Profiles of adolescents' peer and teacher relatedness: Differences in well-being and academic achievement across latent groups

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ABSTRACT

In this study, we identied distinct clusters based on adolescents' relatedness with peers and teachers, and examined how students with different patterns or configurations of school-based relatedness qualities fare in their psychological and academic adjustment. A total of 1964 middle school students (*M* age = 15 years) participated in the study. We used latent profile analysis to identify meaningful patterns of peer and teacher relatedness and found that low feelings of relatedness with or responsiveness from the teacher do not necessarily result in poor school outcomes (low grades or low well-being) if students have at least moderate feelings of relatedness with their classmates. Results provide a better understanding of profiles of students who may be at risk for poor school adjustment, low grades, or school drop-out while offering a window into potential factors that protect or promote students' well-being and achievement.

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1. Introduction

Adolescents in middle or high school are at a transitional stage of their lives as they prepare for emerging adulthood including college or work life (Wentzel, 2009; Wentzel & Ramani, 2016). Academic institutions are places where adolescents spend significant amounts of time learning with and from peers and teachers (Ellerbrock & Kiefer, 2013). Students who develop supportive school-based relationships are more likely to succeed academically than those who develop short-term or superficial relationships with peers and teachers (Goodenow, 1993). As adolescents transition from elementary to middle school, they need to establish new social bonds with both peers and nonparental adults (Anderman, 2003). But many adolescents find the middle-school learning environment to be a socially challenging developmental niche. Students who feel disconnected from their peers and teachers often become disengaged at school, and are prone to poor psychological functioning and low academic achievement or school drop-out (Zee, Koomen, & Van der Veen, 2013).

Despite a large body of research on school-based social relationships and peer or teacher influences on students' motivation and achievement during early and middle adolescence (Wentzel & Muenks, 2016; Wubbels, Brekelmans, Mainhard, Den Brok, & van Tartwijk, 2016), prior studies rarely focused on the role of students' relatedness with peers and teachers (simultaneously or jointly) in students' learning

and school adjustment (King, 2015). From a Self-Determination perspective, relatedness is the feeling of connection and trust or security from knowing another person is there to back you up if needed (Furrer & Skinner, 2003). Moreover, because students' relatedness depends on the people within the school environment (Ryan & Deci, 2001), relatedness is not a stable individual difference variable but changes as the school environment and the people within it change (La Guardia, Ryan, Couchman, & Deci, 2000). As a result, there may not always be a direct correspondence between students' peer relationships or teacher-student relationships and their school-based outcomes. Rather, different patterns of relatedness with peers and teachers might lead to non-linear relationships between relatedness and school-based outcomes (e.g. Furrer & Skinner, 2003; Kindermann, 2016). For example, some students may feel disconnected from their teacher but feel very close to their peers. Alternatively, some students may feel disconnected from their peers but feel very close to the teacher. Thus, it is important to examine students' relatedness to peers and to teachers simultaneously or jointly and to understand the different profiles or patterns of relatedness amongst students. The present study addresses this gap in the literature by examining students' relatedness with both their peers and teachers and how such patterns or clusters of school-based relatedness predict academic adjustment and psychological health.

1.1. Social relationships in school

Given the many developmental and contextual changes experienced by adolescents as they increasingly seek independence or autonomy

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from their parents, school-related relationships such as peer or teacher-student relationships become highly influential in adolescents' psycho-social and academic adjustment (Rigby, 2000; Van Ryzin, Gravely, & Roseth, 2009). For instance, in a sample of 13932 preadolescents, Östberg (2003) found that students who were most liked by peers (assessed with sociometry) were rated by their teachers as more happy than students who were less liked by peers (i.e., had lower punctuations on the sociometry). Similarly Holder and Coleman (2008), found that adolescents' feelings of popularity with peers was associated with higher levels of happiness.

Classrooms with students are social environments, and student learning and achievement often happen within and through social practices (Hamre & Pianta, 2010; Wentzel & Watkins, 2002). Indeed, learning and achievement are socially mediated processes, and studies show that students with positive peer relationships at school tend to display greater school engagement and higher academic achievement (Chen, Hughes, Liew, & Kwok, 2010; Wentzel, 2009). While positive peer relationships impact students' engagement and achievement at school, teacher-student relationships also have short- and long-term impacts on students' academic and adjustment outcomes. The link between teacher-student relationships and academic achievement has been confirmed by a meta-analysis conducted by Roorda, Koomen, Spilt, and Oort (2011) with 17 secondary school samples showing a correlation of 0.20 between teacher-students relationships and academic grades. Furthermore, students' reports of their quality of relationship with teachers predicted students' psychological well-being, including self-esteem and depression (Liu, Li, Chen, & Qu, 2015).

1.2. School-based relatedness

Although prior studies consistently show that adolescents' social relationships with peers or teachers are influential in achievement and school functioning (e.g., Roorda et al., 2011; Wentzel, 2009), majority of prior studies on social relationships in school has focused on social support with limited attention on relatedness (King, 2015). However, the construct of social support differs from relatedness (Furrer & Skinner, 2003). Social support in school refers to positive relationships that students have with people who offer them aid or assistance in school (Wang & Eccles, 2012). Relatedness, within the Self-Determination Theory framework (Deci & Ryan, 1985; Ryan & Deci, 2000a), is understood as a basic need to establish and maintain positive, meaningful, and enduring relationships (Baumeister & Leary, 1995). Thus, students could feel they have social support from teachers or peers who are there to provide instrumental or instructional assistance, but at the same time, could lack a feeling of relatedness with teachers or peers. For students from different socioeonomic, cultural, or linguistic backgrounds than those of the teachers or peers, such a scenario might be particularly likely to happen (e.g., Chiu, Pong, Mori, & Chow, 2012).

The construct of relatedness, or the feeling that one is close and connected to significant others, has roots in the attachment literature (Ainsworth, Blehar, Walters, & Wall, 1978), and it is posited that positive adjustment will flourish in contexts where students feel that they care and are cared for by key school figures such as teachers or peers (Ryan & Deci, 2000b). The construct of relatedness is similar to, but not the same, as the construct of connectedness. Relatedness is conceptualized as one of the basic human needs for well-being (Ryan & Deci, 2000b), while connectedness is often not considered a basic human need but as an important feeling that motivates students to engage in school activities through a sense of school belonging as a valued member of the school community. Researchers have studied relatedness in school settings, measuring students' feeling of trusting and caring relationships at school and the feeling of being accepted, included, and valued by significant individuals at school (e.g., Eccles, 1993; Furrer & Skinner, 2003; Goodenow, 1993; Guay, Marsh, Senécal, & Dowson, 2008; Ryan & Grolnick, 1986). However, some researchers define relatedness differently. For example, Davidson, Gest, and Welsh (2010) used

the term relatedness as a proxy of students' social efficacy to make friends (e.g., social competence), a sociometry to assess students' likeability and teachers' report of students' trust/avoidance of the teacher. This subtle difference in defining and measuring the construct of relatedness as social competence at school rather than as feeling of closeness and connection with significant others at school could potentially lead to differences in research findings.

Students' peer and teacher relatedness are linked to their psychological well-being and psychosocial adjustment. Studies have shown that students who feel that their teacher take a genuine interest in them experience greater well-being (e.g., García-Moya, Brooks, Morgan, & Moreno, 2015). Studies have also found that students who feel that they have teachers who care for them and are willing to back them up display lower levels of depressive symptoms and anxiety when undergoing stressful events (e.g., Pössel, Rudasill, Sawyer, Spence, & Bjerg, 2013; Rueger, Malecki, & Demaray, 2010). In regard to peer relatedness, Guhn, Schonert-Reichl, Gadermann, Hymel, and Hertzman (2012) found that preadolescents' feelings of being backed-up by their peers was related to life satisfaction, self-esteem, and inversely to depression and victimization.

Students' relatedness with teachers has been linked to students' academic achievement. In a longitudinal study with adolescents living in the Philippines, King (2015) found that relatedness with peers at the start of the academic year predicted academic achievement, with this effect mediated by student engagement and disaffection. Importantly, King (2015)'s study examined students' relatedness with peers, teachers, and parents separately and found that relatedness with peers and with parents predicted students' achievement while relatedness with peers and with teachers predicted students' positive affect. Thus, when examining the role of relatedness in the school on student outcomes, it is important to distinguish between relatedness with peers and with teachers because they may have differential associations with student outcomes.

1.3. Person-centered vs variable-centered approach

In research on students' relatedness, the vast majority of studies used a variable-centered approach to examine effects of relatedness on well-being or academic achievement. However, one limitation with this approach is that relatedness is treated as a stable individual difference variable without taking into account that differences could exist in students' relatedness with peers and with teachers (Ryan & Deci, 2001). Further, such an approach cannot detect non-linear relationships between students' relatedness with peers or teachers and student outcomes. As a case in point, Furrer and Skinner (2003) studied children from 3rd to 6th grades using cluster analysis and discovered that children with low relatedness with their teachers and high relatedness with peers, as well as those with high relatedness with peers but low relatedness with teachers, exhibited worse academic adjustment than those with high relatedness with both peers and teachers. Thus, it is important to consider not only the degree or level of connection and support that students feel they have at school, but with whom.

To study different profiles or configurations of relatedness, studies that use non-based model approaches, such as cluster analysis, have been used which draw from standard deviations above or below the mean to classify individuals into an arbitrarily number of clusters (Marsh, Lüdtke, Trautwein, & Morin, 2009). To circumvent this problem of arriving at an arbitrary number of clusters, researchers have used latent profile analysis based on the probability that individuals belong to a latent subgroup and statistical criteria is used to determine how many latent subgroups underlie the data (Lanza & Rhoades, 2013). To our knowledge, no studies have used person-centered, non-based model approaches to study children's or adolescents' feelings of connection and trust with school figures: peers and teachers. at school. Of note, Davidson et al. (2010) conducted a study on 5th, 6th and 7th grade students', created clusters based on three variables: peer social preference

(using a sociometry to measure if students were choosen as liked least or most by peers), perceived peer competence (self-efficacy to make friends) and teacher-student closeness (teachers' report of students relying on them). Davidson et al. (2010) identified a three teacher-peer relatedness groups of High Relatedness, Peer-Oriented and Low Relatedness and found associations between those profiles and school behaviors and adjustment. However, it is also important to recall that while Davidson et al. (2010) used the term relatedness in their study, their measure was a proxy of students' social efficacy, a sociometry and teachers' report of students trust/avoidance rather than of students' feelings of connection and trust with school figures.

1.4. Gender and age differences in school-based relatedness

According to Pössel et al. (2013), girls generally perceive higher levels of emotional support in their relationships than boys, and Madill, Gest, and Rodkin (2014) pointed out that girls are more likely than boys to have close relationships with teachers. This is corroborated with findings of gender differences in adolescents' school-based relatedness (Anderman, 2003). Rose and Smith (2009) pointed out that this could be because girls spend more time talking than boys. Furthermore, developmental or age-related differences in school-based relatedness have been found with patterns suggesting that school-based relatedness drops significantly toward the final years of high school (Gillen-O'Neel & Fuligni, 2013). Such declines in school-based relatedness may correspond to developmental changes during adolescence that includes the increased seeking of social support from mentors and adults outside of the family and increased reliance on peer networks and close friendships (Roorda et al., 2011). Developmentally, declines in closeness in adolescents' relationships with their teachers have been found during middle or high school in a number of studies. For example, in a longitudinal study, Anderman (2003) reported a declining sense of relatedness in adolescents from sixth and seventh grade. Goodenow (1993) also found similar declines in the quality of teacher-student relationships from sixth to eight grades. Studies suggest that deterioration in teacher-student relationships may lead to decreased academic motivation and engagement, and subsequent low achievement or school drop-out (Luo, Hughes, Liew, & Kwok, 2009; Skinner, Kindermann, Connell, & Wellborn, 2009).

1.5. Well-being

In the study of students' school adjustment, it is important to consider that the definition and measurement of well-being differ depending on theoretical perspectives. Two major approaches that researchers have used include *subjective well-being* from the hedonic perspective and *psychological well-being* from the eudemonic perspective (Nelson, Fuller, Choi, & Lyubomirsky, 2014). The hedonic perspective of well-being is focused on the experience of happiness and pleasure (Diener, 1994), but may not necessarily reflect healthy or adaptive functioning (Ryff & Singer, 1998). The eudemonic perspective of well-being is focused on optimal growth and development, and has been posited as an indicator of healthy, congruent, and vital functioning (Ryan & Deci, 2001). In the present study, we focus on psychological well-being as a measure of adolescents' healthy development and adjustment with students' vitality, self-esteem, and life satisfaction as indicators of these key aspects of well-being (Ryan & Deci, 2008). Self-esteem can be understood as a positive or negative orientation toward oneself, which consists of feelings and qualitative judgments (Rosenberg, 1979) and refers to the general sense of personal worth (Harter, 2012). And life satisfaction refers to the overall assessment that an individual makes about her or his own life (Pavot, Diener, Colvin, & Sandvik, 1991), as an overall result of multiple assessments that a person performs on various aspects of her or his life (Shin & Johnson, 1978) and is the most commonly used indicator of well-being (Ferssizidis et al., 2010).

1.6. The present study

Relatedness clusters could be meaningful and useful in understanding students' social lives in schools, as well as in identifying profiles of students who may be at risk for social-emotional, behavioral, or academic problems in schools. The present study builds on research showing that supportive relationships enhance well-being (Baroody, Rimm-Kaufman, Larsen, & Curby, 2014; Guhn et al., 2012; Pössel et al., 2013), and academic achievement (Baroody et al., 2014; Cappella, Kim, Neal, & Jackson, 2013; Furrer & Skinner, 2003; Roorda et al., 2011), and from Davidson et al.'s (2010) findings showing that we can differentiate between distinct patterns based on the degree or level (high vs low) and the type (peers vs teacher) of social support. We hypothesize the existence of different relatedness clusters and that students in higher relatedness clusters will report higher well-being and exhibit higher academic achievement than students in the lower relatedness clusters. But we also explore competing hypotheses for mixed relatedness groups (e.g., high peer and low teacher relatedness). The peers in the present sample spend majority of their time at school together as a cohort, but spend less time with their homeroom teachers. Thus, we expect that students in mixed clusters, characterized by high peer and low teacher relatedness, would still report having positive, meaningful and enduring relationships at school (as met by peers) and would consequently not report low levels of well-being. Alternatively, it is plausible that teacher-student relationships may play such key roles in students' academic adjustment that students in clusters with low teacher relatedness would exhibit lower academic performance regardless of whether they have high or low peer relatedness. Nonetheless, we still hypothesize that students who belong in a cluster with low teacher relatedness would fare better in academic performance if they also have high peer rather than low peer relatedness, because peers could serve as social-emotional and academic support for students despite their low relatedness with teachers. Lastly, studies have found that girls report higher emotional support than boys while relatedness declines across the high school years (e.g., Pössel et al., 2013). Thus, we hypothesize that more girls and younger adolescents will be the higher relatedness groups while more boys and older adolescents will be in the lower relatedness groups.

2. Method

2.1. Participants

A total of 1964 compulsory secondary (middle school) students (50% males; mean age = 15 years, SD = 1.42) participated in this study. Students were drawn from 90 classes in Gran Canaria, Spain, from grades 1 to 4 of secondary education, equivalent to 7th to 10th grades in the U.S. system. The total sample comprised a similar number of students in each grade (Grade 7, $n = 573$, $M_{age} = 13.76$; Grade 8, $n = 489$, $M_{age} = 14.91$; Grade 9, $n = 491$, $M_{age} = 15.88$; Grade 10, $n = 411$, $M_{age} = 16.86$). The schools comprised a mix of urban and outlying rural schools whose students were predominantly from middle class families.

2.2. Measures

Data were collected to assess students' relatedness with teacher, relatedness with peers, well-being, and academic achievement.

2.3. Relatedness

To assess relatedness, that is, the need to maintain positive, meaningful, and enduring relationships, we developed two scales, one for the homeroom teacher and one for the peers. The development of the items was based on the Self-Determination Theory (Ryan & Deci, 2000b) and previous scales developed within this framework (Brien et al., 2012; Broeck, Vansteenkiste, Witte, Soenens, & Lens, 2010; Furrer

& Skinner, 2003; Ilardi, Leone, Kasser, & Ryan, 1993; Ng, Lonsdale, & Hodge, 2011).

2.3.1. Relatedness with the homeroom teacher

The following five items were used to assess students' relatedness with their teacher: My teacher values and appreciates me; I feel comfortable with my teacher; I get on well with my teacher; I feel much sympathy for my teacher; I think of my teacher as a friend. Students rated their responses using a Likert scale from 1 (*strongly disagree*) to 7 (*strongly agree*). The internal consistency for the scale was $\omega = 0.88$.

2.3.2. Relatedness with peers

The following five items were used to assess students' relatedness with peers in their respective classrooms: I feel great sympathy for my peers; I get along with my peers; My peers value and appreciate me; I think of my peers as good friends; I feel comfortable with my peers. Students rated their responses using a Likert scale from 1 (*strongly disagree*) to 7 (*strongly agree*). The internal consistency for the scale was $\omega = 0.93$.

Reliabilities of all measures were examined, and we took into account that Cronbach's alpha can be deflated if loadings are not equal across all items (Yang & Green, 2010) and if the nature of the data is not continuous (Elosua & Zumbo, 2008; Zumbo, Gadermann, & Zeisser, 2007). Thus, we followed Revelle and Zinbarg's (2009) recommendation and computed McDonald's (1999) Omega based on factor loadings after conducting a confirmatory factor analysis using the weighted least square mean and variance adjusted (WLSMV) estimation method to examine reliabilities of measures.

Construct validity was tested using confirmatory factor analysis (CFA). As for the estimation method, bearing in mind that participants' ratings were on Likert-type scales so their responses were ordered categorically (Flora & Curran, 2004), we used WLSMV. Importantly, students were grouped by classes and violate the assumption of independence. To statistically correct for nesting of students within schools which may inflate the value of χ^2 and underestimate standard errors (Stapleton, 2006), parameters were estimated by maximizing a weighted logarithmic function and standard errors using a sandwich type estimator (Muthén & Muthén, 2016). Model fit was assessed using several criteria: χ^2 test, root mean square error approximation (RMSEA) with its 90% confidence interval, the Tucker-Lewis index (TLI) and the comparative fit index (CFI).

For the scale assessing relatedness with peers, the χ^2 value and fit indexes were $\chi^2 (1961, 5) = 103.14$ ($p = 0.00$), RMSEA = 0.10 [0.09, 0.12], CFI = 0.99 and TLI = 0.98. With standardized loadings ranging between 0.54 and 0.86. And for the scale assessing relatedness with teachers the χ^2 value and fit indexes were $\chi^2 (1961, 5) = 92.15$ ($p = 0.00$), RMSEA = 0.09 [0.08, 0.12], CFI = 0.99, TLI = 0.98. With standardized loadings ranging between 0.72 and 0.93. In summary, χ^2 values and RMSEA were high, which were expected due to the large sample size and simple models with few degrees of freedom (Kenny, Kaniskan, & McCoach, 2014), but CFI and TLI values indicated that both relatedness scales were adequate.

2.4. Well-being

Consistent with the eudemonic approach that focused on healthy development and adjustment, well-being was assessed with vitality (vital and energetic functioning) self-esteem (psychological health), and life satisfaction (congruency).

2.4.1. Vitality

To assess vitality, we used the Spanish version (Balaguer, Castillo, García-Merita, & Mars, 2005) of the Subject Vitality Scale (Ryan & Frederick, 1997). It consists of seven items (e.g. I feel alive and vital) that were rated according to a Likert scale of seven points from 1 (*strongly disagree*) to 7 (*strongly agree*). Previous (Núñez, Fernández,

León, & Grijalvo, 2015; Núñez, León, González, & Martín-Albo, 2011) and the present study ($\omega = 0.92$) have shown evidence of reliability.

2.4.2. Self-esteem

To assess students' self-esteem, we used five positively worded items from the Spanish version of the Rosenberg Self-Esteem scale (Martín-Albo, Núñez, Navarro, & Grijalvo, 2007). Sample items included "Overall I am satisfied with myself". Students rated their responses using a Likert scale of four points, from 1 (*strongly disagree*) to 4 (*strongly agree*). Previous (León & Núñez, 2013; Núñez et al., 2011) and the present study ($\omega = 0.77$) have shown evidence of reliability.

2.4.3. Life satisfaction

Satisfaction with life was assessed using the Spanish version of the Satisfaction with Life Scale (SWLS) of Diener, Emmons, Larsen, and Griffin (1985), as translated by Núñez, Martín-Albo, and Domínguez (2010). This scale consists of five items that assess global satisfaction with life (e.g. "I am satisfied with my life"). Student responses were rated using a Likert scale from 1 (*strongly disagree*) to 7 (*strongly agree*). Previous (León & Núñez, 2013; León, Núñez, Domínguez, & Martín-Albo, 2013) and the present study ($\omega = 0.88$) have shown evidence of reliability.

2.4.4. Academic achievement

Students' academic achievement was assessed using the average score of their school grades (0–10, being 10 the highest) across all school subjects. The equivalence in the EEUU system would be: A+: 10; A: 9.175; B+: 8.325; B: 7.5; B-: 6.675; C+: 5.825; C: 5; C-: 4.175; D+: 3.325; D: 2.5; D-: 1.675; F: 0. School grades were recorded and reported at the end of academic courses by the official school board.

2.5. Procedure

This study was conducted at six high schools located in Las Palmas, Spain. Students provided informed consent to participate, and participation was strictly voluntary and confidential. Relatedness measures were collected during December, near the middle of the academic year, so that, students had adequate time to know or form relationships their classmates and the homeroom teacher. Well-being measures were obtained in May, near the end of the academic year, and grades were obtained from school records at the end of the academic year, in June. Such a design allowed testing of how relatedness affects the school outcome variables. Out of the 1964 initial subjects, we collected data on well-being 5 months later from 1611 students, and data on school grades six months later from 1782 students. During the data collection, a researcher administered all measures to students in the classroom and provided students with instructions and clarifications if needed to complete the measures and <1% of students refused to fill out the questionnaires. In Spain, with few exceptions, middle-school students (11 to 16 years) have to enroll in the same school coursework or subjects. Thus, all students enter as a cohort in the first year of secondary studies and complete the same school subjects from year-to-year. Given this type of curriculum in Spain, students remain with the same classmates each school year and students are assigned a homeroom teacher who is charged with taking care of students' academic-related affairs. The design of this study was approved by the first author's institutional research governing board.

2.6. Data analysis

2.6.1. Preliminary analyses

First we estimated means and standard deviations of major variables. Next, we computed variables' indicators (relatedness with peers, relatedness with teachers, vitality, self-esteem, and life satisfaction) using factor scores instead of mean scores, as this method helps overcome measurement error issues implicit in assessments (Justice,

Table 1
Descriptive statistics and Pearson's correlations.

	M	SD	1	2	3	4	5
1. Rel. Peers	5.61	1.24					
2. Rel. Teacher	4.93	1.64	0.33				
3. Vitality	5.05	1.32	0.27	0.22			
4. Self-esteem	3.38	0.62	0.26	0.15	0.67		
5. Life satisfaction	5.44	1.32	0.28	0.18	0.55	0.53	
6. Achievement	6.19	1.82	0.19	0.23	0.37	0.30	0.11

All correlations were significant ($p < 0.001$).

Table 2
Goodness of fit for models with latent groups.

Latent groups	Entropy	AIC	SSA-BIC	A-LRT(p)	% smallest group
1	–	11,153.73	11,163.35	–	–
2	0.49	10,925.21	10,942.05	0.00	40
3	0.68	10,817.80	10,841.86	0.00	13
4	0.70	10,752.70	10,783.97	0.04	7
5	0.77	10,702.72	10,741.21	0.14	3

AIC = Akaike Information Criteria. SSA-BIC = Sample size adjusted Bayes Information Criteria. A-LRT = Lo–Mendell–Rubin adjusted likelihood ratio test.

Petscher, Schatschneider, & Mashburn, 2011). In order to facilitate interpretation, we set the mean to zero and the standard deviations to one. Next, we calculated correlations between all major variables. We relied on full information maximum likelihood method (FIML; Enders, 2010) to estimate missing data, which mainly occur in the dependent variables (vitality, self-esteem, life satisfaction, and grades), because FIML assume that missing values can be predicted by variables that are not missing: the independent variables obtained in the first evaluation. All of the calculations were done with Mplus 7.4 (Muthén & Muthén, 2016).

2.6.2. Latent profile analysis

To identify the latent subgroups or "clusters", we used latent profile analysis. To decide the number of clusters we followed the recommendations of Collins and Lanza (2010) and Marsh et al. (2009) by using the entropy score, the Akaike information criterion (AIC), the sample-size-adjusted Bayesian information criterion (SSA-BIC) and the Lo–Mendell–Rubin adjusted likelihood ratio test (A-LRT). Furthermore, because solutions with small numbers of participants (e.g., 1% or 5% of the total sample) may not truly represent a unique latent subgroup (Marsh et al., 2009), we also analyzed the percentage of cases in the smallest latent subgroup of each model. To estimate more precisely standard

errors' parameters and A-LRT, we took into account that students are nested within classes.

To examine whether identified latent subgroups based on peer and teacher-student relatedness differed on well-being and school grades, we used a method developed by Lanza, Tan, and Bray (2013), that, unlike classic MANOVA, takes into account the participants' probability of belonging to a latent group and the association between the latent groups and the distal outcomes in the classification or imputation stage. It should be noted that, to date, Lanza et al. (2013)'s method has not been developed for use with complex models (e.g. students nested in classes), so we did not account for nesting when comparing across latent subgroups on well-being and grades.

3. Results

3.1. Preliminary analyses

Descriptive statistics (means and standard deviations) and correlation for all major variables are displayed in Table 1. The means varied between 3.38 (self-esteem) and 6.19 (achievement), and standard deviations between 0.62 (self-esteem) and 1.82 (achievement). With regard to correlations, they ranged from 0.67 (vitality with self-esteem) to 0.11 (achievement with life satisfaction).

3.2. Latent profile analysis

3.2.1. Identification of latent groups

We evaluated models between one and five latent groups, and model results are shown in Table 2. The model with five groups had better entropy, AIC and SSA-BIC values, but A-LRT indicated that a model with five latent groups does not fit significantly better than the model with four-factor. In the five-factor model, a small group with only 3% of the sample emerged and, actually, was quite similar to the four-factor model except for two groups that emerged with low relatedness with teachers and peers, instead of only one group with low relatedness with teachers and peers as observed in the four-factor solution. Based on these results, the four-factor model best represented the dataset and appear to best correspond to prior theory and research.

3.3. Description of latent groups

Latent groups were well represented by a combination of intensity and types of (peer and teacher-student) relatedness at school. As seen in Fig. 1, one group with values of relatedness with peers and with
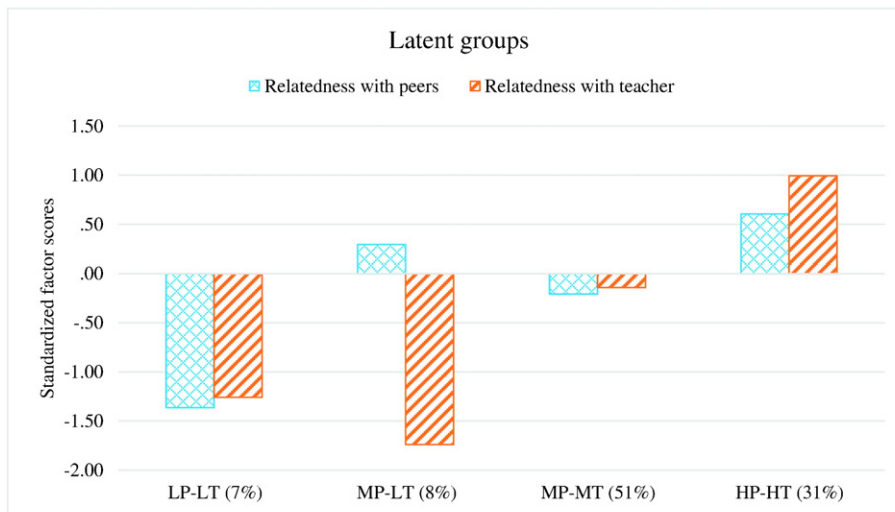

Fig. 1. Standardized factor scores for relatedness with peers and teachers for the four latent groups. LP-LT = low peers-low teacher. MP-LT = moderate peers-low teacher. MP-MT = moderate peers-moderate teacher. HP-HT = high peers-high teachers.

teacher below the mean (comprised by 7% of the sample) was classified as the low peers-low teacher relatedness cluster (LP-LT). The second group, classified as moderate peers-low teacher relatedness cluster (MP-LT), had values of relatedness with peers just above the mean and very low values of relatedness with the teacher was formed by 8% of the sample. The third group, which we classified as the MP-MT relatedness cluster, had values of relatedness with peers and with the teacher just below the mean and was formed by 53% of the sample. The last group, with values of relatedness with peers and the teacher above mean, formed by 31% of the sample, was classified as the high peers-high teacher relatedness cluster (HP-HT).

3.4. Comparison of well-being and grades across latent groups

Results, as shown in Table 3 and Fig. 2, indicated that the LP-LT relatedness group had the lowest well-being and lowest school grades. The MP-LT relatedness group, had higher well-being and higher school grades than the LP-LT relatedness group, but grades did not differ significantly across groups ($p = 0.057$). The MP-MT relatedness cluster, had higher well-being and higher school grades than the LP-LT relatedness group, but differed from the MP-LT cluster only on life satisfaction (i.e., one indicator of well-being). Finally, the HP-HT cluster had the highest well-being and highest school grades of all groups.

3.5. Age, gender and relatedness

No gender differences were observed across the LP-LT relatedness cluster, but more females were in the HP-HT relatedness group and fewer females were in the MP-MT relatedness group. With regard to age, the higher the cluster's mean age, the lower the relatedness with teachers.

4. Discussion

Research on the precursors and consequences of school-based relatedness during early and middle adolescence has traditionally used a variable-centered approach without taking into account that relatedness may vary across school figures (e.g., peers and teachers). This study empirically derived patterns or clusters of relatedness with peers and teachers amongst adolescents and four groups were identified: low relatedness with peers and teachers (LP-LT), moderate relatedness with peers but low relatedness with teachers (MP-LT), moderate relatedness with peers and teachers (MP-MT), and high

Table 3
Means and standard errors for relatedness with peers, relatedness with teachers, well-being indicators, grades, age and gender across latent groups.

		LP-LT (1)	MP-LT (2)	MP-MT (3)	HP-HT (4)
N		7%	8%	53%	31%
Rel. Peer	M	−1.36	0.29	−0.21	0.61
	SE	0.16	0.12	0.07	0.07
Rel. Teac	M	−1.26	−1.74	−0.14	0.99
	SE	0.14	0.08	0.06	0.06
Vitality	M	−0.70[2,3,4]	−0.06[1,4]	−0.14[1,4]	0.47[1,2,3]
	SE	0.07	0.07	0.03	0.04
Self-esteem	M	−0.55[2,3,4]	−0.03[1,4]	−0.15[1,4]	0.40[1,2,3]
	SE	0.08	0.07	0.03	0.03
Life satisfaction	M	−0.72[2,3,4]	0.18[1,3,4]	−0.19[1,2,4]	0.47[1,2,3]
	SE	0.08	0.07	0.03	0.04
Grades	M	5.59[3,4]	5.99[4]	6.09[1,4]	6.58[1,2,3]
	SE	0.15	0.15	0.06	0.08
Age	M	15.65[3,4]	15.47[4]	15.32[1,4]	14.91[1,2,3]
	SE	0.12	0.11	0.05	0.05
Gender	P*	0.48	0.48	0.55[4]	0.45[1]
	SE	0.06	0.05	0.02	0.02

N = Percentage of total sample. M = Mean. SE = Standard error. Rel. Peers = Relatedness with peer. Rel. Teacher = Relatedness with teacher. P* = Proportion of males/females. Numbers in superscript refers to groups significantly different (NC = 95%).
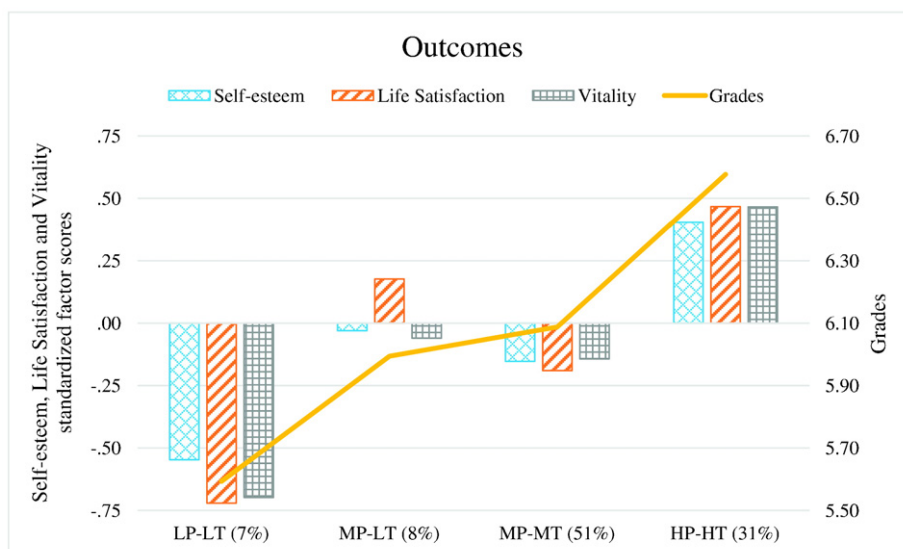
relatedness with peers and teachers (HP-HT). Importantly, the groups differed on psychological well-being (vitality, self-esteem, and life satisfaction) and academic achievement. Study results have implications for better understanding of interpersonal dynamics in classrooms or schools, and for identifying students who may be at risk for social-emotional, behavioral, or academic problems.

4.1. Relatedness

As expected, different profiles of school-based relatedness emerged and four groups were identified (see Fig. 1). One group with low relatedness with peers and low relatedness with the teacher (LP-LT cluster) was represented by 7% of the sample (M age = 15.65 years), with a similar proportion of females and males; a second group with about average relatedness with peers and low relatedness with the teacher (MP-LT cluster) was represented by 8% of the sample (M age = 15.47 years), with a similar proportion of females and males; a third relatedness cluster characterized by moderate relatedness with peers and with the teacher (MP-MT) was represented by 51% of the sample (M age = 15.32 years), with slightly fewer females than males; and a fourth group with high relatedness with peers and with the teacher (HP-HT cluster) was represented by 31% of the sample (M age = 14.91 years), with somewhat more females than males. Our findings are generally consistent with Davidson et al., (2010)'s findings, because two extreme clusters emerged in both studies: one cluster with low peer and low teacher relatedness and another cluster with high peer and high teacher relatedness. However, there are some notable differences between our findings that those from Davidson et al. (2010)'s study. In particular, three clusters emerged in Davidson et al.'s (2010) study while we identified an additional cluster in our study. The forth cluster found in our study consisted of students with average (mean) levels of relatedness with both peers and teacher. Furthermore, Davidson et al. observed a cluster of high social competence and high peer preference, but around the mean with the teacher, while in our study we observed a cluster with low relatedness with the teacher and around the mean with peers. There are at least several reasons for such differences in findings. One reason could be the difference in the methods or measures used to assess students' relatedness. In our study, two Likert scales (one for peers and another for teacher) were used to form the relatedness clusters. Davidson et al. (2010) used three instruments: a Likert scale to assess teachers' perception of the students' relatedness with them, a sociometry to assess peer social preference, and another Likert scale to assess students' social self-concept. Another reason could be developmental or age differences across studies. Our study sample included secondary (middle) school students with a mean age of 15 years, while Davidson et al.'s (2010) study sample included 5th, 6th and 7th grade students with a mean age of 11 years old. Thus, Davidson et al.'s (2010) sample was significantly younger than our study sample. Given declines in the quality of teacher-student relationships have been observed across grades or age (Anderman, 2003; Goodenow, 1993), developmental or age differences between studies may partly explain differences in findings. A third consideration is that latent profile analyses are sensitive to sample size, and Davidson et al.'s (2010) sample consisted of 383 students while our sample consisted of 1964 students (Berlin, Williams, & Parra, 2014).

4.2. Well-being and academic achievement differences across relatedness clusters

The four relatedness groups that were identified in the present study differed in psychological well-being (i.e., vitality, self-esteem, and life satisfaction) and academic achievement. Specifically, the LP-LT relatedness group had lower well-being and academic achievement values than the MP-MT relatedness group, and the HP-HT relatedness group had higher values than the MP-MT relatedness group. School-based relatedness and strong interpersonal ties or relationships are robust

Fig. 2. Standardized factor scores for the outcomes across the four clusters. LP-LT = low peers-low teacher. MP-LT = moderate peers-low teacher. MP-MT = moderate peers-moderate teacher. HP-HT = high peers-high teachers.

contributing factors to students' well-being (Bernat & Resnick, 2009; Pössel et al., 2013) and school engagement (Cappella et al., 2013; Furrer & Skinner, 2003; Roorda et al., 2011; Suárez-Orozco, Pimentel, & Martin, 2009). But, the MP-LT group, characterized by moderate relatedness with peers and low relatedness with the teacher, did not differ on well-being (except for life satisfaction which showed even a higher value) or academic achievement from the MP-MT relatedness group. It seems, as expected that latent groups for school-based relatedness do not follow a linear relation with the studied outcomes, but that peers play a compensatory role when other relationships are far from ideal. It is likely that for students who feel at least moderately related or connected to peers, classmates provide them with motivational and instrumental support for school engagement, even when such students feel that they lack the backing or support of their teachers (Cappella et al., 2013).

Also, it could be that some students find no commonalities or have conflicts with the homeroom teacher. In such instances, La Guardia et al., (2000) noted that it might be an appropriate or adaptive response for students to not focus on figures such as particular teachers who do not fulfill or meet their need for relatedness. While it is often ideal to aim for positive teacher-student relationships, not every student will develop close relationships with every teacher so our results highlight the importance of cultivating a positive school climate for supportive peer relationships and a sense of school belongingness that may also result in adolescents' psychological well-being and academic competence.

4.3. Gender and age differences in relatedness

Gender differences have sometimes been found in studies on adolescents' relatedness. Thus, we examined whether there were different proportions of males and females in the four relatedness groups. Results indicated no gender differences across the LP-LT (peer and teacher) relatedness group. There were somewhat more males in the MP-MT cluster, while there were somewhat more females in the HP-HT group, which are in line with previous studies (Madill et al., 2014; Pössel et al., 2013). In prior research, girls were found to spend more time talking or in social conversations than boys (Rose & Smith, 2009), and teachers might seek out girls to connect with them than for boys. Thus, it is not very surprising that there were more females who were high on relatedness with both peers and teachers if talking or social conversations is one mechanism by which students connect and form social bonds or ties with peers or teachers.

As students transition from middle childhood to early adolescence, declines in the quality of teacher-student relationships have been observed (Anderman, 2003; Goodenow, 1993). In the present study, we observed a pattern where the higher the latent group's mean age, the lower the relatedness with teachers. One potential reason for such a pattern could be changes in social status and school-based relationships associated with the transition from a primary school to a middle or high school (e.g., Schwartz, Stiefel, & Rothbart, 2016). Such school transitions often require students to establish new bonds and relationships at school, particularly if the school or class sizes were smaller in primary school than middle or high school. Furthermore, students' developmental or social-emotional changes from childhood to adolescence may also influence their social bonds and relationships at school. All these changes may contribute to stress and strain that impact students' sense of relatedness to their teachers or peers that could influence their interest, motivation, and performance at school (Goodenow, 1993; Roorda et al., 2011; Schwartz et al., 2016).

4.4. Limitations and future perspectives

Latent profile analysis is a useful technique to identify latent groups that represent a combination of differences in level and shape (e.g. moderate relatedness with peers and low relatedness with the teacher). But researchers need to be aware of the limitations and drawbacks of using latent profile analysis. Taking into account that adolescents can vary in relatedness along a continuum, adolescents were classified into one of four categories using latent profile analysis. The advantage of using a latent profile approach is better comprehension of types or qualities of relatedness, but the disadvantage is a loss of information from transforming continuous data to categorical data. Another drawback of latent profile analysis is that, similar to exploratory factor analysis, researchers need to determine or choose the number of factors that best correspond to theory and data, which require some discretion of researchers to apply their best scientific judgement (Marsh et al., 2009). Lastly, it is important to highlight that several studies have analyzed the best method to test differences across clusters in a distal outcome (Asparouhov, 2015; Asparouhov & Muthén, 2013; Lanza & Rhoades, 2013). But to date, we are not aware of a statistical model that accounts for nested data structures which may affect the standard errors of results.

Some studies have observed that group norms may influence how peer relationships impact well-being and achievement. Relatedness

with peers could be beneficial or harmful to adolescents' well-being and achievement depending on the types of (e.g., prosocial or deviant) peers that adolescents are socializing or interacting with (Jose, Ryan, & Pryor, 2012). Thus, a limitation of the present study is that we did not examine the types of peers or friendships that adolescents had when we assessed peer relatedness. Future studies could consider peer norms when examining peer relatedness and school outcomes. In a similar fashion, Alivernini and Manganelli (2016) and Cherng (2015) have highlighted that immigrants students, as well as highly mobile students such as those from families that move frequently or from military families, are more likely to feel a lack of relatedness compared to their peers. Therefore, future studies could analyze if relatedness clusters vary according to students status (e.g., immigrants vs nonimmigrants) or student/family mobility.

Although Roorda et al. (2011) concluded from a meta-analysis that the effects of teacher characteristics on the relationships between relatedness and achievement were limited, they observed that teachers' gender may influence the association between teacher-student relationships and engagement but not academic achievement. Therefore, future studies could include teachers' gender as a factor in examining teacher-student relatedness and student outcomes.

One final consideration that we would like to note is that we assessed teacher relatedness by focusing on the homeroom teacher. We believe this approach was efficient in providing us information on students' relatedness with teachers at school, because students know that the homeroom teacher is designated as the teacher they go to, if they want to discuss any school-related problems, including teasing or bullying by other classmates, academic difficulties, or home issues that impact their schoolwork. We fully recognize that students in secondary or middle and high school interact with multiple teachers. Thus, future studies could explore whether students who do not feel backed up and connected to their homeroom teachers could rely on other teachers at their school.

5. Conclusion

To our knowledge, this is one of the first studies to systematically examine both student-student relatedness and teacher-student relatedness using latent profile analysis instead of arbitrarily using standard deviations above or below the mean to classify individuals into clusters. Using this systematic approach, we identified meaningful patterns of peer and teacher relatedness and found that low feelings of being backed or supported by the teacher does not necessarily result in low grades or low psychological well-being if there is at least moderate relatedness with peers or classmates. Results provide better understanding of students' profiles who may be at risk for poor school adjustment, low grades, or school drop-out. Results have real-world implications, because most schools have finite resources and students typically only have access to one homeroom teacher and a handful of teachers per grade level but those teachers must accommodate many students' schooling needs. In light of these realities and constraints in the schools, our findings suggest that peers could serve as motivational and instrumental supports for school engagement in the event that teacher relatedness is low. In conclusion, study findings suggest that both teacher-student and student-student relationships offer windows into potential prevention and intervention strategies to promote students' psychological well-being and achievement.

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