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Early Adolescents' Attitudes and Academic Achievement: The Mediating Role of Academic Self-concept☆

Alejandro Veas*, Juan-Luis Castejón, Pablo Miñano, and Raquel Gilar-Corbí

University of Alicante, Spain

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ABSTRACT

This study was designed to examine academic self-concept as a potential mediator to better understand the relations between academic attitudes and academic achievement in early adolescence. A total of 1398 high school students from Alicante, Spain (47% female, $M = 12.5$ years), participated in the study. Multilevel mediation analyses with Monte Carlo confidence intervals were used to measure within-subject effects at the student level (L1) and between-subject effects at the class level (L2). Academic attitudes (attitudes towards teachers and attitudes towards school) and academic self-concept were measured with validated scales, whereas academic achievement was assessed using the end-of-term grades obtained by the students in nine subjects. The results show, first, significant effects of the academic attitude constructs on the mediational and dependent variables at both the within and between levels. Second, academic self-concept was an important mediator for all academic attitude constructs at both levels of analysis. These results highlight the importance of academic self-concept during early adolescence and suggest that academic attitudes are crucial for the future development of educational models.

Actitudes en la adolescencia inicial y rendimiento académico: el rol mediacional del autoconcepto académico

Palabras clave:
Adolescencia inicial
Educación Secundaria Obligatoria
Actitudes académicas
Autoconcepto académico
Rendimiento académico
Análisis mediacional multinivel

RESUMEN

Con el fin de tener un mejor entendimiento de la relación existente entre las actitudes académicas y el rendimiento académico en la adolescencia inicial, se lleva a cabo el presente estudio teniendo en cuenta el autoconcepto académico como mediador relevante. Un total de 1398 estudiantes de la provincia de Alicante, España (47% mujeres, $M = 12.5$ años), participan en el estudio. Se emplean análisis de mediación multinivel para medir los efectos intra-sujetos al nivel del estudiante (L1), e inter-sujetos al nivel de la clase (L2). Las actitudes académicas (actitudes hacia el profesorado y actitudes hacia la escuela) y el autoconcepto académico se miden mediante escalas validadas, mientras que el rendimiento académico se mide a partir de las calificaciones que obtienen los estudiantes en nueve asignaturas. Los resultados muestran, en primer lugar, efectos significativos de las actitudes académicas sobre la variable mediacional y la variable dependiente en los niveles intra e inter. Además, se aprecia un efecto indirecto significativo del autoconcepto como mediador de las actitudes académicas en ambos niveles de análisis. Estos resultados muestran la importancia del autoconcepto académico durante la adolescencia inicial, y señalan la necesidad de considerar las actitudes académicas como variables fundamentales en el desarrollo y puesta en práctica de modelos educativos.

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* Corresponding author.
E-mail address: alejandro.veas@ua.es (A. Veas).

Introduction

Compulsory Secondary Education (CSE) constitutes a crucial stage in the Spanish educational system, mainly due to important changes from the period of primary education. In this sense, and according to Hargreaves, Lorna, Moore, and Manig (2001), three important changes usually occur: first, physical and cultural changes during the adolescence; second, informal changes among peers and friendship; and third, formal changes between primary and secondary institutions (rules, expectations, duties, etc.). Therefore, the existence of this transition requires an analysis of effective interventions to increase students' rates of success. Although school drop-outs have decreased in Spain during the last several years (Education, Culture and Sport, 2014), this progress has not sufficed to reach the objectives for 2020, according to the European Council in Lisbon (2000).

Indeed, each of these changes could imply different consequences in terms of academic attitudes, which may affect academic achievement and engagement (Abu-Hilal, 2010). Attitudes are traditionally defined as "enduring and organized structures of social beliefs that predispose individual to think, feel, perceive and behave selectively towards referents -or cognitive objects-of attitudes" (Kerlinger, 1984, p. 5). In the educational field, some studies have reported that students with positive levels of academic attitudes show an increased probability of school success, which induces positive emotions and satisfaction (Gutiérrez, Tomás, Romero, & Barrica, 2018; Vogl & Preckel, 2014). However, it is important to mention the diversification of construct measurement in terms of operational variables. For example, during recent decades, when examining how multiple educational factors relate to each other, academic attitudes have been studied using more specific constructs, such as attitudes towards different subjects, particularly science (Ali, Yager, Hacieminoglu, & Calliskan, 2013; Houseal, El-Khalick, & Destefano, 2013; Swarat, Ortony, & Revelle, 2012), or specific competencies like reading or mathematics (Heathington & Alexander, 1984; Kush, Watkins, & Brookhart, 2005), and they have been positively related with contextual or physical variables (Cooper & Sánchez, 2016; Shreffler, Giano, Cox, & Merten, 2018).

With respect to the relations between academic attitudes and academic achievement, traditionally researchers obtained different results for strong and weak relations (Abu-Hilal & Atkinson, 1991; Marsh, 1989). This fact implies the need to understand how academic attitudes relate to internal variables and how these relations affect academic achievement. In this sense, Reynolds and Weigand (2010) detected positive but weak correlations and prediction levels between academic and psychological attitudes and academic achievement in a sample of first-year college students. However, there is a lack of evidence on how indirect effects of internal variables may interfere with the relationship between academic attitudes and academic achievement, which some past evidence suggests may have negative consequences in secondary education. Knuver and Brandsma (1993) showed weak relations between attitudes and achievement in the later courses of primary school. This relative independence of academic attitudes over time has been confirmed by McKenna, Kear, and Ellsworth (1995), but again, the attitude measures were not consistent between studies and were focused on specific competencies.

According to the stage-environment fit theory of Eccles and Midgley (1989), an inferior fit between the needs of the students and the contextual conditions is crucial for attitudes to change. Therefore, important academic attitude constructs such as a student's attitudes towards school and teachers are key elements for individual well-being in a particular learning environment. Given this rationale, it is conceivable that academic attitudes may influence academic achievement through self-concept, which is one of the major constructs of motivation in the scientific community (Guay, Ratelle, Roy, & Litallien, 2010; Marsh & Martin, 2011). Indeed, according to Park (2011), better attitude levels imply higher self-perception scores and positive academic experiences in the development of competencies.

In the educational field, academic self-concept is defined as the cognitive representations of one's abilities, thereby referring mostly to the estimated capacities in specific school domains such as math, language, and science (Marsh & Hocevar, 1985). Traditionally, academic self-concept and academic achievement are often highly correlated, even more so than other self-concept or self-esteem domains (Green et al., 2012). In a recent meta-analysis, Huang (2011) confirmed medium to long-term relations between self-concept and academic achievement, as have additional previous long-term studies (Marsh, 2007). High levels of self-concept imply a willingness to invest in learning and an openness to experiences related to achievement (Hattie, 2009).

Among self-concept theoretical frameworks, Expectancy-Value Theory (Wigfield & Eccles, 2000) holds that individuals' choice, persistence, and performance can be explained in part by their own beliefs about how well they will do on the activity. In this way, it may be argued that a good school context and classroom climate—based on teacher-student relationships—may generate positive academic attitudes and socioemotional development, which are related to their subjective well-being and beliefs about their own capacities (Preckel, Niepel, Schneider, & Brunner, 2013). These consequences would imply major levels of participation and academic achievement.

On the other hand, it is important to take into consideration the justification for measurement of academic achievement, which can be referred to as the assessment or evaluation of overall achievement at the school level (Guskey, 2013). Therefore, our construct is concerned with the level of achievement obtained in courses based on the degree to which the evaluation criteria for different courses are met during the school year. This degree of achievement translates into concrete academic grades, which means that the construct is capable of comparison if an increase or decrease in a subject's score also involves an increase or decrease in the measurement construct.

In summary, the literature review reveals an association between academic attitudes, self-concept, and academic achievement. However, by measuring attitudes towards specific domains and not general factors which involve transversal competencies or academic achievement, these studies have not clarified the underlying relations among these constructs. Moreover, these studies have not focused on early adolescence, an important stage in personal and academic development, which is the period of life of students enrolled in the first courses of CSE in Spain. For these reasons, and based on two leading theories, the primary aim of the present study is to examine and test the relations between academic attitudes, academic self-concept, and academic achievement in early adolescence to gain a deeper understanding of these constructs. To guide this study, the following questions are posed, using a hierarchical data structure for a multilevel mediation analysis. This makes it possible to measure the contributions of different variables in predicting individual achievement (individual level, L1) and different classroom effects (group level, L2): (1) Do attitudes towards school and attitudes towards teachers predict academic self-concept and academic achievement? and, (2) Does academic self-concept mediate the relation of each of the academic attitude constructs and academic achievement?

We expect that attitudes towards school and teachers will be significantly related and will predict academic self-concept and academic achievement. Further, as self-concept has been shown to be an important mediator in the educational field (Marsh & Martin, 2011), academic self-concept is expected to play an important

mediating role in the relationship between academic attitudes and academic achievement.

Method

Participants

Cluster sampling was applied with the school as the sampling unit. This technique allowed the identification of participants representative of the sample frame based on a cost-efficient probability design. Of all schools in the province of Alicante (a region situated in the southeast of Spain), eight were randomly selected. From these, two were state-assisted private schools and six were state schools. All students in the first and second years of CSE participated in the study, for a total of 1456. Of these, 56 were excluded due to coding errors or a lack of qualifications because they had special education needs or because parental consent was not given, resulting in a total of 1400 students ($n = 1400$). A total of 53% of the students were male (47% female), with an average age of 12.5 years and a standard deviation of 0.67. A total of 52.4% of the students were from the first year of CSE and 47.6% were from the second year. Due to the racial and ethnic homogeneity of the country, the overwhelming majority of the children were Caucasian (98%). A chi-square test was used to examine the difference between the gender ratio of the sample and that of the national student population (51.3% boys and 48.7% girls), and the results support the absence of gender differences between the sample and the population ($\chi^2 = 0.29$, $df = 1$, $p \geq .05$).

Childhood socioeconomic status (SES) was indexed according to parental occupation. There was a wide range in socioeconomic status, with a predominance of middle-class children. This classification was based on the income level and educational level of the families. Regional education counsellors determined the SES through a questionnaire for the students whose variables were their parents' professions, professional situation, and educational level, the number of books at home, cultural and sporting activities, and the availability of information and communication technology at home. Students answered on a Likert scale ranging from 1 to 5, depending on the frequency with which their parents did the activity in each statement.

Instruments

To measure academic attitudes, we used two subscales of the *School Attitude Assessment Survey Revised* (SAAS-R), elaborated by McCoach and Siegle (2003) and widely employed in different countries with adolescent population (Dedrick, Shaunessy-Dedrick, Suldo, & Ferron, 2015; Din & Hall, 2007) and validated in Spain by (Miñano, Castejón, & Gilar, 2014; Veas, Castejón, Gilar, & Miñano, 2017). This instrument is composed by 5 factors: *academic self-perception* (ASP), *goal valuation* (GV), *motivation/self-regulation* (M/S), *attitudes toward teachers* (ATT), and *attitudes toward school* (ATS). The Confirmatory Factor Analysis (CFA) showed adequate fit of the measurement model: CFI = .951, NFI = .931, NNFI = .947, IFI = .951, RMSEA = .040, AIC = 651.54. For the present study, we used those factors strictly related with academic attitudes. Concretely, we adopted seven questions of the ATT factor (e.g. "I like my teachers") and five questions of the (ATS) factor (e.g. "I am proud of this school"). The values of Cronbach's alpha were .87 and .90; whereas the values of composite reliability (CR) were .89 and .92, respectively. Following the same order of factors, the average variance extracted (AVE) were .71 and .53, while Omega coefficient (Ω) values were .89 and .92.

To evaluate self-concept, the *Self-concept evaluation scale for adolescents* (ESEA-2) was used, as expanded by González-Pienda et al. (2002). This questionnaire is a Spanish adaptation of the SDQ-II (*Self-Description Questionnaire*) of Marsh (1990), validated in a study with 503 students in CSE. It is composed of 70 items measuring 11 specific self-concept dimensions, as previous studies showed better adjustment when self-concept is considered as a multidimensional construct (Marsh, 1990; Marsh et al., 2014) to which students must answer on a Likert scale from 1 to 6 depending on the extent to which they agree or disagree with each statement. In the authors' evaluation, all Cronbach's alpha values were between .73 and .91. For this study, we only selected the *academic self-concept* factor, with a Cronbach's alpha of .75, CR was .90, AVE was .61 and Ω was .90.

Grade point averages (GPAs) were used as an indicator of academic achievement, and were considered to serve as assessments or evaluations of the overall achievement obtained at the school level. Therefore, our construct is concerned with the level of course achievement based on the degree to which the evaluation criteria for different courses in the school year were met. Teachers provided full-term grades for nine subjects: Spanish Language and Literature, Natural Sciences, Valencian/Regional Language, Social Sciences, Mathematics, English, Technology, Art Education, and Physical Education. Scores of subjects of each grade showed high reliability, with Cronbach's alpha values of .93 and .94 for first and second-year participants, respectively. In the present study, all subjects were compulsory for students; thus, it was not possible for choice of the examination to affect the measurement of the latent construct (Korobko, Glas, Bosker, & Luyten, 2008).

Procedure

Prior to administering the test, the present study was authorised by the ethical committee of the University of Alicante. Necessary consent was also sought from the authorities and school boards of the various schools. Once obtained, informed consent was then sought from the students' parents or legal guardians. Confidentiality was guaranteed to all families, such that any personal data of the students would be employed only for the study. The instruments were administered at the schools themselves in the second term of the academic year during normal class periods. The tests were administered by collaborating researchers who had previously received instruction in the procedures; they particularly emphasized the voluntary nature of participation and the need for sincerity. On average, approximately two periods of 45 minutes were required to administer the tests.

Data analysis

First, data distribution was examined to test for normality. Correlation analysis was employed to explore the bivariate relations between each pair of variables. Given the hierarchical data structure, the possibility of using multilevel analysis was explored by using the intraclass correlation coefficient (ICC). An analysis was conducted to test the variability in academic achievement for a two-level factor (eight schools). A one-way ANOVA model with random effects (the null model) and academic achievement as the outcome variable was performed using SPSS (Pardo, Ruiz, & San Martín, 2007). The intraclass correlation coefficient was low (ICC = .05), indicating that only 5% of the variation in achievement was due to the schools. This percentage was not significant: the between-school variance estimate was .18 (Std. error = .11), Wald test $Z = 1.66$, $p = .10$.

On the other hand, the variation of achievement by classroom showed an ICC = .14, with a significant Wald test $Z = 4.37$, $p < .01$. Therefore, as the sample of students was nested in 64 classrooms (an average of 21.87 students per classroom), hypotheses were tested with a 1-1-1 multilevel mediation model, with all variables measured at student L1 units, and all causal paths allowed to vary

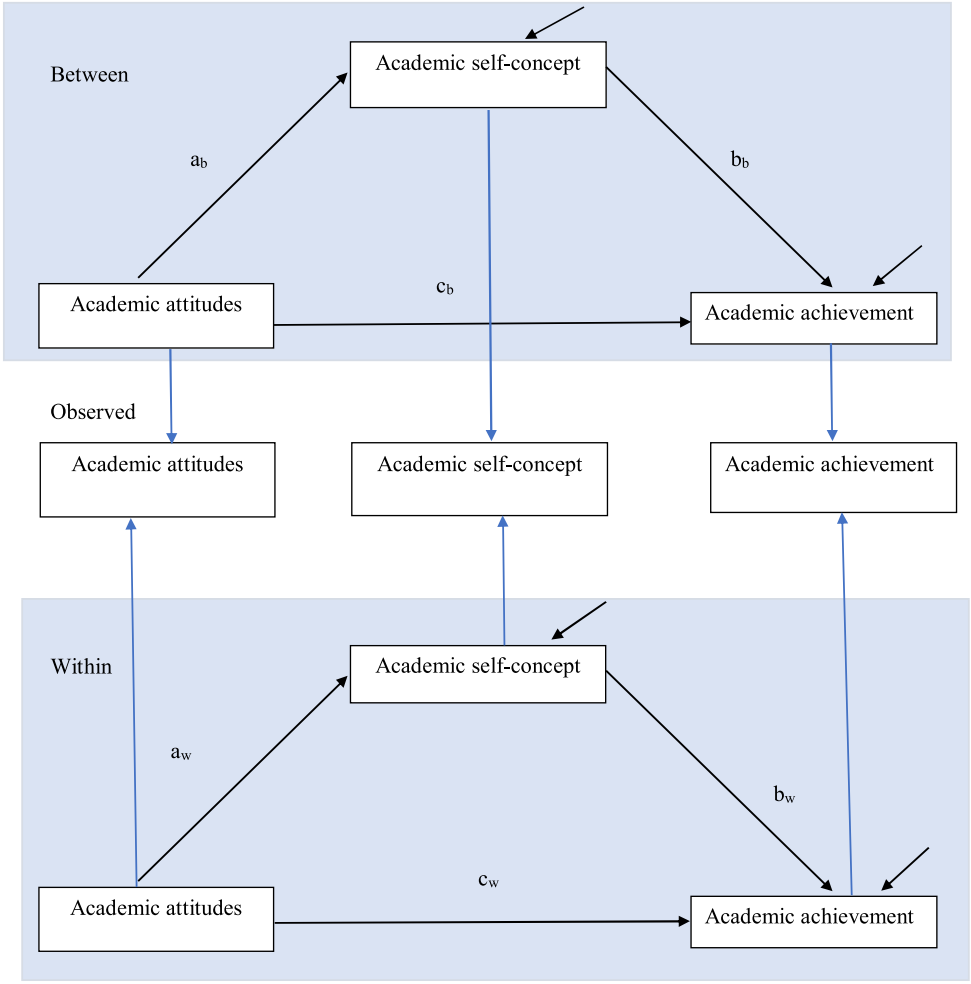

Figure 1. 1-1-1 Multilevel mediational model between academic attitudes, academic self-concept and academic achievement.

between classroom L2 units (Zhang, Zyphur, & Preacher, 2009), meaning that the direct, indirect, and total effects can vary between L2 units.

We tested the relations between the variables, as well as the mediational hypotheses using the MLmed macro for SPSS (Rockwood & Hayes, 2017), with robust standard errors (REM estimation). The variables employed were measured as individual, but the control variable "classroom" was employed to test significant variations (L2 units). Given the predictors (X), the mediator (M), and the dependent variable (Y), the macro automatically group-mean centers X, and uses the group means as a level-2 predictor of M. Further, group-mean centered X and M are used as level-1 predictors of the Y and the group means of X and M are used as level-2 predictors. All intercepts are random, all slope terms are fixed and the random effect covariance matrix is diagonal, where variances are freely estimated and covariances are constrained to zero. Therefore, we estimated all parameters for a 1-1-1 mediational model, including random intercepts, and indirect effects were tested using a Monte Carlo confidence interval (CI). Two independent multilevel mediation analyses were conducted, using both the academic attitude constructs: *attitude towards teachers* and *attitude towards school*. A general representation of the model can be seen in Figure 1.

Results

Data distribution was examined to test for univariate normality. Results showed skewness and kurtosis values below |1.5|. Kolmogorov-Smirnov *Z* score for ATT was 3.05 ($p \leq .005$), for ATS 5.90 ($p \leq .005$), for *academic self-concept* 1.76 ($p \leq .005$), and for *academic achievement* 1.76 ($p \leq .005$). Therefore, it was considered that the data did not show univariate normal distribution.

Table 1 displays the descriptive statistics, the bivariate correlations, and the collinearity statistics of all the measures. The predictor variables, mediation variable (*academic self-concept*), and outcome variable of *academic achievement* were all significantly correlated, fulfilling the first condition for the test of a mediation effect. None of the correlations exceeded .80, suggesting no problems with multicollinearity (Tabachnick & Fidell, 2007). The collinearity statistics, including the tolerance and variance inflation factor estimates, were within normal limits and ranged from .90 to 1.00 and from 1.00 to 1.11, respectively; whereas the condition index showed values which are lower than 30, accepting the lack of multicollinearity (Tabachnick & Fidell, 2007).

Table 2 shows the results of a multilevel analysis investigating direct relationships between *academic attitudes*, *academic self-concept*, and *academic achievement*, as well as the indirect effects of *academic self-concept*, at both the within- and between-subject levels. All academic attitude constructs were significantly and positively associated with *academic self-concept*, but they had a null direct relation with *academic achievement* at both levels when the *academic self-concept* effect was considered, indicating a possible mediation effect (Baron & Kenny, 1986).

Table 2 also shows significant indirect effects of *academic attitudes* and *academic achievement* through *academic self-concept* at

Table 1
Descriptive statistics, correlations and collinearity statistics among measures of attitudes towards teachers, attitudes towards school, academic self-concept and academic achievement

	M	*SD*	1	2	3	Tolerance	VIF	CI
1. Attitudes towards teachers	35.31	8.21	–			.58	1.70	9.62
2. Attitudes towards school	28.08	6.74	.61**	–		.62	1.61	12.52
3. Academic self-concept	4.46	1.18	.25**	.24**	–	.85	1.17	13.95
4. Academic achievement	6.3	1.77	.20**	.20**	.66**	–	–	–

Note. CI: Condition Index, VIF: variance inflation factor.
** Correlation is significant at the .01 level (2-tailed).

Table 2
Multilevel mediation model predicting academic achievement with attitudes towards teachers and attitudes towards school as predictors

	Academic achievement (Attitudes Towards Teachers as predictor)		Academic achievement (Attitudes Towards School as predictor)	
Parameter	Estimate	*SE*	Estimate	*SE*
Between-subjects				
Intercept	.17**	.05	.17**	.02
Path a_b	.03**	.01	.06**	.02
Path b_b	.1.56**	.19	1.49**	.20
Path c_b	.01	.02	.04	.02
Indirect effect	.05**	.02	.09**	.03
Residual variance outcome	1.54**	.06	1.27**	.06
Within-subjects				
Path a_w	.03**	.46	.04**	.00
Path b_w	.93**	.03	.94**	.03
Path c_w	.01	.00	.00	.01
Indirect effect	.03**	.00	.04**	.00

Note. Models are random intercept models.
*$p \leq .05$.
** $p \leq .01$ (significance based on Sobel's *Z*-test of mediation).

both the within- and between-subject level in a 1-1-1 multilevel mediation model, showing the importance of considering the variability of the classroom at L2. The major indirect effect was found at this level with ATS as a predictor, with a point estimate of .09, $Z_{Sobel} = 3.14$, $p \leq .05$, 95% CI [0.035, 0.139]. The indirect effect with ATT as a predictor was also significant at this level, with a point estimate of .05, $Z_{Sobel} = 2.41$, $p \leq .05$, 95% CI [0.012, 0.095]. When considering the within-subjects level, we can observe slightly smaller but significant indirect effects from ATS, with a point estimate of .04, $Z_{Sobel} = 8.10$, $p \leq .05$, 95% CI [0.029, 0.047]; and from ATT, with a point estimate of .03, $Z_{Sobel} = 9.02$, $p \leq .05$, 95% CI [0.027, 0.042].

Discussion

The complex nature of the variables involved in the academic process implies the need to analyse their different levels of interaction during adolescence, as this is an important stage in which cognitive, motivational, and contextual processes can be consolidated as salient elements in development. According to the stage-environment fit theory of Eccles and Midgley (1989), internal and external conditions should be in balance for a person's psychological structure. As *academic attitudes* are mainly influenced by the academic context, important relations may be tested with respect to cognitive and motivational factors like self-concept. In this sense, from the perspective of Expectancy-Value Theory (Wigfield & Eccles, 2000), positive and subjective well-being states generate appropriate thoughts about ourselves which then reinforce *academic attitudes* for learning. Given this rationale, the aim of the present study was to examine the relations among *academic attitudes*, as well as *academic self-concept* and *academic achievement*, in a multidimensional mediational model using a hierarchical data structure.

The results confirmed the hypotheses, as *academic attitudes* had a significant relation with *academic self-concept*, which is a crucial mediator in the relation between attitudes and *academic achievement* in traditional socio-cognitive theories. These results reinforce the consistence effects due to the interaction of contextual variables and the self that need to be considered in current educational achievement models, based on a framework interaction (Greenwald et al., 2002). Furthermore, the importance of self-concept as a mediator is consistent with previous studies (Green et al., 2012; Ramos-Díaz, Rodríguez-Fernández, Fernández-Zabala, Revuelta, & Zuazagoitia, 2016) which found it key to *academic achievement*. The present study contributes to consider self-concept as an important predictor of *academic achievement* measured with school grades, in comparison with other motivational constructs such as task values (Chamorro-Premuzic, Harlaar, Greven, & Plomin, 2010). Therefore, students need a consistent support network, which can improve their positive self-perception and acceptance in secondary education.

Given the results of the present research and the information above, the mediating effect of *academic self-concept* in the relation between *academic attitudes* and *academic achievement* at both the student (L1) and class levels (L2) allows us to confirm important implications. First, mainly at the group level, social interactions among parents, teachers, and children are necessary for academic success (Kraft & Rogers, 2015; Pino-Pasternak, Whitebread, & Tolmie, 2010), as they can lead to better emotional support and prosocial behaviours (Luckner & Pianta, 2011) and promote classroom equality. Second, as the major indirect effects were found to involve ATS as a predictor, it is essential to promote general educational plans based on formal and informal activities to promote positive consequences in individuals, like emotional support and good levels of engagement (Martín & Rimm-Kaufman, 2015). Moreover, ATT were also an important predictor when considering academic functioning. In this sense, formal and informal

interactions between teachers and students imply good levels of social self-support, giving continuous feedback, which can reinforce students' self-concept to attain success (Gutiérrez et al., 2018; Ramos-Díaz et al., 2016).

Indeed, future studies should proceed in this direction by analysing possible influences of other contextual variables on attitudes and other cognitive variables. This is important because the difficulty of learning increases in secondary education, and students need to fulfil their personal goals at the same time as they undergo psychological changes during adolescence. In this sense, parental involvement is an important construct to consider in future studies, as parents can improve their children's emotional functioning (Wang & Eccles, 2012) and motivational factors can also serve as important mediators (Wang and Sheikh-Khalil, 2013).

Finally, some limitations of the present study must be addressed. First, it is important that there is no generalized measure of *academic attitudes* validated with a Spanish sample of adolescents, as this construct has traditionally been used in specific subjects or competencies. Given the importance of general levels of attitudes, future revisions and validation of academic attitude scales are necessary to obtain significant number of measures. Second, longitudinal studies are also necessary to analyse possible reciprocal effects among the variables (Kelly, 2004; Preckel et al., 2013) or moderating effects of gender, as different studies have claimed that students' attitudinal patterns can vary between boys and girls (Meece, Bower, & Burg, 2006; Smith, Sinclair, & Chapman, 2002). Third, new studies are also needed to test if classroom attitude structures moderate or interact with the relation between personal attitudes and academic achievement, as happen with other important variables such as academic goals (Murayama & Elliot, 2009). Finally, implementation of latent multilevel analysis should be considered in the future, as it helps minimize measurement error, allowing for the use of multiple indicators to control measurement error at the individual student and classroom levels (Lüdtke, Marsh, Robitzsch, & Trautwein, 2011; Morin, Marsh, Nagengast, & Scalas, 2014).

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