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Research paper

Teacher leadership and students' psychological needs: A multilevel approach

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HIGHLIGHTS

- Transformational leadership was positively linked to students' needs satisfaction.
- Transactional leadership had a positive effect on students' needs frustration.
- Passive leadership generated a confusing work environment for the students.
- Differences considering subject, time, and leadership with psychological needs.

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ABSTRACT

This study aimed to determine the association between students' perception of teacher leadership (i.e., transformational, transactional, and passive) and students' psychological needs (i.e., need satisfaction and need frustration) in Mathematics, English as a foreign language, Spanish Language and Literature, and Physical Education. Participants were 858 students (346 boys and 512 girls), who completed questionnaire measures at three temporal points over an academic course. They were aged between 13 and 17 years ($M = 14.83$, $SD = 0.74$) from 118 different classes and 32 secondary schools of southwestern Spain. We conducted multilevel modeling analysis (MLM), using the linear mixed modeling procedure for each dependent variable (i.e., need satisfaction and need frustration), including the different subjects, the three measurements over the academic course (i.e., Time 1, Time 2, and Time 3), and the leadership styles (i.e., transformational, transactional, and passive leadership) as independent variables. The results showed that transformational leadership was positively related to students' need satisfaction and negatively to their need frustration. Transactional leadership was positively associated with students' need frustration, and passive leadership negatively predicted students' need satisfaction and positively predicted need frustration. Differences were found as a function of the time and the subject in the associations between variables. These findings suggest that teachers should adopt transformational behaviors to satisfy the students' psychological needs.

The role of basic psychological needs in the educational context has been essential to improve students' motivational processes towards learning (Haerens et al., 2015; Ng et al., 2016; Sánchez-Oliva et al., 2017). In this line, teaching behaviors have been one of the most researched contextual factors from different perspectives to explain students' needs satisfaction and needs frustration (Aelterman et al., 2019; De Meyer et al., 2016; García-González et al., 2019; Haerens et al., 2018; Vasconcellos et al., 2020). It has been shown that the way teachers teach their classes can lead to students' higher needs satisfaction or needs frustration (Haerens et al., 2015; Ntoumanis, 2001; Vasconcellos et al., 2020). Although the importance of teachers' role in the development of the learning process is well-known, the literature has paid less attention to how the leadership style adopted by the teacher,

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seen from the students' perception, can lead to their students' needs satisfaction or frustration. Different ways of leading and influencing students during the learning process may also be associated with greater satisfaction or frustration of needs (Koka & Hagger, 2010). Thus, grounded in the basic psychological needs theory (Ryan & Deci, 2000), we aimed to examine the relationships between the students' perception of teacher leadership style and their needs satisfaction and needs frustration in the educational context.

1. The basic psychological needs

The basic psychological needs theory (Ryan & Deci, 2000) assumes that individuals tend to satisfy three needs that are essential to well-being: autonomy, competence, and relatedness, which determine the quality of participation in a given setting. In an academic context, a need for autonomy reflects the students' initiative and desire to be the origin of their behavior and to freely participate in their learning (Deci & Ryan, 2000). The need for competence refers to the students' perception of mastery and effectiveness in the face of tasks that they must perform to reach their goals, producing a sense of achievement (Ryan & Deci, 2020). Finally, the need for relatedness refers to positive interaction in which the student feels integrated with the other elements (i.e., classmates and teachers) that make up the social environment where the educational process takes place, producing a sense of belonging and acceptance in that context rather than feeling unintegrated or excluded (Deci & Ryan, 2008).

In contrast, psychological needs frustration refers to people's negative feelings when they perceive that their psychological needs are being actively limited by the actions of other elements (Bartholomew et al., 2011). Specifically, autonomy frustration occurs when students feel pressured to take part in activities or forced to do certain behaviors (Cheon et al., 2019). Competence frustration refers to students' experiences of ineffectiveness, inadequacy, or feelings of failure and doubts about their efficacy (Chen et al., 2015). Lastly, relatedness frustration refers to students' lack of integration or feeling rejected or excluded by their educational environment (Vansteenkiste & Ryan, 2013).

Previously, aspects such as the teachers' interpersonal style (Aelterman et al., 2019; De Meyer et al., 2016; Haerens et al., 2018; Vasconcellos et al., 2020) or motivational climate (García-González et al., 2019) have been studied in depth as an antecedent of the students' perception of their needs satisfaction and needs frustration. Considering that teachers can influence, guide, and inspire their students, the leadership style employed during their teaching can be decisive for the students' learning process (De Nobile, 2018; Hallinger, 2014). In this line, knowledge of how leadership styles are linked to students has been addressed by various teaching leadership studies (Heck & Hallinger, 2014; Noland & Richards, 2014; Wilson et al., 2012).

2. Transformational leadership theory

The transformational leadership theory (Bass, 1995) provides a framework that explains the relationship between leaders (i.e., teachers) and individuals (i.e., students; Bass & Riggio, 2005). This framework establishes three main leadership styles: transformational, transactional, and passive or non-leadership. Through transformational leadership, the teacher manages to earn the students' respect and valuation, increasing their satisfaction with the training process, encouraging their efforts and improvement (Bass & Riggio, 2005). For this purpose, teachers must be a reference for their students, valuing their views when making decisions, and reinforcing their behaviors and actions based on their needs and skills (Bass, 1995). This leadership style has been linked to students' cognitive, emotional, and behavioral improvements (Boberg & Bourgeois, 2016; Heck & Hallinger, 2014; Wilson et al., 2012). Specifically, several investigations have found that teachers' transformational leadership, for instance, increases students' motivation (Beauchamp et al., 2011; Noland & Richards, 2014; Yang & Dong, 2017). In this way, the satisfaction of students' needs can be reinforced by customizing teaching to advance learning individually and autonomously, making students feel more competent and able to achieve better results, and it will increase their well-being in their group (Wilson et al., 2012). In contrast, a transactional teacher usually has rigid classroom control, providing supportive behavior only when activities are done well (Bass & Riggio, 2005). Therefore, the teacher's maintenance of this leadership style can have a negative impact on students' needs satisfaction and imply an increase in their needs frustration. Transactional leadership has not shown as many benefits as transformational leadership in academic achievement in the subjects of Language and Mathematics (Cuciac et al., 2015). Finally, passive leadership style leads to the absence of leadership behavior, where the teacher avoids responsibility, delays or does not make decisions, does not provide feedback, and has been linked to negative consequences in satisfaction, participation, and academic grades in a virtual learning environment with university students (Bogler et al., 2013). This leadership style may favor higher needs frustration in students, as they lack a reference that guides the learning process in the educational context.

3. The present study

Few studies relate the different profiles of the theory of transformational leadership to basic psychological needs. Wilson et al. (2012) analyzed the association between teachers' transformational leadership and students' needs satisfaction. However, this cross-sectional study was established exclusively in Physical Education, and the authors did not consider other leadership styles (i.e., transactional and passive) or students' needs frustration. In this line, Koka and Hagger (2010) analyzed a large number of dimensions related to teacher leadership, as well as other teaching behaviors such as the application of feedback or the type of instruction used in their classes. Also, researchers have encouraged moving beyond longitudinal studies (i.e., several measures during the academic course) to broaden the theoretical understanding of the targeted concepts (Heck & Hallinger, 2014).

Thus, we focused on analyzing the relations between students' perceptions of teacher leaderships (i.e., transformational, transactional, and passive) and their needs satisfaction and needs frustration, key elements to understand the set of psychological needs, as previously argued (Vansteenkiste & Ryan, 2013). In this sense, to gain a deeper insight into the consequences of each of the leaderships and taking into account the basic psychological needs theory, we examined the potential of transformational, transactional, and passive leadership styles on students' needs satisfaction and needs frustration separately (i.e., autonomy, competence, and relatedness). To advance in the knowledge of the relationship between these two constructs, we assessed their association through a longitudinal study at three different times during the academic year. We explored this relationship in subjects with different structures. Thus, we selected Spanish Language and Mathematics, both instrumental subjects with a higher academic load in the Spanish educational system; English as a foreign language, a subject with idiomatic barriers that adds difficulty to any learning process; and Physical Education, where motor activities are the most important tool for the development of its contents. Results in other studies found differences between subjects with variables

associated with those used in the current study and students' outcomes, which led us to assume that the relationship between the variables analyzed throughout the academic year could be different (Alivernini & Lucidi, 2011; Gnambs & Hanfstingl, 2016; Tsai et al., 2008).

Therefore, the main objective of this study was to examine the association between students' perceptions about teachers' transformational, transactional, and passive leadership and students' needs satisfaction and needs frustration in four different subjects over three measures in an academic year. Based on previous research, transformational leadership has been associated with students' positive consequences (Anderson, 2017; Balwant, 2016; Heck & Hallinger, 2014), such as self-determined motivation (Beauchamp et al., 2011; Noland & Richards, 2014) and needs satisfaction (Wilson et al., 2012). On another hand, transactional leadership has been negatively related to needs satisfaction (Koka & Hagger, 2010) and has not shown as many benefits as transformational leadership in academic achievement (Cuciac et al., 2015). Finally, passive teaching leadership has been related to negative effects on satisfaction, participation, and academic grades of university students (Bogler et al., 2013). Thus, the following hypotheses were proposed:

Hypothesis 1. Teachers' transformational leadership as perceived by the students will be positively associated with needs satisfaction, and negatively associated with needs frustration over the academic year in the different subjects.

Hypothesis 2. Teachers' transactional leadership as perceived by the students will have fewer positive results than transformational leadership, will have more negative effects associated with needs satisfaction, and will be positively related to needs frustration in the different subjects over the academic year.

Hypothesis 3. Teachers' passive leadership as perceived by the students will be negatively related to needs satisfaction and positively related to needs frustration over the academic year in the different subjects.

As a secondary objective, we explored possible differences between the subjects in the association between students' reported teacher leadership styles and students' needs satisfaction and needs frustration over the academic year. As there are no previous studies that have analyzed the differences between subjects, no hypotheses were established.

4. Method

4.1. Participants

Participants were 858 students (346 boys and 512 girls) aged between 13 and 17 years ($Mage = 14.83$, $SD = 0.74$), from the third ($n = 472$) and fourth academic levels ($n = 386$) belonging to 118 groups, from 32 secondary schools of southwestern Spain (29 public and 3 concerted centers). For sample selection, intentional cluster sampling was used, considering the geographical proximity of the centers and the possibilities of the researchers to access the sample. The participating schools had a small number of groups (in some cases, there was only one group), and the ratio (number of students per class) was low in many of them.

4.2. Instruments

Students' perception of teacher leadership. To assess the students' perception of teacher leadership, we used the adaptation to the educational setting (Moreno-Casado et al., 2021) of the Spanish version of the Multidimensional Leadership Questionnaire – 5X in the educational context (Molero et al., 2010). The instrument presents an initial sentence: "During classes, the teacher of this subject …", followed by 34 items organized into three main factors: Transformational Leadership (20 items; e.g., "… seeks different perspectives when problem-solving"), Transactional Leadership (8 items; e.g., "… only supports me when I do tasks and activities well"), and Passive Leadership (6 items; e.g., "… waits till things go wrong before acting"). The transformational leadership factor was, in turn, composed of five secondary factors (Idealized Behavioral Influence, Attributed Idealized Influence, Inspirational Motivation, Intellectual Stimulation, and Individualized Consideration) with four items each factor.

Students' needs satisfaction. To examine the students' needs satisfaction, we used an adaptation to all the subjects considered in the current study of the Spanish version of the Basic Psychological Needs Exercise Scale in Physical Education context (Moreno-Murcia et al., 2008). The initial sentence of the original questionnaire was adapted to be generic to all the subjects. Specifically, "In my Physical Education classes" was replaced with "In the classes of this subject …", followed by 12 items (i.e., four items for each subscale) to assess Autonomy Satisfaction (e.g., "I have the opportunity to choose how to perform the activities"), Competence Satisfaction (e.g., "I feel like I have progressed well toward the final goal I have set"), and Relatedness Satisfaction (e.g., "I am very friendly with the rest of my classmates").

Students' needs frustration. To measure the students' needs frustration, we used an adaptation to students' perception of the Spanish version of the Psychological Need Thwarting Scale (Cuevas et al., 2015). The original scale begins with the phrase: "In my work environment, I feel …" which was replaced by: "In the classes of this subject …", followed by 12 items (i.e., four items for each subscale) to examine Autonomy Frustration (e.g., "I feel pressured to behave in a certain way"), Competence Frustration (e.g., "I feel incompetent because they don't give me a chance to develop my potential"), and Relatedness Frustration (e.g., "I feel rejected by those around me").

Students indicated their agreement or disagreement with each statement on a five-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Also, a confirmatory factorial analysis was performed to verify the validity of each instrument, with all statements showing an adequate factorial structure in the different measures of the study (see Supplementary Table 1). All the variables of the different instruments showed adequate levels of internal consistency in the three measures (see Supplementary Table 2), except for the Transactional Leadership factor, which presented values close to 0.60 but could be considered suitable because there is good validity evidence, theoretical support for the scale, and it has fewer than 10 items (Loewenthal, 2001).

4.3. Procedure

First, the principal investigator contacted the participating schools' headmasters to explain the objectives of the study and request their participation. As this was a sample of minors, informed consent was provided by the direction of each center for parents or legal guardians to authorize the students' participation in this investigation. We informed them about the confidential treatment of the data and responses within the field of the investigation. The ethical standards (protocol number: 239/2019) of action necessary when working with minors, as well as the agreements of the Helsinki (1964) second declaration, were

followed at all times. The measurement procedure was carried out during school hours, based on the ethical guidelines of the American Psychological Association (2019) related to the consent, confidentiality, and anonymity of the responses. We carried out three assessments during the academic year, at the end of each of the three terms (i.e., November, February, and May) to ensure that the students had enough time to generate a stable opinion of the variables that were under investigation. Only those students who completed all three measures of all subjects were considered in the study. In each measurement, all participants completed the questionnaires individually for each subject, in approximately 45 min, during a regular school day, in a suitable climate for their concentration, without distractions or the presence of the teachers of the subjects involved in the study, also with the help of a researcher to resolve any doubts and or unforeseen questions.

4.4. Data analysis

Data were analyzed using SPSS Statistics 25.0 software (2017). First, we calculated descriptive statistics at the three times across the academic year of all variables included in the study (see Table 1). Second, given the nested structure of the data (i.e., students are nested in the class),[1] multilevel modeling (MLM) analysis, using the linear mixed modeling procedure for each dependent variable, was conducted, in conjunction with the maximum likelihood estimation (Hox et al., 2017). MLM is recommended because it takes dependence into account, leading to a more accurate estimation of the regression coefficients and standard errors (Hox et al., 2017). Accordingly, we estimated unconditional models (see Table 2) without any predictors to determine the intra- and inter-class variability as random effects (i.e., null models). Concerning the random effects, we estimated the intercept variability and slopes for all dependent variables (i.e., needs satisfaction and needs frustration) at the class level. These unconditional models also allowed us to calculate the intraclass correlation coefficient (ICC), which showed values greater than 10%, indicating variability in the data and justifying the multilevel approach (Hox et al., 2017). Accordingly, we estimated new MLMs by including the three needs satisfaction and the three needs frustration (i.e., autonomy, competence, and relatedness) as dependent variables, and considering the different subjects (i.e., Mathematics, English as a foreign language, Spanish Language and Literature, and Physical Education), the different measurement times during the course (i.e., Time 1, Time 2, and Time 3), and the leadership styles (i.e., transformational, transactional, and passive leadership) as independent variables (Hox et al., 2017). Tables 3–5 show the MLMs representing the differences found in the relationship between the independent and dependent variables in the type of subject (i.e., a = Mathematics, b = Spanish Language and Literature, c = English as a foreign language, d = Physical Education).[2] Lastly, we estimated the random effects of all the dependent variables to examine how these associations could vary from class to class at all three times. In all the previous models, the Akaike Information Criterion (AIC) was included. AIC is an estimate of the mean log-likelihood, providing a versatile procedure for statistical model identification. The models' goodness-of-fit increases as the statistical value decreases.

Table 1
Four subjects descriptive statistics in the three times of the academic course.

	Mathematics			English as a foreign language			Spanish Language and Literature			Physical Education		
	Time 1	Time 2	Time 3	Time 1	Time 2	Time 3	Time 1	Time 2	Time 3	Time 1	Time 2	Time 3
	M±*SD*	*M*±*SD*	*M*±*SD*	*M*±*SD*	*M*±*SD*	*M*±*SD*	*M*±*SD*	*M*±*SD*	*M*±*SD*	*M*±*SD*	*M*±*SD*	*M*±*SD*
Transformational leadership	3.48 ± .79	3.48 ± .74	3.50 ± .76	3.41 ± .78	3.42 ± .68	3.40 ± .73	3.54 ± .69	3.40 ± .70	3.40 ± .71	3.63 ± .69	3.53 ± .67	3.39 ± .60
Transactional leadership	2.98 ± .66	2.95 ± .64	3.05 ± .65	3.00 ± .73	2.94 ± .58	3.02 ± .70	2.99 ± .62	2.89 ± .59	2.95 ± .60	2.94 ± .68	2.91 ± .60	2.97 ± .62
Passive leadership	2.12 ± .83	2.27 ± .88	2.47 ± .99	2.17 ± .86	2.30 ± .84	2.50 ± .92	2.10 ± .79	2.33 ± .86	2.43 ± .89	2.08 ± .79	2.25 ± .82	2.38 ± .87
Autonomy satisfaction	3.30 ± .95	3.36 ± .93	3.35 ± .96	3.30 ± .89	3.33 ± .88	3.34 ± .93	3.33 ± .84	3.28 ± .85	3.28 ± .89	3.53 ± .86	3.50 ± .86	3.46 ± .90
Competence satisfaction	3.67 ± .90	3.59 ± .90	3.51 ± .97	3.74 ± .83	3.64 ± .82	3.60 ± .88	3.74 ± .80	3.59 ± .82	3.52 ± .88	3.95 ± .76	3.74 ± .83	3.68 ± .87
Relatedness satisfaction	4.03 ± .87	3.86 ± .93	3.73 ± .96	4.02 ± .85	3.82 ± .94	4.01 ± .85	4.07 ± .83	3.82 ± .92	3.66 ± .95	3.94 ± .90	3.94 ± .91	3.81 ± .92
Autonomy frustration	2.14 ± .82	2.29 ± .90	2.44 ± .92	2.13 ± .78	2.31 ± .86	2.13 ± .78	2.09 ± .80	2.30 ± .86	2.41 ± .91	2.14 ± .83	2.30 ± .89	2.41 ± .91
Competence frustration	1.98.±.91	2.14 ± .97	2.24 ± 1.02	1.99 ± .90	2.12 ± .94	1.99 ± .90	1.93 ± .89	2.11 ± .92	2.20 ± 1.00	1.96 ± .90	2.11 ± .95	2.21 ± .99
Relatedness frustration	1.75 ± .83	2.06 ± .98	2.21 ± 1.06	1.80 ± .84	2.07 ± .96	1.80 ± .84	1.77 ± .84	2.05 ± .95	2.16 ± 1.02	1.78 ± .86	2.08 ± .98	2.13 ± 1.00

[1] We did not consider other nestings (i.e., educational centers or teachers), because the number of schools was low ($n = 32$) and the teacher of each subject in each school was the same.

[2] The minimum significance level was set at $p < .05$, and also, a tendency toward statistical significance ($p < .07$) was included (see Tables 3–5), which is widely accepted in exploratory research designs such as this (Gay et al., 2011).

Table 2
Multilevel null model predicting needs satisfaction and needs frustration at three times of the course.

Variables	Autonomy Satisfaction	Competence Satisfaction	Relatedness Satisfaction	Autonomy Frustration	Competence Frustration	Relatedness Frustration
	Coeff(SE)	Coeff(SE)	Coeff(SE)	Coeff(SE)	Coeff(SE)	Coeff(SE)
Fixed Effects						
Intercept	3.36***(.02)	3.65***(.02)	3.88***(.02)	2.28***(.02)	2.11***(.02)	2.00***(.02)
Random Effects						
Residual Time 1	.71***(.02)	.63***(.01)	.64***(.02)	.61***(.01)	.75***(.02)	.67***(.02)
Residual Time 2	.66***(.02)	.63***(.01)	.72***(.02)	.71***(.02)	.82***(.02)	.85***(.02)
Residual Time 3	.72***(.02)	.72***(.02)	.74***(.02)	.70***(.02)	.85***(.02)	.86***(.02)
Intercept	.12***(.01)	.09***(.01)	.14***(.01)	.08***(.01)	.10***(.01)	.12***(.01)
ICC Time 1	.14	.13	.18	.12	.11	.15
ICC Time 2	.15	.13	.16	.10	.11	.12
ICC Time 3	.14	.12	.16	.10	.10	.12
AIC	26156.73	25499.03	26247.31	25747.74	27597.92	27403.38

Note. ***$p < .001$. Coeff = Coefficient, SE = Standard Error, ICC = Intraclass Correlation Coefficient, AIC = Akaike Information Criteria.

Table 3
Multilevel model predicting basic psychological needs by subjects, time, and transformational leadership.

Variables	Autonomy Satisfaction	Competence Satisfaction	Relatedness Satisfaction	Autonomy Frustration	Competence Frustration	Relatedness Frustration
Fixed Effect	Coeff(SE)	Coeff(SE)	Coeff(SE)	Coeff(SE)	Coeff(SE)	Coeff(SE)
Mathematics Intercept	3.32***(.04)^{d}	3.68***(.03)^{d}	4.02***(.04)^{d†}	2.18***(.04)	2.02***(.04)	1.82***(.04)
English as a foreign language Intercept	3.34***(.04)^{d}	3.72***(.03)^{d}	3.97***(.04)	2.20***(.04)	2.05***(.04)	1.90***(.04)
Spanish Language and Literature Intercept	3.32***(.04)^{d}	3.71***(.03)^{d}	4.04***(.04)^{d}	2.14***(.04)	1.99***(.04)	1.84***(.04)
Physical Education Intercept	3.49***(.04)^{abc}	3.87***(.03)^{abc}	3.90***(.04)^{ca†}	2.20***(.04)	2.02***(.04)	1.87***(.04)
Mathematics*Time	-.01(.02)	-.12***(.02)	-.18***(.02)^{bd}	.16***(.02)^{b}	.14***(.02)^{b}	.24***(.02)^{bd}
English as a foreign language*Time	.00(.02)	-.07***(.02)	-.01(.02)^{ac}	.01(.02)^{acd}	.01(.02)^{acd}	.01(.02)^{acd}
Spanish Language and Literature*Time	-.01(.02)	-.10***(.02)	-.20***(.02)^{bd}	.16***(.02)^{b}	.13***(.02)^{b}	.19***(.02)^{b}
Physical Education*Time	-.00(.02)	-.11***(.02)	-.05*(.02)^{ac}	.12***(.02)^{b}	.12***(.02)^{b}	.17***(.02)^{ab}
Mathematics*TransfLeader	.50***(.04)^{db†}	.44***(.04)^{bd}	.31***(.04)^{d}	-.12**(.04)^{c†}	-.19***(.05)	-.05(.04)
English as a foreign language*TransfLeader	.38***(.04)^{a†}	.27***(.04)^{a}	.27***(.04)^{d}	-.15***(.04)	-.15**(.05)^{c}	-.11*(.04)
Spanish Language and Literature *TransfLeader	.43***(.05)	.36***(.04)	.30***(.05)^{d}	-.23***(.04)^{da†}	-.29***(.05)^{bd}	-.16**(.05)
Physical Education*TransfLeader	.35***(.05)^{a}	.31***(.04)^{a}	.12**(.04)^{abc}	-.10*(.04)^{c}	-.15**(.05)^{c}	-.13**(.04)
Mathematics*Time*TransfLeader	.09**(.03)	.10***(.03)^{d†}	.14***(.03)^{bd}	-.05†(.03)^{b}	-.07*(.03)	-.07*(.03)^{b}
English as a foreign language*Time*TransfLeader	.10***(.03)	.13***(.03)	-.00(.03)^{acd}	.03(.03)^{ad}	.00(.03)	.01(.03)^{a}
Spanish Language and Literature *Time*TransfLeader	.10**(.03)	.13***(.03)	.11***(.03)^{bd}	.00(.03)	-.02(.03)	-.03(.03)
Physical Education*Time*TransfLeader	.15***(.03)	.17***(.03)^{a†}	.24***(.03)^{abc}	-.06†(.03)^{b}	-.04(.03)	-.01(.03)
Random Effect						
Residual Variance Time 1	.60***(.01)	.53***(.01)	.58***(.01)	.57***(.01)	.70***(.02)	.62***(.01)
Residual Variance Time 2	.56***(.01)	.54***(.01)	.65***(.02)	.68***(.02)	.78***(.02)	.83***(.02)
Residual Variance Time 3	.53***(.01)	.54***(.01)	.60***(.01)	.66***(.02)	.78***(.02)	.80***(.02)
Intercept	.08***(.01)	.07***(.01)	.13***(.01)	.08***(.01)	.10***(.01)	.12***(.01)
Slope	.06***(.01)	.05***(.01)	.05***(.01)	.03***(.01)	.05***(.01)	.04***(.01)
AIC	24226.43	23759.59	25139.09	25397.68	27184.20	27043.95

Note. $^{\dagger}p < .07$. *$p < .05$. **$p < .01$. ***$p < .001$. TransfLeader = Transformational Leadership, a = Mathematics, b = English as a foreign language, c = Spanish Language and Literature, d = Physical Education.

5. Results

5.1. Descriptive statistics and internal consistency

Means and standard deviations of the dependent variables by subjects at the three times are displayed in Table 1.[3] Concerning leadership styles, transformational leadership showed the highest scores in all three measures. Passive leadership increased over time in the four subjects, whereas transformational and transactional were maintained. Regarding needs satisfaction, the evolution over time varied depending on the subject and factor, although relatedness satisfaction obtained the highest scores in all subjects and times (except for Time 1 in Physical Education). Finally, the three factors of needs frustration tended to increase over time, and autonomy frustration showed the highest means at all times and in all subjects.

[3] The bivariate correlations between variables across the three times are shown in Supplementary Table 2.

5.2. Main analysis

Table 2 shows the null models of the three needs satisfaction and the three needs frustration. The intercept represents the estimated means of each variable. Random effects also showed a significant variation for all dependent variables ($p < .001$). The Wald test and the ICC of the three measures suggested statistically significant variability in the scores of needs satisfaction and needs frustration, with values higher than 10% at the three times across the academic course (ICC >0.10; Hox et al., 2017). AICs values of each dependent variable are also presented in Table 3.

Tables 3–5 display the MLMs, including subjects, time, and the three leadership styles (i.e., transformational, transactional, and passive style, respectively) as indicators of the needs satisfaction and needs frustration variables. Concerning the fixed effects of all the MLMs and including the subjects as a covariate, and the group-mean-centered leadership as a predictor, Physical Education showed significantly higher levels of autonomy and competence satisfaction than the rest of the subjects. Conversely, lower scores were obtained for relatedness satisfaction in Physical Education

Table 4
Multilevel model predicting basic psychological needs by subjects, time and transactional leadership.

Variables	Autonomy Satisfaction	Competence Satisfaction	Relatedness Satisfaction	Autonomy Frustration	Competence Frustration	Relatedness Frustration
Fixed Effect	Coeff(SE)	Coeff(SE)	Coeff(SE)	Coeff(SE)	Coeff(SE)	Coeff(SE)
Mathematics Intercept	3.29***(.04)^{d}	3.65***(.04)^{d}	3.99***(.04)	2.19***(.04)	2.03***(.04)	1.82***(.04)
English as a foreign language Intercept	3.30***(.04)^{d}	3.70***(.04)^{d}	3.95***(.04)	2.20***(.04)	2.06***(.04)	1.90***(.04)
Spanish Language and Literature Intercept	3.32***(.04)^{d}	3.71***(.04)^{d}	4.04***(.04)	2.14***(.04)	1.99***(.04)	1.84***(.04)
Physical Education Intercept	3.54***(.04)^{abc}	3.92***(.04)^{abc}	3.93***(.04)	2.19***(.04)	2.01***(.04)	1.87***(.04)
Mathematics*Time	.03(.02)^{dc†}	-.08***(.02)^{d†}	-.15***(.02)^{bdc†}	.14***(.02)^{b}	.12***(.02)^{b}	.22***(.02)^{b}
English as a foreign language*Time	.02(.02)^{d†}	-.06*(.02)^{d}	-.00(.02)^{acd}	.00(.02)^{acd}	.00(.02)^{acd}	.01(.02)^{acd}
Spanish Language and Literature*Time	-.02(.02)^{a†}	-.10***(.02)	-.20***(.02)^{bda†}	.17***(.02)^{b}	.14***(.02)^{b}	.20***(.02)^{b}
Physical Education*Time	-.35(.02)^{ab†}	-.13***(.02)^{ba†}	-.06**(.02)^{abc}	.13***(.02)^{b}	.12***(.02)^{b}	.18***(.02)^{b}
Mathematics*TransacLeader	.00(.05)	.01(.05)	.10*(.05)	.11*(.05)	.09(.05)^{b†}	.05(.05)
English as a foreign language*TransacLeader	-.01(.05)	-.02(.05)	-.00(.05)	.17**(.05)	.22***(.05)^{a†}	.15**(.05)
Spanish Language and Literature*TransacLeader	.12(.05)	.06(.05)	.04(.05)	.14**(.05)	.16**(.05)	.12*(.05)
Physical Education*TransacLeader	.04(.05)	.05(.04)	.03(.05)	.08(.04)	.11*(.05)	.10*(.05)
Mathematics*Time*TransacLeader	.01(.03)	-.01(.03)	-.02(.03)	.10**(.04)^{b†}	.10**(.03)^{b}	.08*(.03)^{b}
English as a foreign language*Time*TransacLeader	.00(.03)	-.02(.03)	.00(.03)	.01(.03)^{a†}	-.02(.04)^{ad}	-.02(.04)^{a}
Spanish Language and Literature*Time*TransacLeader	-.03*(.03)	-.02(.03)	-.02(.03)	.08*(.03)	.07†(.04)	.05(.04)
Physical Education*Time*TransacLeader	.03(.03)	.01(.03)	.03(.03)	.08**(.03)	.08*(.03)^{b}	.05(.03)
Random Effect						
Residual Variance Time 1	.69***(.02)	.60***(.01)	.61***(.01)	.57***(.01)	.72***(.02)	.62***(.01)
Residual Variance Time 2	.64***(.02)	.61***(.01)	.70***(.02)	.68***(.02)	.80***(.02)	.82***(.02)
Residual Variance Time 3	.70***(.02)	.69***(.02)	.69***(.02)	.65***(.02)	.80***(.02)	.80***(.02)
Intercept	.11***(.01)	.09***(.01)	.14***(.01)	.08***(.01)	.10***.01)	.12***(.01)
Slope	.06***(.01)	.04***(.01)	.05***(.01)	.05***(.01)	.04***(.01)	.05***(.01)
AIC	26107.91	25366.95	26054.25	25349.97	27337.71	27024.65

Note. $^{\dagger}p < .07$. *$p < .05$. **$p < .01$. ***$p < .001$. TransacLeader = Transactional Leadership, *a* = Mathematics, *b* = English as a foreign language, *c* = Spanish Language and Literature, *d* = Physical Education.

Table 5
Multilevel model predicting basic psychological needs by subjects, time, and passive leadership.

Variables	Autonomy Satisfaction	Competence Satisfaction	Relatedness Satisfaction	Autonomy Frustration	Competence Frustration	Relatedness Frustration
Fixed Effect	Coeff(SE)	Coeff(SE)	Coeff(SE)	Coeff(SE)	Coeff(SE)	Coeff(SE)
Mathematics Intercept	3.29***(.04)^{d}	3.65***(.04)^{d}	3.99***(.04)	2.19***(.04)	2.04***(.04)	1.83***(.04)
English as a foreign language Intercept	3.31***(.04)^{d}	3.70***(.04)^{d}	3.95***(.04)	2.20***(.04)	2.06***(.04)	1.91***(.04)
Spanish Language and Literature Intercept	3.32***(.04)^{d}	3.71***(.04)^{d}	4.04***(.04)	2.14***(.04)	1.99***(.04)	1.85***(.04)
Physical Education Intercept	3.54***(.04)^{abc}	3.91***(.04)^{abc}	3.93***(.04)	2.19***(.04)	2.01***(.04)	1.87***(.04)
Mathematics*Time	.03(.02) ^{dc†}	-.08***(.02)^{d}	-.15***(.02)^{bcd}	.14***(.02)^{b}	.12***(.02)^{b}	.22(.02)^{b}
English as a foreign language*Time	.02(.02)^{d}	-.06**(.02)^{d}	-.00(.02)^{acd}	.00(.02)^{acd}	.00(.02)^{acd}	.01(.02)^{acd}
Spanish Language and Literature*Time	-.02 (.02)^{da†}	-.11***(.02)	-.21***(.02)^{abd}	.16***(.02)^{b}	.14***(.02)^{b}	.20(.02)^{b}
Physical Education*Time	-.04*(.02)^{ab}	-.14***(.02)^{ab}	-,07**(.02)^{abc}	.14***(.02)^{b}	.13***(.02)^{b}	.18(.02)^{b}
Mathematics*PassiveLeader	-.24***(.04)^{cb†}	-.22***(.04)^{bd†}	-.15***(.04)	.24***(.04)	.26***(.04)	.14(.04)
English as a foreign language*PassiveLeader	-.14***(.04)^{a†}	-.11**(.03)^{a}	-.10**(.04)	.21***(.03)	.24***(.04)	.16(.04)
Spanish Language and Literature*PassiveLeader	-.12**(.04)^{a}	-.14***(.04)	-.08*(.04)	.23***(.04)	.27***(.04)	.17(.04)
Physical Education*PassiveLeader	-.15***(.04)	-.12**(.04)^{a†}	-.14***(.04)	.17***(.04)	.21***(.04)	.18(.04)
Mathematics*Time*PassiveLeader	.02(.02)^{c}	-.01(.02)^{b}	-.04†(.02)	.07**(.02)^{b}	.08**(.02)^{b}	.11(.02)^{b}
English as a foreign language*Time*PassiveLeader	-.04(.02)	-.08**(.02)^{a}	-.02(.02)	-.02(.02)^{acd}	-.01(.02)^{acd}	-.02(.02)^{acd}
Spanish Language and Literature*Time*PassiveLeader	-.05*(.03)^{a}	-.05†(.03)	-.08**(.03)	.07**(.02)^{b}	.07**(.03)^{b}	.11(.03)^{b}
Physical Education*Time*PassiveLeader	-.00(.03)	-.04(.03)	-.02(.03)	.10***(.02)^{b}	.09**(.03)^{b}	.09(.03)^{b}
Random Effect						
Residual Variance Time 1	.67***(.02)	.59***(.01)	.61***(.01)	.56***(.01)	.70***(.02)	.62***(.01)
Residual Variance Time 2	.62***(.01)	.59***(.01)	.68***(.02)	.64***(.02)	.73***(.02)	.78***(.02)
Residual Variance Time 3	.66***(.02)	.66***(.02)	.68***(.02)	.60***(.01)	.74***(.02)	.73***(.02)
Intercept	.10***(.01)	.08***(.01)	.13***(.01)	.09***(.01)	.10***(.01)	.12***(.01)
Slope	.03***(.00)	.02***(.00)	.02***(.00)	.02***(.00)	.03***(.00)	.04***(.01)
AIC	25745.26	24992.59	25842.09	24851.60	26736.03	26626.70

Note. $^{\dagger}p < .07$. *$p < .05$. **$p < .01$. ***$p < .001$. PassiveLeader = Passive Leadership, *a* = Mathematics, *b* = English as a foreign language, *c* = Spanish Language and Literature, *d* = Physical Education.

than in Mathematics and Spanish Language and Literature (significant differences were only found in the transformational leadership model; see Table 3). Adding the time as a covariate, Mathematics, Spanish Language and Literature, and Physical Education negatively predicted competence and relatedness satisfaction, whereas they positively predicted the three needs frustration (*ps* < .05). English as a foreign language was also an indicator of competence satisfaction (*ps* < .05). In other words, the levels of frustration in the set of subjects increased across the academic course, whereas competence and relatedness satisfaction decreased. Regarding the trend between subjects across time, significant differences were found in relatedness satisfaction and in the three needs frustration (see Tables 3–5).

Next, including transformational leadership (see Table 3) as a predictor (i.e., Subjects X Time X Transformational Leadership), transformational leadership positively predicted the three needs

satisfaction in the four subjects (*ps* < .01), whereas transformational leadership was a negative predictor of the three needs frustration in all subjects (*ps* < .05), except for relatedness frustration in Mathematics. Including the time, the relationship between transformational leadership and the three needs satisfaction significantly increased across time in all the subjects (*ps* < .01; except for relatedness satisfaction in English as a foreign language), whereas negative predictions were only obtained in competence frustration and relatedness frustration in Mathematics (*ps* < .05). As can be seen in Table 3, significant between-subject differences were found in the relationship of the subject, time, and transformational leadership with the dependent variables. For instance, Physical Education obtained a significantly higher increase across the academic course in the relationship with the rest of the subjects in competence satisfaction and relatedness satisfaction.

Following the same process, Table 4 shows the MLMs including transactional leadership (see Table 4) as a predictor (i.e., Subjects X Time X Transactional Leadership). Focusing on the inclusion of the subjects and transactional leadership as independent variables (i.e., without considering time), a positive prediction of relatedness satisfaction in Mathematics was found (*ps* < .05). Regarding needs frustration, overall, a positive prediction of the three needs frustration in all subjects was also obtained (*ps* < .05). Including time as a covariate, transactional leadership only negatively predicted autonomy satisfaction in Spanish Language and Literature (*p* < .05). Furthermore, in general, transactional leadership positively predicted autonomy frustration and competence frustration in Mathematics, Spanish Language and Literature, and Physical Education. A positive relationship between transactional leadership and relatedness frustration in Mathematics was also obtained (*ps* < .05). On the other hand, when including time and transactional leadership, significant between-subject differences were found in the relationship between Mathematics and English as a foreign language in competence frustration and relatedness frustration, and between Physical Education and English as a foreign language in competence frustration.

Finally, in line with previous models, Table 5 represents the MLMs considering passive leadership as a predictor of the three needs satisfaction and the three needs frustration. In terms of fixed effects, all Subjects X Passive Leadership cross-level interactions negatively predicted the three needs satisfaction in all subjects (*ps* < .05). Conversely, the four Subjects X Passive Leadership positively predicted autonomy frustration and competence frustration in the four subjects (*ps* < .05). Significant differences were obtained between Mathematics and English as a foreign language (*ps* < .05) in autonomy satisfaction and competence satisfaction. Including also the time as a covariate, passive leadership negatively predicted autonomy satisfaction (*p* < .05) and relatedness satisfaction (*p* < .01) in Spanish Language and Literature, and only competence satisfaction in English as a foreign language (*p* < .01). All the subjects (except for English as a foreign language), also showed an increase in the relation between passive leadership and autonomy frustration and competence frustration over time (*ps* < .01). Table 5 also represents the between-subject differences. For instance, including subjects, time, and passive leadership as covariates, significant differences were found between English as a foreign language and the rest of the subjects in the three needs frustration across the academic course.

In terms of random effects, all residual variances were significant in the different dependent variables at the three times (see Tables 3–5). We also estimated slopes as random effects at class level (i.e., an estimation of how these associations could vary from class to class). All slopes were also significant (*ps* < .001). Finally, we also show the AIC values for all these models, with lower AIC values when including the different leadership styles as predictors.

6. Discussion

The main research goal was to examine the relationship between students' perception of transformational, transactional, and passive leadership adopted by teachers with students' needs satisfaction and needs frustration in four subjects and at three times over an academic year. First, the unconditional models showed significant differences in needs satisfaction and needs frustration between the different subjects and across time in each of the models. Second, the main results indicated that these variations in needs satisfaction and needs frustration can be explained by teacher leadership. In general, the results indicate that transformational leadership positively predicts needs satisfaction and negatively predicts needs frustration in the different subjects throughout the course; that transactional leadership positively predicts needs frustration, and that passive leadership negatively predicts needs satisfaction and positively predicts needs frustration.

Firstly, Hypothesis 1 established that perceived transformational leadership would be positively associated with needs satisfaction and negatively with needs frustration. As expected, in general, the findings were conceptually consistent and supported that transformational leadership was positively related as an antecedent of needs satisfaction in all the subjects, with this relationship being stronger in the subject of Mathematics. Also, the negative relationship of transformational leadership and needs frustration in all the subjects was confirmed, with higher values in Spanish Language and Literature. In addition, these relationships were generally maintained throughout the academic year. These results are in line with previous research in which the teachers' transformational behavior was positively related to needs satisfaction (Beauchamp et al., 2011; Wilson et al., 2012). From the students' perspective, a transformational leadership adopted by teachers could be related to greater reports of autonomy, competence, and relatedness with their classmates during the teaching-learning process (Beauchamp et al., 2011; Noland & Richards, 2014). Moreover, the negative link between transformational leadership and needs frustration could reinforce the importance of teachers' transformational performance in their classes.

This self-determination theory-based research corroborated that interpersonal teaching styles support and seek to understand the learning processes of the students (Aelterman et al., 2014, 2019; Reeve & Cheon, 2016) and considerably help to satisfy their needs. An interpersonal need-supportive teaching style brings together many common characteristics with transformational leadership. In both concepts, for example, teachers become a reference for the students through the affectionate treatment and assessment of them, generating situations in which they make their own decisions (i.e., autonomy), adapting the learning process to their individual levels and abilities (i.e., competence), and promoting and encouraging positive and inclusive strategies (i.e., relatedness). In turn, a greater need-supportive style is related to lower levels of students' needs frustration (Haerens et al., 2015; Jang et al., 2016; Reeve & Cheon, 2014) and to higher levels of students' needs satisfaction (De Meyer et al., 2016; Haerens et al., 2018). In short, teaching from a transformational perspective has been shown to entail the ability to guide students by creating values and long-term goals that meet their individual needs (Jang et al., 2016; Reeve & Cheon, 2014; Wilson et al., 2012) and prevent their frustration in the classes. Therefore, Hypothesis 1 is confirmed: the development of teaching from a transformational perspective has positive effects on the basic psychological needs within the different subjects.

Secondly, regarding Hypothesis 2, we expected that transactional leadership would be positively related to some needs satisfaction, and also positively related to needs frustration

throughout the academic year. The results corroborate this hypothesis, as transactional leadership was positively associated with needs satisfaction, although that relationship became negative when including the effect of time on the relationship. Time effects in the relationship between the variables confirm that transactional leadership can be temporarily positive because it provides a sense of stability, predictability, and security (Deci & Ryan, 2000). It also had a positive effect on needs frustration, which remained over time, although this relationship decreased over the academic course. To our knowledge, few previous studies focused on the educational context have related transactional leadership (defined as autocratic behavior) to psychological needs (Koka & Hagger, 2010), but from the self-determination theory, directorial teaching behaviors have been linked to negative effects on needs satisfaction (Haerens et al., 2018; Jang et al., 2016). Similarly, need-thwarting interpersonal teaching styles have been shown to have a positive link with needs frustration (Bartholomew et al., 2011; Earl et al., 2017; Haerens et al., 2015; Van den Berghe et al., 2013). Despite being different constructs, teachers seem to consider the teaching-learning process from a directorial perspective, and the results found so far do not appear to show benefits for the students. The teachers clearly define their students' obligations and the functions they should perform, reducing or avoiding contradictions on their part, using the threat of sanctions or punishments if the students do not meet the teachers' requirements (Aelterman et al., 2019; Bartholomew et al., 2011; Jang et al., 2016). Furthermore, the positive relationship between transactional leadership and needs frustration reveals the teachers' inefficient transactional and directorial role in setting up a complete educational process (Khan, 2017). Therefore, it is a priority for the training process to try to switch from transactional leadership to transformational leadership in the teaching-learning processes, given the positive consequences this can have on students, as confirmed by different studies grounded in the self-determination theory (Bartholomew et al., 2011; Cheon et al., 2019; Haerens et al., 2015; Jang et al., 2016).

Finally, Hypothesis 3 established that passive leadership would negatively predict needs satisfaction and positively predict needs frustration. The results, both at the beginning of the course and throughout the course, confirm this hypothesis for virtually all variables and subjects, except for the relationship of this leadership style with relatedness frustration. In line with these findings, the absence of leadership on the part of the teacher or a laissez-faire teaching style defining the objectives to be achieved seems to generate a confusing work environment for the students and their needs frustration (Krijgsman et al., 2019). The role of "chaos" (term assigned to define *awaiting* and *abandoning* teaching behavior) has been recently added from the circumplex model based on self-determination theory (Aelterman et al., 2019). This chaotic teaching style produces less satisfaction and greater needs frustration. It resembles the passive leadership style in that it generates confusion in the students by delaying or eliminating the actions and decisions to be taken as a reference in their educational process (Aelterman et al., 2019). In addition, teachers allow things to happen freely, and the students must assume all the responsibility for their learning. Contrasting with this teaching behavior, students appear to prefer to have their teachers' help and active participation (Teng & Zhang, 2018), even more so when difficulties in their learning emerge (Teng & Zhang, 2018).

Concerning the between-subject differences, no hypotheses were initially established, given the absence of previous studies. The results of needs satisfaction in Physical Education are higher than in the other subjects. The use of motor tasks is a specific feature of this subject, which can provide it with a different work structure than the others. This makes the presentation of tasks more attractive, producing more interactions among the students, fostering social relations, and generating a greater sense of autonomy over their behavior than a traditional classroom structure (Aelterman et al., 2019; Jang et al., 2016; Reeve & Cheon, 2016; Vasconcellos et al., 2020). Moreover, the evolution of needs frustration was positive in all the subjects except for English. In this subject, the novel nature and attractiveness of the subjects' personal resources (Lamb, 2017; Stockwell, 2013) may explain why it does not generate negative effects on students' needs as the course progresses. The importance granted by teachers to learning environments where the communicative process is essential may generate positive perceptions in the students, which would help to prevent their needs frustration. In addition, in this subject, the communicative process applied to a real context that is close to them (technology, music, social relations, travels, etc.) allows them to develop a cultural awareness that makes it easier for them to acquire tools and abilities in a foreign language (Hinkel, 2014). It is essential to overcome the idiomatic barrier that the study of a foreign language implies and which adds difficulty to any students' learning process.

Concerning the differences between subjects in predicting the effect of different leaderships on students' psychological needs, two main aspects can be highlighted. First, transformational leadership in Mathematics significantly predicts needs satisfaction compared to other subjects, where positive effects are also obtained. These results confirm the line of work developed from methodological proposals that can be identified with the teachers' transformational profile, focused on the promotion of autonomy, mindfulness, and the flexibility of the tasks' structure (Ng et al., 2016) or the use of spaces other than the conventional classroom to develop the contents and classes (Otte et al., 2019). These results also reinforce the importance of this type of behavior in the face of content considered complex or difficult to understand by the students, which have been addressed conventionally from a more directorial perspective (Cuciac et al., 2015; Gilbert et al., 2014). Second, passive leadership in English is the only leadership that does not favor needs frustration compared to other subjects throughout the course. In fact, the role of the teacher in this subject has ceased to be that of an expert to become someone who facilitates resources (Moeller & Catalano, 2015), which can be perceived by their students as passive but not negative behavior.

6.1. Strengths, limitations, and future research

Our study provides a longitudinal analysis of students' perception of teacher leadership and the relationship with each of the needs satisfactions and needs frustrations. Specifically, three measures were taken throughout the academic year, in four different subjects, with a large number of participants. However, our study has some limitations that are important to note. First, the students' perceptions of the behavior of their teachers were used. No objective variables through observation of the teaching behavior or the opinion of the teachers involved were considered (Aelterman et al., 2019). Further research could consider how teachers' and students' perceptions of the teacher leadership styles are linked, and also use an observational methodology to accurately examine teacher leadership during the lessons (Van den Berghe et al., 2013). This design would provide more precise information about the reality of the teacher as the leader of their students. However, this research design would be highly complex and difficult to carry out, and students' perceptions in each subject can be obtained through the design used in this longitudinal study, which is common in the educational context. Second, despite being a longitudinal study, we cannot establish causal relationships between the variables analyzed. Future intervention studies could help to experimentally link leadership and psychological needs.

Thirdly, our analyses were carried out on the results in four subjects of the Spanish educational system. Therefore, the results should be taken with caution when extrapolating or generalizing these findings to other educational contexts or cultures. Another future line of work can focus on the need to determine the reality in the other subjects that make up the educational stage. Fourth, our study does not analyze the consequences of other variables that may produce needs satisfaction or needs frustration, so we cannot identify the scope of leadership over other consequences (e.g., motivation, engagement, or learning; Beauchamp et al., 2011; Noland & Richards, 2014; Wilson et al., 2012). Therefore, future lines of research could examine how the teachers' leadership style as perceived by the students is associated with variables such as academic performance, motivation, or the perception of fun and boredom through the psychological needs in each of the subjects. Finally, it should be noted that the reliability values of some of the factors of the variables studied had values below those expected, so it is necessary to more accurately determine the internal consistency of the scales.

7. Conclusions and practical implications

The main conclusion of our study is that the different leadership styles are associated differently with the students' needs satisfaction and needs frustration. Specifically, a transformational perception of the teacher appears to be positively linked to the students' needs satisfaction, as well as negatively to their needs frustration. All other leadership styles have the opposite effects on basic psychological needs, especially passive leadership. This defines the characteristics that teaching behavior should have to improve the motivational processes in the development of different subjects. Teaching leadership should be a reference for the students, earning their respect and appreciation through the ability to encourage and transmit confidence in the achievement of their objectives, and to increase their satisfaction with the learning process. To achieve this, students should make an effort to improve their positive attitudes towards their learning, treating their abilities and needs individually. Teachers should create an environment that promotes opportunities for student learning, personalizing the learning process based on their behaviors and abilities and favoring autonomous work. This will mean establishing clear and fluid communication in which positive and sincere messages are transmitted with students. In addition, using explanations and non-controlling and informative language that reinforces confidence and positive disposition towards the completion of tasks, showing patience and affection, allowing time and respecting the individual rhythm of learning.

In addition, teachers should take into account the students' possible criticisms and different points of view when making decisions, seeking different perspectives to solve problems that arise during the process. Also, students must develop the process of finding the learning solutions to the challenges, and teachers should encourage students' active participation and decision-making using the strategies provided by them, contributing to the amount and clarity of the information, and guiding students in their tasks. For this purpose, teachers should provide positive feedback about students' learning progression and instructions according to their individual levels. In this way, students' perception of their competence needs satisfaction and their well-being within the group would increase, and they would learn faster and more meaningfully (Alevriadou & Pavlidou, 2016; Cheon & Reeve, 2015). On the contrary, a relationship focused exclusively on the outcome of the students' learning, with continuous rewards and punishments depending on that outcome, or the absence of any reference guidelines or aids in the learning process will have a negative impact on needs satisfaction and a positive impact on needs frustration.

Credit author statement

Héctor Moreno-Casado: Conceptualization, Writing – original draft, Writing- Reviewing and Editing. Francisco M. Leo: Data curation, Methodology, Software, Writing – original draft, Writing-Reviewing and Editing, Supervision. Miguel Á. López-Gajardo: Software, Validation, Writing – original draft preparation, Writing-Reviewing and Editing. Tomás García-Calvo: Visualization, Investigation. Ricardo Cuevas-Campos: Investigation. Juan J. Pulido: Methodology, Software, Visualization, Writing – original draft, Writing- Reviewing and Editing, Supervision.

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Declarations

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.

The ethical approval of the study was obtained from the first author's university (Protocol number: 239/2019; following the American Psychological Association's ethical guidelines regarding consent, confidentiality, and anonymity of responses.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.tate.2022.103763.

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