to be able to participate in the development of the class (organization, choice of tasks, etc.).
13. Para mi, es importante que mis estudiantes estén unidos en las distintas unidades didácticas que desarrollamos durante el curso.	13. For me, it is important for my students to be united in the different teaching units that we develop throughout the course.
14. Intento que mis estudiantes realmente trabajen juntos como un equipo en mis clases.	14. I try to get my students to really "work together" as a team in my lessons.
15. Intento que durante mis clases mis estudiantes se junten para trabajar.	15. I try to get my students to "pull together" to work during my lessons.

Note: items 1 to 5 = Task climate support; 6 to 8 = Ego climate support; 9 to 12 = Autonomy support; 13 to 15 = Relatedness support. * = English version has not been validated.

Table 2

Standardized factor loadings (λ) and uniquenesses (δ) for the preliminary CFA and ESEM solutions.

	Preliminary CFA (18)		Preliminary ESEM (18)				
			Tcs	Eos	As	Rs	
Indicator	λ	δ	λ	λ	λ	λ	δ
Task climate support							
1	**0.68**	0.54	**0.72**	*0.03*	- 0.10	*0.03*	0.52
2	**0.69**	0.53	**0.67**	*0.01*	*0.04*	*0.03*	0.53
3	**0.74**	0.45	**0.70**	*0.01*	*- 0.03*	0.11	0.46
4	**0.72**	0.48	**0.67**	*- 0.06*	0.09	*0.03*	0.47
5	**0.53**	0.72	**0.53**	- 0.10	*0.05*	*0.09*	0.68
Ego climate support							
6	**0.75**	0.43	*- 0.02*	**0.75**	- 0.08	*0.06*	0.42
7	**0.32**	0.89	*0.06*	**0.34**	0.13	- 0.13	0.86
8	**0.79**	0.37	*0.02*	**0.78**	*- 0.04*	0.07	0.40
9	**0.51**	0.72	*0.02*	**0.53**	0.14	*- 0.07*	0.70
Autonomy support							
10	**0.61**	0.61	0.05	*0.05*	**0.59**	*- 0.01*	0.63
11	**0.34**	0.88	0.41	*- 0.02*	**0.19**	*0.03*	0.73
12	**0.63**	0.60	*- 0.03*	*0.04*	**0.63**	*0.03*	0.60
13	**0.64**	0.59	- 0.17	*- 0.01*	**0.64**	0.10	0.57
14	**0.67**	0.55	- 0.11	*- 0.03*	**0.70**	*0.05*	0.52
Relatedness support							
15	**0.47**	0.77	0.52	*- 0.07*	0.21	**0.03**	0.55
16	**0.62**	0.61	0.08	*0.03*	0.13	**0.50**	0.65
17	**0.70**	0.51	*- 0.05*	*-0.01*	- 0.09	**0.97**	0.15
18	**0.71**	0.49	*0.07*	*0.01*	0.15	**0.54**	0.57

Note: Preliminary CFA (18) = Preliminary confirmatory factor analyses model 18 items; Preliminary ESEM (18) = Preliminary exploratory structural equation modeling model 18 items; Tcs = Task climate support; Ecs = Ego climate support; As = Autonomy support; Rs = Relatedness support; bold = target factor loadings. Non-significant parameters ($p \geq 0.05$) are marked in italics.

Table 3
Descriptive statistics and correlations for the items.

Item	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1.Tcs	-														
2.Tcs	.54**	-													
3.Tcs	.49**	.52**	-												
4.Tcs	.46**	.45**	.57**	-											
5.Tcs	.39**	.34**	.29**	.43**	-										
6.Ecs	-.11**	-.13**	-.11**	-.18**	-.23**	-									
7.Ecs	-.07	-.09*	-.10*	-.11**	-.15**	.61**	-								
8.Ecs	-.03	*.02*	-.07	-.09*	-.13**	.35**	.39**	-							
9.As	.09*	.19**	.19**	.19**	.14**	.04	.02	.05	-						
10.As	.07	.13**	.12**	.17**	.13**	-.00	.05	-.10**	.46**	-					
11.As	.02	.09*	.08*	.11**	.06	-.01	.05	.06	.34**	.38**	-				
12.As	.04	.15**	.10*	.16**	.10*	-.03	-.01	-.08*	.39**	.38**	.53**	-			
13.Rs	.18**	.23**	.24**	.22**	.21**	-.02	.02	.05	.25**	.24**	.28**	.30**	-		
14.Rs	.14**	.18**	.24**	.20**	.19**	-.01	.03	-.03	.22**	.24**	.29**	.28**	.49**	-	
15.Rs	.13**	.19**	.23**	.24**	.27**	-.01	-.01	.02	.24**	.35**	.28**	.25**	.40**	.56**	-
M	4.54	4.57	4.55	4.54	4.59	1.80	2.01	2.31	3.52	3.54	2.67	3.27	3.51	3.17	3.71
SD	0.59	0.58	0.57	0.58	0.58	0.86	0.94	1.02	0.85	0.91	1.07	0.98	0.88	1.07	0.94

Note: Tcs = Task climate support; Ecs = Ego climate support; As = Autonomy support; Rs = Relatedness support; M = Mean; SD = Standard Deviation; * = $p < 0.05$; ** = $p < 0.01$.

Table 4
Goodness-of-fit statistics of the confirmatory factor analyses and exploratory structural equation models.

Model	χ^2 (df)	CFI	TLI	RMSEA [90% CI]	CM	$\Delta\chi^2$ (df)	ΔCFI	ΔTLI	ΔRMSEA
M1. CFA	212.44* (84)	0.941	0.927	0.051 [0.043-0.060]	-	-	-	-	-
M2. ESEM	136.15* (51)	0.961	0.920	0.053 [0.043-0.064]	M1	76.94 (33)*	+ 0.020	- 0.007	+.002
Invariance across gender									
M3. Configural Invariance	215.29* (102)	0.950	0.900	0.049 [0.039-0.058]	-	-	-	-	-
M4. Weak Invariance	252.68*(146)	0.953	0.932	0.050 [0.039-0.060]	M3	50.63 (44)*	+ 0.032	+ 0.010	+ 0.001
M5. Strong Invariance	274.96*(157)	0.948	0.930	0.051 [0.041-0.061]	M4	17.63 (11)*	- 0.005	- 0.002	+ 0.001
M6. Strict Invariance	292.42* (172)	0.947	0.935	0.049 [0.039-0.058]	M5	31.42 (15)	- 0.001	+ 0.005	- 0.002
M7. Variance-covariance invariance	308.08* (182)	0.944	0.936	0.049 [0.039-0.058]	M6	15.75 (10)	- 0.003	+ 0.001	0.000
M8. Latent mean invariance	311.08* (186)	0.945	0.938	0.048 [0.038-0.057]	M7	2.96 (4)	+ 0.001	+ 0.002	- 0.001
Invariance across type of school									
M9. Configural Invariance	168.50* (102)	0.966	0.939	0.047 [0.034-0.060]	-	-	-	-	-
M10. Weak Invariance	242.32* (146)	0.957	0.938	0.048 [0.037-0.058]	M8	73.76 (44)*	- 0.009	- 0.001	+ 0.001
M11. Strong Invariance	253.80* (157)	0.948	0.930	0.046 [0.035-0.056]	M9	11.37 (11) *	- 0.009	- 0.008	- 0.002
M12. Strict Invariance	262.19* (172)	0.960	0.951	0.042 [0.032-0.052]	M10	12.94 (15)	+ 0.012	+ 0.021	- 0.004
M13. Variance-covariance invariance	270.65* (182)	0.960	0.954	0.041 [0.030-0.051]	M11	11.79 (10) *	0.000	+ 0.003	- 0.001
M14. Latent mean invariance	279.98* (186)	0.958	0.953	0.042 [0.031-0.051]	M12	9.33 (4)	- 0.002	- 0.001	+ 0.001

Note: CFA = Confirmatory factor analyses; ESEM = Exploratory structural equation modeling; χ2 = Scaled chi-square test of exact fit; df = Degrees of freedom; CFI = Comparative fit index; TLI = Tucker-Lewis index; RMSEA = Root mean square error of approximation; 90% CI = 90% Confidence interval of the RMSEA; CM = Comparison model; Δ = Change in fit information relative to the CM; Var-Cov = Variance – Covariance; * $p < 0.01$.

Table 5

Standardized factor loadings (λ) and uniquenesses (δ) and latent factor correlations for the CFA and ESEM solutions.

	M1. CFA (15 items)		M2. ESEM (15 items)				
			Tcs	Eos	As	Rs	
Indicator	λ	δ	λ	λ	λ	λ	δ
Task climate support							
1	**0.68**	0.54	**0.75**	*0.05*	- 0.09	*- 0.04*	0.48
2	**0.69**	0.53	**0.71**	*0.03*	*0.05*	*- 0.04*	0.50
3	**0.74**	0.45	**0.72**	*0.02*	*- 0.04*	*0.07*	0.46
4	**0.72**	0.48	**0.69**	*- 0.04*	*0.07*	*- 0.01*	0.49
5	**0.53**	0.72	**0.46**	- 0.15	*0.01*	*0.10*	0.70
ω	0.92		0.93				
Ego climate support							
6	**0.76**	0.42	*- 0.04*	**0.77**	*- 0.06*	*0.03*	0.39
7	**0.80**	0.36	*0.01*	**0.78**	*- 0.02*	*0.04*	0.38
8	**0.50**	0.75	*0.02*	**0.48**	0.14	*- 0.08*	0.75
ω	0.75			0.75			
Autonomy support							
9	**0.59**	0.65	*0.11*	*0.05*	**0.57**	*- 0.03*	0.64
10	**0.62**	0.61	*0.03*	*0.03*	**0.59**	*0.02*	0.62
11	**0.67**	0.55	- 0.09	*- 0.01*	**0.65**	*0.07*	0.54
12	**0.69**	0.52	*- 0.04*	*- 0.04*	**0.71**	*0.01*	0.50
ω	0.76				0.76		
Relatedness support							
13	**0.63**	0.60	0.10	*0.03*	0.12	**0.49**	0.62
14	**0.77**	0.40	- 0.05	*0.01*	*- 0.08*	**0.93**	0.25
15	**0.71**	0.49	*0.04*	*- 0.01*	*0.08*	**0.61**	0.54
ω	0.76					0.78	
			Tcs	Eos	As	Rs	
Task climate support			-	- 0.20	0.26	0.38	
Ego climate support			- 0.22	-	*0.05*	*0.02*	
Autonomy support			0.26	*0.04*	-	0.52	
Relatedness support			0.42	*0.01*	0.58	-	

Note: CFA (15) = Confirmatory factor analyses model 15 items; ESEM (15) = Exploratory factor analyses model 15 items; Tcs = Task climate support; Ecs = Ego climate support; As = Autonomy support; Rs = Relatedness support; bold = Target factor loadings. Non-significant parameters ($p \geq 0.05$) are marked in italics. CFA latent correlations are displayed below the diagonal and ESEM latent correlations are displayed below the diagonal.

Table 6
Latent correlations between NSTSS factors, motivation to teach, engagement and burnout at work.

	Task climate support	Ego climate support	Autonomy support	Relatedness support
Motivation to teach				
Autonomous motivation	0.38**	- 0.17**	0.30**	0.32**
Controlled motivation	- 0.09	0.38**	- 0.09	- 0.11
Amotivation	- 0.36**	0.32**	- 0.19**	- 0.23**
Engagement at work				
Vigor	0.33**	- 0.08	0.27**	0.29**
Dedication	0.35**	- 0.13*	0.28**	0.34**
Absorption	0.34**	- 0.06	0.26**	0.27**
Burnout at work				
Overload	0.01	0.18**	0.03	- 0.04
Lack of development	- 0.19**	0.24**	- 0.12*	- 0.16**
Neglect	- 0.36**	0.25**	- 0.17**	- 0.23**

* $p < 0.05$; ** $p < 0.01$.

Highlights

- The NSTSS four-factor structure via theoretically integration of SDT and AGT is supported.
- ESEM solutions provide better fit to the data compared with CFA models.
- The NSTSS is invariant across gender and type of school.
- The nomological validity in relation to motivation to teach, engagement and burnout at work is supported.