



# Insights into School Connectedness: Validation of a Scale in Spanish Adolescents and Relationship with Mental Health Indicators

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## Abstract

The role of feelings of belonging at school in adolescents' academic and psychological functioning is well established. This study aimed to validate the School Connectedness subscale from the Maryland Safe and Supportive Schools (MDS3) School Climate Survey for secondary school students in Spain. This subscale encompasses the three key dimensions traditionally associated with school belonging. The internal structure of the scale and its measurement invariance across sex and age groups were examined. Additionally, new sources of validity evidence related to psychological adjustment were analyzed. A total of 1774 students aged 14–18 years ( $M = 15.70$ ;  $SD = 1.26$ ; 53.7% females) participated in the study. The results confirmed the three-factor structure of the scale, consistent with the theoretical framework proposed. Furthermore, measurement invariance was supported across sex and age groups. School connectedness was positively correlated with personal well-being and self-esteem, and negatively correlated with suicidal behavior, depressive symptoms, and emotional and behavioral problems. The resulting School Connectedness Scale is a brief, easy, and reliable tool for assessing this construct in adolescents. The findings have practical implications for assessing and promoting belongingness in educational settings.

**Keywords** School belonging · School connectedness · Mental health · Adolescents · Validation

## Introduction

In recent years, there has been an increased recognition of the crucial role played by schools in promoting mental health and addressing early psychological adjustment challenges (Wiedermann et al., 2023). Amidst this growing awareness, the concept of school belonging has emerged as a critical educational variable strongly associated with academic achievement, emotional well-being and mental health outcomes (Allen et al., 2022a, 2022b; Arslan et al., 2020; Korpershoek et al., 2020).

The examination of school belonging has been closely intertwined with related constructs, such as school connectedness, school bonding, school attachment, and school

engagement, among others (Allen & Kern, 2017; Korpershoek et al., 2020). These terms have been often used interchangeably, with subtle distinctions in their operational definitions (Korpershoek et al., 2020; Reschly & Christenson, 2012). This overlap likely originates from a shared emphasis across these constructs on students establishing meaningful and authentic connections with others within the school environment (Allen et al., 2021a, 2021b, 2022a, 2022b). This aligns with the belongingness hypothesis, which posits that human beings have a pervasive drive to form and maintain lasting, positive, and significant interpersonal relationships (Baumeister & Leary, 1995).

Goodenow and Grady (1993) have offered one of the most widely acknowledged definitions of school belonging, describing it as the degree to which students identify with their school and experience feelings of acceptance, respect, inclusion, and support from others within the school environment. Similarly, school connectedness has been generally defined as the degree to which students feel part of their school and attached to the adults and students therein (Lohmeier & Lee, 2011). These definitions underscore the conceptual similarities and multidimensional nature of both constructs, highlighting their shared focus on the broader

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socioecological context, encompassing both peers and teachers' dynamics within the school environment. A synthesis of the extant literature reveals that the numerous proposed terms and definitions of school belonging often converge around three common aspects (Allen et al., 2018; Furlong et al., 2014): (1) interactions and experiences within the school, (2) relationships between students and teachers, and (3) students' feelings toward the school institution as a whole.

In this paper, we adopt the term school belonging as the primary term, given its widespread use as an umbrella concept that encompasses various related constructs present in the existing literature (Allen et al., 2021a, 2021b; Allen & Kern, 2017; Korpershoek et al., 2020). Nevertheless, due to the name of the scale to be validated in the present study, we will also use the term school connectedness. Both terms will be used alternately throughout the paper, adhering to the terminology employed by the studies referenced, while maintaining consistency with the three shared dimensions previously identified (Allen et al., 2018; Furlong et al., 2014).

Extensive research strongly advocates for the benefits of school belonging, demonstrating its favorable influence on both academic accomplishments (Korpershoek et al., 2020) and psychosocial and mental health aspects (Arslan et al., 2020). For instance, Niehaus et al. (2012) have associated a perceived sense of school connectedness with academic adjustment and performance. Moreover, Gillen-O'Neel and Fuligni (2013) found a positive correlation between school belonging and increased academic motivation over a 4-year period. Additionally, empirical evidence indicates that school belonging correlates with reduced absenteeism rates (Demanet & Van Houtte, 2012; Rasasingham, 2015). It also relates to more favorable attitudes toward learning and higher academic self-efficacy (Korpershoek et al., 2020).

Regarding indicators of psychosocial adjustment and mental health, research has shown that school belonging is strongly associated with higher levels of well-being, life satisfaction, psychological functioning, self-esteem, and a coherent sense of identity (e.g., Arslan et al., 2020; Jose et al., 2012). Conversely, studies consistently reveal an inverse relationship between school connectedness and a range of behavioral and socioemotional problems, such as bullying, vandalism, disruptive behaviors, emotional distress, symptoms of anxiety and depression, substance use, early initiation of sexual activity, and suicidal behavior (e.g., Arslan & Allen, 2021; Arslan et al., 2020; Loukas et al., 2016).

Moreover, school belonging has shown particular significance during adolescence compared to other developmental stages. It influences social identity, interpersonal relationships, emotional regulation, and can even impact early adulthood (Allen & Kern, 2017; Allen et al., 2021a, 2021b; Flum & Kaplan, 2012). Nevertheless, at this developmental stage,

it is common to experience a disconnection with school and peers outside their close social circle (O'Brennan & Furlong, 2010). Indeed, research findings indicate a decline in school connectedness during the transition to secondary education (Niehaus et al., 2012), with girls reporting higher average levels compared to boys (Gillen-O'Neel & Fuligni, 2013). Negative experiences associated with school connectedness during adolescence can detrimentally affect psychosocial adaptation (Loukas et al., 2016), whereas a strong sense of connectedness may contribute to better adjustment (Loukas et al., 2009). For example, several studies have highlighted the moderating effect of student connectedness on the relationship between victimization and cybervictimization and suicidal behavior among adolescent populations (Lee et al., 2021; Lucas-Molina et al., 2022a, 2022b), showing a lower (or even null) relationship between victimization and suicidal behavior when there is a stronger sense of connectedness. Importantly, the protective role of school connectedness is especially relevant among socially marginalized adolescents (Eugene et al., 2021; Marraccini & Brier, 2017). For instance, Fenaughty et al. (2019) found that school belonging moderated the adverse impact of school bullying on academic achievement, especially for sexual minority students.

Given the fundamental role of school belonging in the healthy psychological development and optimal learning of students, especially during adolescence, it is crucial to assess this construct. However, as previously mentioned, there is no consensus regarding its nomenclature, definition or operationalization (Allen & Kern, 2017; Allen et al., 2022a, 2022b; Whiting et al., 2018). This lack of agreement extends to the methodology for its assessment, and to date, no universally accepted standard measure exists (Allen et al., 2021a, 2021b). Furthermore, the measurement of school belonging has shown variation across different school settings and age groups (Allen & Kern, 2017; Libbey, 2004). Notwithstanding, the Psychological Sense of School Membership scale (PSSM; Goodenow & Grady, 1993), the pioneering instrument in this field, has been commonly used to assess school belonging (Allen et al., 2021a, 2021b; You et al., 2011), as well as related constructs such as school connectedness (Marraccini & Brier, 2017; Shochet & Smith, 2014; Tomek et al., 2017).

Despite its popularity, extensive research has revealed inconsistencies in the dimensional structure, factor interpretation, and even the number of items comprising the scale, leading to confusion about the underlying conceptualization of the construct (Whiting et al., 2018). In this context, while several studies have advocated for the unidimensional structure, as evidenced by Gaete et al. (2016) in Chile, alternative analyses have suggested the potential existence of multiple factors (Cheung, 2004; Ye & Wallace, 2014; You et al., 2011). Indeed, the theoretical coherence

of a three-dimensional structure aligns more closely with the conceptualization and complexity of school belonging (Allen et al., 2018, 2021a, 2021b; Whiting et al., 2018).

The preceding emphasizes the critical need for a comprehensive yet parsimonious measurement instrument to effectively assess school belonging in adolescents, particularly within Spanish school settings, where such tools are currently lacking. The Maryland Safe and Supportive Schools (MDS3) School Climate Survey (Bradshaw et al., 2014) is an internationally recognized instrument for assessing various facets of school climate, including school belonging (i.e., Bradshaw, 2022; Bradshaw et al., 2014; Morin et al., 2018; Shukla et al., 2019). Notably, one of its subscales, termed “school connectedness”, broadly measures the three core components of school belonging as identified in the literature: student connectedness (interactions among students), teacher connectedness (student–teacher relationships), and whole-school connectedness (students’ perceptions of the school as a cohesive entity) (Allen et al., 2018, 2021a, 2021b; Furlong et al., 2014). Given the established validity of this instrument and its alignment with the multidimensional nature of school belonging, the “school connectedness” subscale was chosen in this study as a promising tool to measure school belonging.

Within this research context, the primary objective of this study is to conduct a preliminary adaptation of the “school connectedness” scale from the MDS3 for use in the context of Spain. This adaptation aims to establish a valid and reliable method for measuring school belonging among adolescents. The intended goal of this adaptation is to provide a valuable tool for researchers and practitioners in the field. Furthermore, the use of an established and internationally recognized instrument like the MDS3 enhances the potential replicability of this study, as researchers in other contexts can readily utilize the same instrument to compare their findings. In addition, this study also aimed to (a) examine the internal structure of the MDS3’s subscale; (b) test the scale’s measurement invariance by sex and age; (c) estimate the reliability of the measure scores; and (d) analyze the correlation between school connectedness scores and various psychometric indicators of mental health and well-being. In this regard, we hypothesized that: (a) the internal of the MDS3’s subscale will show a three-factor structure consistent with theoretical expectations, (b) the scale will exhibit measurement invariance across sex and age groups; (c) the measure will yield adequate reliability; and (d) there will be significant correlations between school connectedness scores and different psychometric indicators related to mental health and well-being. Specifically, we expect positive correlations between school connectedness and self-esteem and personal well-being, whereas negative correlations are anticipated with emotional and behavioral problems, depressive symptomatology, and suicidal behavior.

## Method

### Participants

The initial sample was composed of 1956 students. Students with more than one point ( $n = 146$ ) on the Oviedo Infrequency Scale-Revisited (Fonseca-Pedrero et al., 2019) or an age of more than 19 years ( $n = 36$ ) were eliminated. Thus, the study finally comprised 1774 students aged between 14 and 18 years ( $M = 15.70$ ;  $SD = 1.26$ ), with 959 participants being female (53.7%). These students were drawn from 31 schools located in the region of La Rioja, Spain. The sampling method employed was a stratified random cluster sampling approach, utilizing classrooms as the primary sample unit. The sampling frame consisted of a student population of 15,000 in La Rioja. The student cohort encompassed individuals attending various public (45.2%) and charter (54.8%) secondary and vocational training schools, representing diverse socio-economic backgrounds.

The stratification of the sample was based on geographical zones and the educational stage of the students. The distribution across age groups was as follows: 338 students at age 14 (19.1%), 534 students at age 15 (30.1%), 409 students at age 16 (23.1%), 297 students at age 17 (16.7%), and 196 students at age 18 (11.0%).

### Instruments

#### The School Connectedness Scale

To assess the extent to which students feel part of their school, we used fourteen items related to school connectedness from the MDS3 School Climate developed by Johns Hopkins Center for Youth Violence Prevention (Bradshaw, 2022; Bradshaw et al., 2014). The MDS3 comprises 56 core items that assess different aspects of school climate, including safety, engagement, and the overall environment. Of these, the 14 items selected for our study belong to the engagement domain. Responses to these items are scored on a 4-point Likert scale (1 = *strongly disagree* to 4 = *strongly agree*). The 14 items conform three different dimensions: Student Connectedness, that includes four items that examine the perception that students helped, respected, liked, and trusted one another (e.g., “In this school, students help each other”), Connection to Teachers, with 6 items that include both perception of teacher behavior (e.g., “My teachers listen when I have something to say”), as well as student–teacher relationships (e.g., “Students trust the teachers”), and Whole-school Connectedness, with 4 items focused on general feeling about school

including liking coming to school and taking pride in the school (e.g., "I like this school"). The scale has showed good reliability in previous studies, with values of Cronbach's alpha ranging from 0.82 to 0.87 (Bradshaw et al., 2014). The Spanish translation, validated for adolescent use (Lucas-Molina et al., 2022a, 2022b), was employed in this study and also showed adequate internal consistency, with Cronbach's alpha ranging from 0.76 to 0.86.

#### **The Personal Well-being Index–School Children (PWI-SC; Cummins & Lau, 2005)**

This instrument encompasses eight items assessing subjective satisfaction, utilizing a response range from 0 (*completely dissatisfied*) to 10 (*completely satisfied*). These items assess satisfaction across various life domains, including life as a whole, standard of living, health, life achievements, relationships, safety, community-connectedness, and future security. The total scale score is derived by summing up the scores from these seven domains, ranging between 0 and 70 points. In this study, the Cronbach's alpha for the total PWI-SC score was 0.83, whereas the Omega coefficient was 0.80, indicating good internal consistency. The Spanish version of the PWI-SC was used in the present study (Fonseca-Pedrero, 2018).

#### **The Rosenberg Self-Esteem Scale (RSE; Rosenberg, 1965)**

This instrument is used to gauge self-esteem using 10 items scored on a 4-point Likert scale (1 = *strongly disagree* to 4 = *strongly agree*). Employing the Spanish version (Oliva et al., 2011) in this study exhibited strong reliability within this sample (Cronbach's alpha = 0.89; Omega total score = 0.89).

#### **The Adolescent Suicidal Behavior Assessment Scale (SENTIA; Díez-Gómez et al., 2020)**

It is a self-reported tool comprising 16 dichotomous (*yes/no*) items designed to evaluate suicidal behavior among adolescents (e.g., "Have you planned to take your own life?"). The SENTIA scale has demonstrated robust psychometric properties among Spanish adolescents, exhibiting good reliability within this sample (Cronbach's alpha = 0.90; Omega total score = 0.91) (Díez-Gómez et al., 2020).

#### **The Reynolds Adolescent Depression Scale-Short Form (RADS-SF; Reynolds, 2002)**

The RADS-SF is a self-reported instrument aimed at assessing the severity of depressive symptomatology in adolescents. It encompasses 10 items measuring anhedonia, somatic complaints, negative self-evaluation, and dysphoria,

responded to on a 4-point Likert scale (1 = *almost never* to 4 = *almost always*). The Spanish adaptation, validated for adolescent use (Ortuño-Sierra et al., 2017), was employed in this study. The scale demonstrated acceptable reliability within this sample (Cronbach's alpha = 0.69; Omega total score = 0.84).

#### **The Strengths and Difficulties Questionnaire (SDQ; Goodman, 1997)**

The SDQ is a widely employed self-report tool for evaluating emotional and behavioral issues linked to adolescent mental health. Comprising 25 statements, the SDQ organizes items into five distinct subscales: Emotional Symptoms, Conduct Problems, Hyperactivity, Peer Problems, and Prosocial Behavior. The first four subscales contribute to generating a Total Difficulties score. In this study, the Spanish version of the SDQ was utilized, employing a three-point Likert-type response scale (0 = *not true*, 1 = *somewhat true*, 2 = *certainly true*) (Ortuño-Sierra et al., 2018). The Total difficulty score demonstrated acceptable reliability in this sample (Cronbach's alpha = 0.80; Omega total score = 0.84).

#### **The Oviedo Infrequency Scale-revisited (INF-OV-R)**

The INF-OV-R (Fonseca-Pedrero et al., 2019) was administered to participants in order to detect those who responded in a random, pseudorandom or dishonest manner. The INF-OV-R is a self-report instrument consisting of 10 items in a dichotomous scale format (*yes/no*). Students with more than three incorrect responses on the INF-OV-R scale were excluded from the sample.

#### **Procedure**

This research obtained approval from both the Regional Government of Education of La Rioja and the Clinical Research Ethics Committee of La Rioja (Ref. CEImI.AR P.I.337). The investigation adhered to the principles outlined in the Declaration of Helsinki. Initial contact with schools involved reaching out via telephone, email, or postal mail, and the first point of contact was typically the school principal, head of studies, or counseling department.

To ensure a standardized administration process, all researchers received a protocol that delineated the procedures to be followed before, during, and after the administration of the measurement instruments. The questionnaires were administered via computers, collectively, in groups ranging from 10 to 30 participants, during a designated school session lasting 50 min, conducted in a specifically prepared classroom environment.

Participants were explicitly briefed on the confidentiality of their responses and the voluntary nature of their



participation. No incentives were offered for participation. For participants under 18 years of age, informed consent was obtained from their parents or legal guardians. Failure to secure informed consent resulted in the exclusion of the participant from the study. The research was presented to the participants as an investigation concerning emotional well-being and mental health, conducted with the support of the Regional Government of Education of La Rioja. The endorsement of the Regional Government of Education facilitated high participation, with only anecdotal cases of non-consent. As a result, the consent rate approached 100%. This study was not preregistered.

## Data Analyses

First, descriptive statistics, including means and standard deviations, were computed for the school connectedness items.

Second, several confirmatory factor analyses (CFAs) were performed to examine the internal structure of the scale. The robust weighted least squares means and variance-adjusted (WLSMV) estimator, suitable for ordinal data (Newsom, 2015), was employed for analysis. Goodness-of-fit indices such as Chi-square ( $\chi^2$ ), Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), Root Mean Square Error of Approximation (RMSEA) with a 90% Confidence Interval, and Standardized Root Mean Square Residual (SRMR) were utilized. Hu and Bentler (1999) recommended an RMSEA of 0.06 or lower and CFI and TLI values of 0.95 or higher for a good model fit, although values above 0.90 are considered acceptable.

Third, successive multigroup CFAs were conducted to assess measurement invariance across sex and age (Sireci, 2023). This involved a hierarchical set of steps starting with establishing a well-fitting multigroup and baseline model, followed by progressively imposing equivalence constraints on model parameters across groups. Configural invariance, the least restrictive model, was tested initially, verifying that the factor structure remains similar across groups. Metric or weak invariance, which tests if the item measurements are equivalent across groups, was assessed by imposing equality constraints on factor loadings. Scalar invariance, which imposes cross-group equality constraints on all factor loadings and item intercepts, was then tested. When met, this suggests similar interpretations of the measure across groups (Meredith, 1993). To test the invariance hypothesis, we examined both the significance of the change in  $\chi^2$  (where a non-significant change indicates invariance) between two nested models (Byrne et al., 1989) and the change in CFI ( $\Delta$ CFI) to assess practical equivalence between models (Cheung & Rensvold, 2002). Typically, if  $\Delta$ CFI is less than 0.01 between two nested models, the specified equality constraints are considered acceptable. This latter criterion

is considered more robust than the  $\chi^2$  difference test due to the increased sensitivity of the  $\chi^2$  statistic in large samples (Putnick & Bornstein, 2016).

Fourth, reliability estimates for the school connectedness scores were computed using Cronbach alpha and McDonald's Omega (Dunn et al., 2014).

Finally, the associations between school connectedness scores and other mental health indicators were calculated. Pearson correlations were interpreted following Cohen's (1988) guidelines, where values around 0.10 indicate small effects, around 0.30 indicate moderate effects, and 0.50 or higher indicate large effects. The analyses were conducted with IBM SPSS Statistics Version 26.0 (SPSS, 2019), Mplus 7.0 (Muthén & Muthén, 2013), and JASP 0.18.2.0 software packages.

## Results

### Descriptive Statistics

Table 1 shows the descriptive statistics for the school connectedness scores (means, standard deviations, skewness, and kurtosis) for the total sample ( $N=1774$ ). The highest mean score was on item 1 "I feel like I belong" ( $M=3.35$ ;  $SD=0.72$ ). The lowest mean score was on item 10 "Students trust the teachers" ( $M=2.58$ ;  $SD=0.76$ ). There were several items that had skewness and kurtosis values outside the  $-1$  to  $1$  range (e.g., items 1, 4 and 9).

### Confirmatory Analysis of the School Connectedness Items

First, the goodness-of-fit indices for one-factor model were computed [ $\chi^2=419.456$ ;  $df=77$ ;  $CFI=0.786$ ;  $TLI=0.747$ ;  $RMSEA$  (90% CI)=0.150 (0.136–0.15);  $SRMR=0.073$ ], indicating a poor fit. Then, a three-factor model was tested yielding acceptable goodness of fit indices:  $\chi^2=520.881$ ;  $df=74$ ;  $CFI=0.946$ ,  $TLI=0.934$ ,  $RMSEA$  (90% CI)=0.058 (0.053–0.063),  $SRMR=0.051$ . The standardized factor loadings for the total sample, and by sex and age are shown in Table 2. The confirmatory factor model is illustrated in Fig. 1.

The correlations between the SCS-Student and the SCS-Teacher and SCS-School latent factors were 0.577 and 0.626, respectively. Additionally, the correlation between the SCS-Teacher and SCS-School latent factors was 0.732.

**Table 1** Descriptive statistics for the school connectedness items ( $N=1774$ )

Items	<i>M</i>	<i>SD</i>	Skewness	Kurtosis
1. I feel like I belong (SCS-Student)	3.35	.725	− 1.107	1.358
2. Students help one another (SCS-Student)	3.02	.661	− .532	.902
3. Students respect one another (SCS-Student)	2.82	.689	− .466	.434
4. Students like one another (SCS-Student)	2.93	.614	− .512	1.188
5. My teachers listen to me when I have something to say (SCS-Teachers)	3.05	.745	− .640	.459
6. My teachers care about me (SCS-Teachers)	2.78	.774	− .492	.066
7. Teachers respect the students (SCS-Teachers)	3.08	.703	− .681	.902
8. My teachers tell me when I do a good job (SCS-Teachers)	3.10	.720	− .668	.659
9. My teachers notice when I am not there (SCS-Teachers)	3.26	.726	− .925	1.013
10. Students trust the teachers (SCS-Teachers)	2.58	.763	− .211	− .290
11. Students and staff feel pride in this school (SCS-School)	2.80	.756	− .464	.110
12. I enjoy learning at this school (SCS-School)	3.04	.750	− .723	.679
13. I like this school (SCS-School)	3.05	.783	− .772	.561
14. I like coming to school (SCS-School)	2.61	.879	− .251	− .620

*Note:* SCS School Connectedness Scale (in parentheses, the dimension assessed by the specific item)

**Table 2** Standardized factor loadings of the school connectedness scale for the total sample and by sex and age

Item	Total		Male		Female		14 years		15 years		16 years		17 years		18 years	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
1	0.40	0.02	0.44	0.04	0.37	0.03	0.36	0.05	0.36	0.05	0.41	0.04	0.42	0.05	0.49	0.05
2	0.52	0.01	0.55	0.03	0.49	0.02	0.59	0.04	0.59	0.04	0.44	0.03	0.52	0.03	0.61	0.04
3	0.51	0.02	0.50	0.03	0.52	0.03	0.53	0.04	0.53	0.04	0.48	0.04	0.49	0.04	0.54	0.04
4	0.42	0.01	0.44	0.03	0.41	0.03	0.45	0.04	0.45	0.04	0.36	0.04	0.40	0.04	0.47	0.05
5	0.59	0.02	0.61	0.03	0.55	0.02	0.58	0.04	0.58	0.04	0.60	0.03	0.59	0.04	0.56	0.04
6	0.57	0.02	0.60	0.03	0.51	0.02	0.56	0.04	0.56	0.04	0.55	0.04	0.60	0.04	0.55	0.04
7	0.53	0.02	0.60	0.03	0.45	0.02	0.47	0.04	0.47	0.04	0.53	0.03	0.58	0.04	0.54	0.04
8	0.51	0.02	0.55	0.03	0.47	0.02	0.50	0.04	0.50	0.04	0.47	0.04	0.52	0.04	0.56	0.05
9	0.35	0.02	0.41	0.03	0.30	0.03	0.35	0.05	0.35	0.05	0.32	0.04	0.32	0.05	0.45	0.05
10	0.54	0.02	0.57	0.02	0.52	0.02	0.53	0.04	0.53	0.04	0.55	0.03	0.49	0.04	0.55	0.04
11	0.55	0.02	0.58	0.03	0.50	0.03	0.53	0.04	0.53	0.04	0.55	0.03	0.55	0.04	0.57	0.04
12	0.68	0.01	0.71	0.03	0.65	0.02	0.67	0.04	0.67	0.04	0.66	0.03	0.70	0.04	0.69	0.04
13	0.68	0.02	0.69	0.03	0.67	0.02	0.67	0.04	0.67	0.04	0.64	0.03	0.71	0.04	0.72	0.04
14	0.51	0.02	0.49	0.03	0.52	0.03	0.50	0.05	0.50	0.05	0.46	0.04	0.52	0.04	0.61	0.04

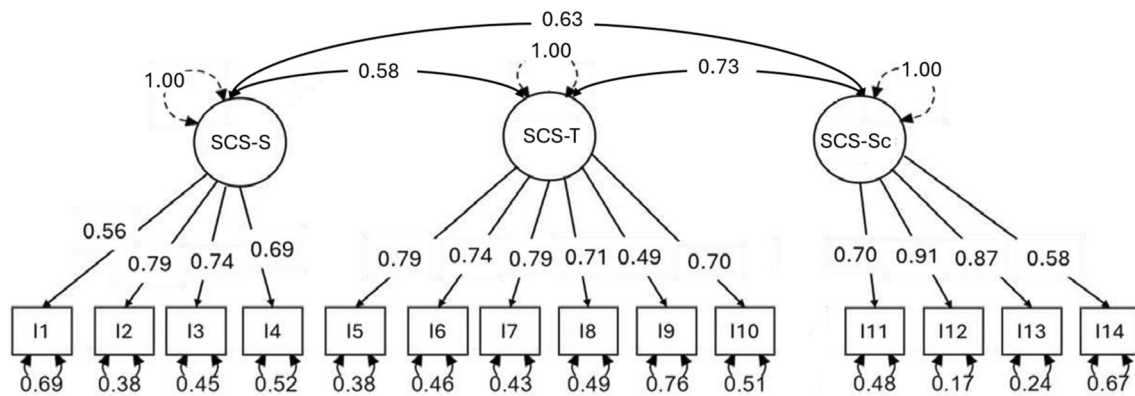
*Note:* All standardized factor loadings estimated were statistically significant ( $p < .01$ )

### Measurement Invariance of the School Connectedness Scores Across Sex and Age and Latent Means Comparisons

Given that the three-factor model factor showed a good fit, the invariance of the three-factor model of the School Connectedness Scale was tested as a function of sex and age. The goodness-of-fit indices for males and females, as well as for each age group (14, 15, 16, 17, 18), were adequate (see Table 3). The configural, metric invariance and scalar measurement invariance models showed an adequate fit to the data. Although the  $\Delta\chi^2$  between the constrained and unconstrained models was significant, the  $\Delta CFI$  was below

0.01. Given that  $\Delta\chi^2$  is considered overly sensitive to model misfit in large samples (Cheung & Rensvold, 2002; Putnick & Bornstein, 2016), we concluded that measurement invariance across sex and age, respectively, for the three-factor model was supported based on the  $\Delta CFI$ .

Latent mean differences across sex and age groups were estimated from the strong invariance model. Females scored higher than males in all three dimensions. These differences were statistically significant only for Connection to Teachers ( $d=0.52$ ,  $p < 0.01$ ) and Whole-school Connectedness ( $d=0.56$ ,  $p < 0.001$ ). No age differences were found.



**Fig. 1** Confirmatory factor analysis model. *Note.* SCS-S: School Connectedness Scale-Student; SCS-T: School Connectedness Scale-Teacher; SCS-Sc: School Connectedness Scale-School. Factors loadings are standardized

**Table 3** Goodness-of-fit indices for the hypothetical models tested and measurement invariance of the school connectedness scale by sex and age

Model	$\chi^2$	df	CFI	TLI	RMSEA (90% CI)	SRMR	$\Delta\chi^2$	$\Delta df$	$\Delta CFI^1$
One-factor model	419.456	77	0.786	0.747	0.150 (0.136–0.165)	0.073			
Three-factor model	520.881	74	0.946	0.934	0.058(0.053–0.063)	0.051			
<i>Sex</i>									
Male ( $n = 815$ )	298.449	74	0.945	0.932	0.061(0.054–0.069)	0.051			
Female ( $n = 959$ )	246.981	74	0.948	0.936	0.049(0.043–0.056)	0.055			
Configural invariance	616.753	148	0.944	0.931	0.060(0.055–0.065)	0.053			
Metric Invariance	654.960	162	0.941	0.933	0.059(0.054–0.063)	0.054	38.21**	14	< .01
Scalar Invariance	755.278	176	0.934	0.930	0.060(0.055–0.064)	0.059	100.32**	14	< .01
<i>Age</i>									
14 years ( $n = 342$ )	158.014	74	0.941	0.927	0.058(0.045–0.070)	0.058			
15 years ( $n = 539$ )	207.740	74	0.935	0.920	0.058(0.049–0.068)	0.056			
16 years ( $n = 410$ )	186.264	74	0.940	0.927	0.061(0.050–0.072)	0.059			
17 years ( $n = 298$ )	183.646	74	0.943	0.930	0.071(0.058–0.084)	0.054			
18 years ( $n = 198$ )	144.885	74	0.941	0.927	0.070(0.053–0.087)	0.063			
Configural invariance	908.476	370	0.936	0.926	0.064(0.059–0.069)	0.058			
Metric invariance	966.941	426	0.935	0.936	0.060(0.055–0.065)	0.066	58.47**	56	< .01
Scalar invariance	1129.860	482	0.926	0.932	0.061(0.057–0.066)	0.069	162.92**	56	< .01

*Note.*  $\chi^2$ =Chi square;  $df$ =degrees of freedom; CFI=Comparative Fit Index; TLI=Tucker-Lewis Index; RMSEA=Root Mean Square Error of Approximation; CI=Confidence Interval; SRMR=Standardized Root Mean Square Residual;  $\Delta\chi^2$ =Change in  $\chi^2$ ; \*\* $p < .001$ , indicates significant  $\Delta\chi^2$ ;  $\Delta CFI$ =Change in Comparative Fix Index. <sup>1</sup> $\Delta CFI < .01$  indicates measurement invariance across sex or age

### Reliability Estimation of the School Connectedness Scores

The total score for School Connectedness exhibited good internal consistency, estimated with McDonald's Omega, with a coefficient of 0.89 (95% CI 0.88–0.90). For the Student Connectedness factor, the coefficient was 0.80 (95% CI 0.79–0.91), while for the Connection to Teachers factor, it was 0.85. Similarly, the Whole-school Connectedness factor also displayed a coefficient of 0.85 (95%

CI 0.84–0.86). All item discrimination indices surpassed 0.30.

### Evidence Based on the Relations of School Connectedness to Other Variables

As shown in Table 4, scores on the three dimensions and the total score of School Connectedness were positively and statistically significantly correlated with personal well-being and self-esteem and were negatively and statistically significantly associated with suicidal behavior,

**Table 4** Pearson correlations between the school connectedness total and dimensional scores and psychometric indicators of mental health

	SCS-Total	SCS-Student	SCS-Teacher	SCS-School	PWI-SC	RSS	SENTIA	RADS-SF
SCS-Student	.766**							
SCS-Teacher	.893**	.509**						
SCS-School	.873**	.563**	.660**					
PWI-SC	.239**	.277**	.156**	.206**				
RSS	.243**	.286**	.182**	.177**	.645**			
SENTIA	-.169**	-.249**	-.104**	-.112**	-.512**	-.550**		
RADS-SF	-.267**	-.329**	-.182**	-.207**	-.655**	-.727**	.671**	
SDQ	-.288**	-.333**	-.215**	-.216**	-.504**	-.577**	.520**	.655**

*Note.* SCS=School Connectedness Scale; PWI-SC=Personal Well-being Index–School Children Well; RSS=Rosenberg Self-esteem Scale; SENTIA=The Adolescent Suicidal Behavior Assessment Scale; RADS-SF=The Reynolds Adolescent Depression Scale-Short Form; SDQ=The Strengths and Difficulties Questionnaire, Total score

\*\* $p < 0.01$

depressive symptoms, and emotional and behavioral problems.

## Discussion

The principal aim of this study was to validate an instrument to assess the feelings of belonging at school among secondary school students. Given that, to the best of our knowledge, there is no validated measure in Spain to comprehensively assess this construct, we opted to adapt and validate the "school connectedness" scale from the widely utilized Maryland Safe and Supportive Schools (MDS3) School Climate Survey (Bradshaw, 2022; Bradshaw et al., 2014) into Spanish. Although the scale is referred to as "school connectedness", it encompasses the three key components of school belonging (Allen et al., 2018, 2021a, 2021b; Furlong et al., 2014). Additionally, the present study sought to examine the internal structure of the scale and determine whether it replicated the three dimensions of school belonging. The investigation also aimed to analyze the measurement invariance of the scale across sex and age groups. Finally, latent means and new sources of validity evidence in relation to socioemotional adjustment were analyzed.

Our findings validated the three-factor structure of the scale within our sample, providing support to the hypothesis that the assessed construct exhibits a multidimensional nature (Allen et al., 2018; Whiting et al., 2018), characterized by a three-dimensional structure rather than only one. Furthermore, the factorial structure remained invariant across sex and age groups. This suggests that the latent variables were measured equivalently across all groups, thereby supporting the second hypothesis of our study. Likewise, the factors demonstrated satisfactory psychometric properties within our sample, exhibiting acceptable to good reliability and adequate construct validity, as evidenced by the

correlations observed among the three dimensions, which supported our third hypothesis.

Examination of sex differences in the three subscales revealed that females scored higher than males. However, these differences were only statistically significant for the Connection to Teachers and Whole-school Connectedness subscales. These results regarding higher scores among females align with prior research (Gillen-O'Neel & Fuligni, 2013). In contrast, no age-related differences were observed, contrary to previous studies suggesting a decline in school connectedness during the transition to secondary school (Niehaus et al., 2012). Nevertheless, some studies have questioned this decline across the transition to secondary school (Gillen-O'Neel & Fuligni, 2013), suggesting that any initial decrease in school connectedness observed during this phase may stabilize or even be followed by a gradual increase in the sense of school belonging as students adapt to the secondary school environment. Consequently, understanding the trajectories of school connectedness and belonging among students throughout the secondary school years is crucial. This is an issue that could be analyzed through future longitudinal studies that span the entire secondary school stage.

To provide further evidence of the validity of the measure, correlations were obtained between the total and the three dimensions scores of the School Connectedness Scale, and other psychometric indicators of mental health. Both the total score and each of the dimensions displayed significantly positive correlations with emotional well-being and self-esteem. Conversely, they exhibited significant negative correlations with suicidal behavior, depressive symptoms, and emotional and behavioral problems. Prior research has yielded similar findings (e.g., Allen et al., 2018; Arslan & Allen, 2021; Arslan et al., 2020; Korpershoek et al., 2020; Marraccini & Brier, 2017). For instance, Marraccini and Brier (2017) identified in a systematic review that school



connectedness was associated with reductions in suicidal behavior. Similarly, Markowitz (2017) found a negative relationship between school belonging and depressive symptomatology. Although the correlation values in our study were relatively small (equal to or less than 0.333), taken together, these findings support the fourth hypothesis of our study, and reinforce the importance of feeling connected at school as a potentially significant factor in student emotional well-being and mental health.

It is essential to acknowledge the following limitations when interpreting the results of the present study. First, although the sample size is considerable and the participants are representative of the Spanish autonomous community of La Rioja, it is important to note that the results may not be generalizable to other contexts. Second, self-report measures were used to assess all psychological indicators, which are known to have certain limitations. Finally, the cross-sectional nature of this study precludes the ability to draw conclusions about causal relationships. The inability to examine the measurement invariance of the School Connectedness Scale and its dimensions over time represents an important limitation, hindering the exploration of the construct across secondary school years (i.e., from 14 to 18 years of age).

Despite its limitations, the current study provides evidence supporting the construct validity and equivalence across sex and age of a concise scale designed for effectively assessing school connectedness within Spanish school settings. While our findings primarily refer to school connectedness to remain aligned with the scale's nomenclature, they also contribute to the broader literature on school belonging, given the conceptual overlap between these constructs. As previously emphasized, school belonging plays a crucial role in psychological well-being (Allen et al., 2022a, 2022b), with schools serving as fundamental environments for its enhancement. However, research on school belonging has been characterized by fragmentation and inconsistency in both terminology and assessment methodologies. The findings of this study underscore the utility of the School Connectedness Scale as a brief, straightforward, multidimensional, and reliable instrument for capturing self-reported school belonging during adolescence. Assessing school belonging can serve as an initial step toward understanding the nature of the construct and identifying its most strongly related variables. This, in turn, enables schools and policymakers to identify key areas in the system for implementing preventive and intervention strategies aimed at promoting healthy psychological development and cultivating optimal learning environments within schools. Nevertheless, further research is necessary to explore and validate the scale's dimensionality and equivalence. This should be done not only across sex and age but also longitudinally, in diverse samples, and within various cultural contexts. In that regard,

the validation of a subscale from an internationally used measure such as the MDS3 could enhance the study's replicability and facilitate deeper exploration of the concepts of school connectedness and belonging, clarifying the relationship between both constructs while also generating valuable knowledge to design more effective educational interventions.

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## Declarations

**Conflict of interest** The authors have no conflicts of interest to declare that are relevant to the content of this article.

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