

British Journal of Educational Psychology

Relationship between parent involvement and academic achievement through metacognitive strategies: a multiple multilevel mediation analysis.

--Manuscript Draft--

Article Type:	Article
Manuscript Number:	BJEP.17.0115R3
Full Title:	Relationship between parent involvement and academic achievement through metacognitive strategies: a multiple multilevel mediation analysis.
Corresponding Author:	Alejandro Veas, Ph.D. Universidad de Alicante Alicante, Comunidad Valenciana SPAIN
Corresponding Author E-Mail:	alejandro.veas@ua.es
Order of Authors (with Contributor Roles):	Alejandro Veas, Ph.D. (Investigation; Methodology; Writing – original draft) Juan-Luis Castejón (Funding acquisition; Project administration; Supervision; Writing – review & editing) Pablo Miñano (Conceptualization; Data curation; Investigation; Writing – review & editing) Raquel Gilar (Conceptualization; Investigation; Visualization; Writing – review & editing)
Funding Information:	
Keywords:	academic achievement; parent involvement; metacognition; multilevel mediation analysis; Secondary education.
Manuscript Classifications:	Secondary/high schools; Learning strategies; Metacognition; Statistics and data analysis
Abstract:	<p>Background: Different studies reveal an association between parent involvement, metacognition, and academic achievement; however, the majority analyse the developmental process of acquisition in experimental or quasi-experimental designs with students enrolled in child education. Adolescence is an important stage in personal and academic development. Given the complexity of learning, and according to the metacognitive and affective model of self-regulated learning (Efklides, 2011), different types of metacognitive processes are relevant for the optimal development of individuals in academic contexts. At the same time, individuals need stimuli from the environment, based on observation of their own and other's behaviour, as well as through communication and interaction with others.</p> <p>Aim: The present study examined the relations among parent involvement, metacognitive strategies, and academic achievement to investigate the mediational role of metacognition in the relation between parent involvement and academic achievement.</p> <p>Sample. The participants were 1398 high school students from Spain (47 % female, M = 12. 5 years).</p> <p>Method. Multiple multilevel mediation analyses with Monte Carlo confidence intervals were used for measuring within-subjects effects at the student level and between-subjects effects at the class level. Parent involvement (perception of support, organization, and interest in the educational process; expectations; school relationship; time of support with homework) and metacognition were measured by questionnaires, whereas academic achievement was assessed using the end-of-term grades obtained by students for nine subjects.</p> <p>Results. First, there was a significant direct effect of most parent involvement constructs on the mediational and dependent variables at both the within and between levels. Expectations had the highest predictive power on academic achievement. On the other hand, metacognitive strategies were an important mediator for all parent</p>

	<p>involvement constructs at both levels of analysis.</p> <p>Conclusions. These results highlight the importance of metacognition during early adolescence and suggest that parent involvement is crucial for the future development of educational models.</p>
Additional Information:	
Question	Response
If you have any potentially competing interests to declare, please enter them in the box below. If you have no interests to declare, please enter 'none'.	none
Does this submission have any links or overlap with any other submitted or published manuscripts, for this or any other publication? (For example; as part of a long-term project, using a shared data set, a response to, or extension of, earlier work). If yes, please give brief details. If no, please enter 'none'. Any overlap not declared and later discovered will result in the manuscript being withdrawn from consideration.	none
Please specify the word count of your manuscript (excluding the abstract, tables, figures and references). Please note that any papers that are over the 5000 word limit will be returned to the authors unless they have received prior permission from the Editor for the submission of the longer manuscript.	5417
Do you use Twitter for academic purposes? (If you do and your paper is accepted, we will 'mention' you when we share a link to the online article.)	yes
What is your Twitter handle? as follow-up to "Do you use Twitter for academic purposes? (If you do and your paper is accepted, we will 'mention' you when we share a link to the online article.)"	@Alejandro_veas

RESPONSE TO REVIEWER

We would like to thank the reviewer for the suggestion. Indeed, we need to clarify this sentence, as this study was part of a larger project, and more tests were administered to this sample of 1400 students. We want to make clear that the tests of this study were administered in one session of 45 minutes for each classroom (not two, as the second session was employed to administer other tests which do not belong to this study); but we needed the second term of the academic year to recover all the information from all the schools (each school had different time requirement, as logical).

Therefore, to better understand the procedure, the last sentence of the paragraph has been modified: "...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 research who had previously received instruction in the procedures; they particularly emphasized the voluntary nature of participation and the need for sincerity. The administration of the tests was made in one period of 45 minutes for each classroom".

**Relationship between parent involvement and academic achievement through
metacognitive strategies: a multiple multilevel mediation analysis**

Authors

Alejandro Veas^{a,*}, Juan-Luis Castejón^{a,b}, Pablo Miñano^{a,c} Raquel Gilar^{a,d}

^a University of Alicante, Spain. Postal Address: Carretera San Vicente del Raspeig, s/n-03690, San Vicente del Raspeig, Alicante, Spain.

^b e-mail address: jl.castejon@ua.es ORCID: 0000-0003-0743-0882

^c e-mail address: pablo.m@ua.es ORCID: 0000-0001-9413-0436

^d e-mail address: raquel.gilar@ua.es

*Corresponding author. Department of Developmental and Educational Psychology, University of Alicante. PO 99, 03080, Alicante (Spain).

e-mail address: alejandro.veas@ua.es (A. Veas). ORCID: 0000-0002-5560-2215

Telephone number: +34 965 90 34 00 (extension 2248)

Relationship between parent involvement and academic achievement through metacognitive strategies: a multiple multilevel mediation analysis

Abstract

Background: Different studies reveal an association between parent involvement, metacognition, and academic achievement; however, the majority analyse the developmental process of acquisition in experimental or quasi-experimental designs with students enrolled in child education. Adolescence is an important stage in personal and academic development. Given the complexity of learning, and according to the metacognitive and affective model of self-regulated learning (Efklides, 2011), different types of metacognitive processes are relevant for the optimal development of individuals in academic contexts. At the same time, individuals need stimuli from the environment, based on observation of their own and other's behaviour, as well as through communication and interaction with others.

Aim: The present study examined the relations among parent involvement, metacognitive strategies, and academic achievement to investigate the mediational role of metacognition in the relation between parent involvement and academic achievement.

Sample. The participants were 1398 high school students from Spain (47 % female, $M = 12.5$ years).

Method. Multiple multilevel mediation analyses with Monte Carlo confidence intervals were used for measuring within-subjects effects at the student level and between-subjects effects at the class level. Parent involvement (perception of support, organization, and interest in the educational process; expectations; school relationship; time of support with homework) and metacognition were measured by questionnaires,

whereas academic achievement was assessed using the end-of-term grades obtained by students for nine subjects.

Results. First, there was a significant direct effect of most parent involvement constructs on the mediational and dependent variables at both the within and between levels. Expectations had the highest predictive power on academic achievement. On the other hand, metacognitive strategies were an important mediator for all parent involvement constructs at both levels of analysis.

Conclusions. These results highlight the importance of metacognition during early adolescence and suggest that parent involvement is crucial for the future development of educational models.

Key words: Academic achievement; parent involvement; metacognition; multilevel mediation analysis; secondary education.

Academic achievement is one of the most studied variables in the educational field. Over recent decades, several scientific studies have analysed causal models, leading to a better understanding of the contextual, motivational, and cognitive variables involved in academic achievement (Green et al., 2012; Kitsantas & Zimmerman, 2009; Lu, Weber, Spinath, & Shi, 2011; Matthews, Poitz, & Morrison, 2009; Okpala, Okpala, & Smith, 2001; Roebken, 2007; Zeegers, 2004). In this context, increasing interest in contextual variables has been observed, and more specifically, the importance of parent involvement in children's educational progress has been recognized. For instance, in a sample of high school students, González and Wolters (2006) found that perceived authoritative parenting was related to both a mastery goal orientation and higher relative autonomy; permissive parenting was negatively related to a mastery orientation and positively related to a performance approach orientation, whereas authoritarian parenting was positively related to a performance approach orientation only. Phillipson and Phillipson (2012) also found that parental expectations mediated the relation between IQ and academic achievement in a sample of 780 Chinese students, supporting the hypothesis that parents help their children to actualize their cognitive ability by directly communicating their academic expectations to their children.

Different studies have considered the ways in which children's own characteristics or psychological attributes mediate or modify the effects of parental behaviours on academic outcomes. For example, Dearing et al. (2006), in a longitudinal study of a low-income sample (N = 281), confirmed that increased school involvement predicted improved child literacy, and no achievement gap between mothers' educational level and average literacy was detected when family involvement levels were high. In another study, Salone, Lepola, and Vauras (2005), showed differences in socio-emotional regulation patterns in scaffolding interactions between parents and their 7-year-old

children, depending on the children's non-task or task orientation. Further, studies have analysed the general influences of specific parental behaviours or attitudes on metacognitive processes. In this sense, Meyer and Turner (2010) described how scaffolded instruction during whole-class mathematics lessons can provide the knowledge, skills, and supportive contexts for developing students' self-regulatory processes. Neitzel and Stright (2003) also showed that mothers' metacognitive content and manner of instruction were positive predictors of child behaviours related to cognitive awareness and management in terms of children's regulatory competence.

Metacognition plays a fundamental role in the selection and intelligent regulation of strategies and learning techniques (Nisbet & Shucksmith, 1986; Schraw & Dennison, 1994). However, because parent involvement constitutes a multidimensional framework that can differently affect both the self-regulation process and academic outcomes (Wilder, 2014), it is important to know how different parent behaviours interact with metacognitive strategies and academic achievement. The aims of the present study are to test the relations among parent involvement, metacognitive strategies, and academic achievement, as well as to investigate the mediational role of metacognition in the relation between parent involvement and academic achievement.

Parent involvement and academic achievement

Parent involvement refers to a set of parent behaviours in the home and at school that support children's educational progress (El Nokali, Bachman, & Votruba-Drzal, 2010). The multidimensional nature of parent involvement has been confirmed both theoretically and empirically. For example, Lorenz and Wild (2007) provide support for a multidimensional framework that holds three basic assumptions of parent involvement. First, it is related to home-based learning involving direct parent-child in-person contact. Second, it includes a wide range of activities that can be considered

relevant, including promoting a child's reliance on others for help, being consistent with expectations and rules, and acknowledging the child's feelings during learning sessions. Third, it is related not only to direct instructional interactions but also to the development of effective study habits and positive attitudes toward learning and education (Ryan & Deci, 2000).

Individual elements of parent involvement imply different and diverging classifications and results. During the 1990s, the classical dimensions identified in the parenting literature were control, responsiveness, and warmth (Deci et al., 1993; Grolnick & Slowaczek, 1994; Hokoda & Fincham, 1995; Richman & Rescorla, 1995). More recently, Castro et al. (2015) conducted a meta-analysis of 37 studies that analysed the relation between parent involvement and academic achievement in kindergarten, primary, and secondary school students between 2000 and 2013. The most commonly used types of parent involvement variables were the following: general description (familial participation defined by the researcher and estimated as a combination of several specific measures); communication with children about school issues; homework (parent supervision of schoolwork); parental expectations, referring to the anticipation that parents have for their children to successfully progress in academics (Yammamoto & Holloway, 2010); reading with children; parental attendance and participation in school activities; and parental style (parental attitude at home oriented toward supporting and helping their children). The largest observed effect was associated with parental expectations, followed by developing and maintaining communication with children about school activities and homework, and promoting the development of reading habits. This effect of parental expectations is congruent with previous meta-analyses conducted by Fan and Chen (2001) and Jeynes (2005, 2007) in different educational stages.

Two additional important conclusions may be addressed based on Castro et al. (2015). First, although the average effect size for all studies was significant, the magnitude is considered small or moderate ($d = 0.12$). Second, the variable of parental supervision of schoolwork (homework) had very little influence, as did attendance and participation in school activities.

Indeed, this variability of the effects of parent involvement on academic achievement has appeared in previous research. Whereas Fan and Chen (2001) found a small-to-moderate relationship, Hill and Tyson (2009) found a highly significant effect. This variability is related to the different impacts that parent behaviours present. In this sense, as noted above, the inconsistent effect of parent involvement in homework on student achievement is remarkable (Cooper et al., 2001; Niggly et al., 2007; Van Voorhis, 2011). Patal, Cooper, and Robinson (2008) claimed that parent involvement in homework is related more to intermediate variables than it is to academic performance. These intermediate variables might include self-regulation (Grolnick, 2009) and motivational variables (Dumont et al., 2012; Ginsburg & Bronstein, 1993). Núñez et al. (2015) also highlighted the need to distinguish between control and support in parental homework involvement, which lead to negative and positive effects on academic outcomes, respectively, particularly in secondary education.

Another important issue concerns differences in the effect of parent involvement considering global academic achievement or specific domains. Fan and Chen (2001) found an effect size of 0.40 and 0.30, respectively. The results from the meta-analysis by Castro et al. (2015) are similar, although a major effect of specialized academic subjects, such as art or music, is observed. In this context, the use of report card grades may be an important tool because they are based on repeated evaluations of students and are typically followed by parents and teachers (Rogers, Theule, Ryan, & Keating,

2009). Furthermore, specialized subjects such as those noted above can be included in the types of measures (Gordon & Cui, 2012; Veas et al., 2015).

Metacognition and academic achievement

Metacognition has been related to reflective abstraction of new or existing cognitive structures. It refers to the capacity to monitor one's own thinking, evaluate the appropriateness of the procedures used, and identify potential errors (Dinsmore, Alexander, & Loughlin, 2008; Schraw & Dennilson, 1994). Different processes have been extracted from this construct: first, knowledge of cognition, which can be declarative, procedural, and conditional (Flavel, 1979), and second, regulation of cognition, which leads to the development of checking and monitoring abilities.

Although metacognition has been found to be an important variable leading to a better understanding of different types of knowledge by learners, there has been theoretical and empirical confusion between this construct and others, more specifically, regarding self-regulated learning (SRL) in academic contexts (Dinsmore, Alexander, & Loughlin, 2008; Effeney et al., 2013; Follmer & Sperling, 2016). SRL can be described as a cognitive active process in which students set goals for their learning and attempt to monitor, regulate, and control their cognition, motivation, and behaviour, guided and constrained by their goals and contextual factors in the environment (Pintrich, 2000).

For many researchers, the key characteristics of SRL as a construct are the understanding of individuals' awareness and their regulatory responses during interaction with the environment (van Grinsven & Tilema, 2006; Winters, Greene, & Costich, 2008). The implication is that there are two main differences with respect to metacognition. First, whereas in SRL, monitoring or control refers to behaviour, cognition, or motivation, metacognition emphasizes the monitoring and control of

cognition (Dinsmore, Alexander, & Loughlin, 2008). Second, based on this assumption, metacognition can be considered a necessary component of SRL, enabling students to organize their knowledge and skills for better learning. The present research is based on these assumptions, given that metacognition is considered a defining process that explains how students monitor or think about appropriate cognitive strategies to reach determined goals.

From the socio-cognitive perspective, different SRL models have posed metacognition as a key construct (Pintrich, 2000; Zimmerman, 2000; Zimmerman & Meylan, 2009). In recent years, Efklides' metacognitive and affective model of self-regulated learning (MASRL) has emerged as an important integrated and advanced framework of SRL, in which metacognition is largely explained within two levels of SRL representations. First, the Person level represents a generalized level in which a person views a task in the context of memory, knowledge, skills, motivational and metacognitive beliefs, and affect (Efklides, 2011, p. 10). At this level, metacognition can be expressed in the form of 1) metacognitive knowledge, or declarative knowledge stored in memory that encompasses information regarding persons, how we or other people process various tasks and how good we are at them, as well as how we feel during a specific task processing; and 2) metacognitive skills, or the deliberate use of strategies to control cognition, comprising orientation strategies, planning, regulation, monitoring, and evaluation (Efklides, 2008). The second level is the Task \times Person level, in which an interaction occurs between the type of task and the student's characteristics. Here, the student's attention moves toward the mechanisms of performing the task, and the general learning goal is subsumed in more specific goals. For this reason, monitoring is crucial at this level, and motivation and affect will depend on the evolution of the metacognitive resources (Panadero, 2017).

The development process of acquiring appropriate metacognitive skills enables students to manage their own learning and academic outcomes. For this reason, the use of well-defined metacognitive strategies has been positively related to better academic achievement (Chiu, Chow, & McBride-Chan, 2007; Yip, 2007). However, it is important to determine the extent to which specific metacognitive processes influence this achievement beyond cognitive strategies. For example, whereas cognitive strategies have been found to be a better predictor of academic achievement (García & Pintrich, 1994), the capacity for monitoring may be even more important because it enables students to be aware of their comprehension of the material.

Aiming to explore the separate effects of metacognitive and cognitive processes, Dent and Koenka (2016) recently conducted an extensive meta-analysis showing the importance of metacognitive strategies compared to other specific regulatory processes, demonstrating a significant overall correlation with academic achievement ($r = 0.24$), a higher value than that for the cognitive strategy construct ($r = 0.14$). Given these results, the authors confirmed the importance of metacognitive strategies in the academic field as compared to other self-regulatory or cognitive processes, although these medium-low effects also suggest a weak influence on achievement. This aspect is essential in considering the mediating role of metacognition, given that the combination of different external or internal factors can be crucial in better understanding the learning process.

The present study

In summary, the literature review reveals an association between parent involvement, metacognition, and academic achievement. A number of studies have explored the possible relations between parent styles, behaviours, or cognitions and the SRL process; however, some have analysed the developmental process of acquisition in experimental or quasi-experimental designs with students enrolled in child education (Gronlick &

Ryan, 1989; Pianta, Smith, & Reeve, 1991; Wertsch, McNamee, McLane, & Budowg, 1990), showing minimal focus on adolescence. Consequently, there are fewer studies on the relation of parent involvement variables with specific metacognitive strategies, tending to treat more general SRL processes in the early academic stages (Grolnick & Slowiaczed, 1994; Stright, Neitzel, Sears, & Hoke-Sinex, 2001) or in different types of competences (Moilanen & Manuel, 2017).

Adolescence is an important state in personal and academic development. Given the complexity of learning, achievement in middle school is more a function of academic tasks for which SRL can improve, especially due to better metacognitive monitoring and reflection (Ryan & Pintrich, 1997). However, contextual factors are crucial for the positive development of metacognitive strategies. According to the MASRL model (Efklides, 2011), individuals need stimuli from the environment, based on observation of one's own and other's behaviours, as well as through communication and interaction with others (Ruffman, Slade, & Crowe, 2002). Parents are the closest persons who interact with them from childhood. Both experiences and knowledge – attributions, feelings, and judgements – are important tools that allow students to integrate information, and to monitor, plan, and control their cognition at a conscious level (Efklides, 2008).

It is important to mention the justification for the measurement of academic achievement, which can be referred to as the assessment or evaluation of overall achievement obtained 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 evaluation criteria were met for different courses in the school year. This degree of achievement translates into concrete academic grades, which means that comparing

the construct occurs if an increase or decrease in a subject's score also involves an increase or decrease in the measurement construct.

Given the above information, the primary aim of the present study is to examine and test the relations between parent involvement, metacognition, and academic achievement in early adolescence to gain a deeper understanding of these constructs. To guide this study, the following questions are posed, considering the hierarchical data structure for a multilevel mediation analysis. This makes it possible to measure the contribution of variables in predicting individual student achievement (individual level, L1) and different classroom effects (group level, L2)

- (1) Does the perception of support, expectations, the school relationship, and the time of support with homework predict metacognition and academic achievement?
- (2) Does metacognition mediate the relation between each of the parent involvement measures and academic achievement?

Based on previous findings, we expect that the perception of support, expectations, and the school relationship will be significantly related to and predict metacognition and academic achievement. We also expect that the time of support with homework will not be significantly related to metacognition and will be negatively associated with academic achievement (Veas et al., 2015). Further, because metacognition may be situated in the middle ground between parent involvement and academic achievement (Pino-Pasternak & Whitebread, 2010), metacognitive strategies are expected to play a mediating role in the relationship between the parent involvement variables and academic achievement, except for the time of support with homework variable. Finally, as we considered a hierarchical data structure and contextual influences on all variables,

all these relations are expected to occur with variation at the within-subjects level (students), and the between-subjects level (classrooms).

Method

Participants

The cluster sampling technique was used with the school as the sampling unit. This technique allowed the identification of participants who represented the sample frame based on a cost-efficient probability design. Of all schools in the province of Alicante (geographical area situated at the southeast of Spain), 8 were randomly selected. All students in the first and second years of Compulsory Secondary Education 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 they did not have parent consent, resulting in a total of 1400 students ($n = 1400$). A total of 53% of 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 grade of Compulsory Secondary Education, whereas 47.6% were from the second grade. Due to the racial and ethnic homogeneity of the country, the majority of children were Caucasian (98%). The Chi-square test was used to determine the difference between the gender of the sample and the gender of the national student population (51.3% boys and 48.7% girls), supporting the absence of gender differences between the sample and 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 of socioeconomic status, with a predominance of middle-class children. This classification was based on the income level and educational level of the families. The regional education counsellors determined the SES through a

questionnaire that recorded the students' responses. The variables used were the 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.

Procedure

Prior to administering the test, necessary consent was 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, so that any personal data from 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. The administration of the tests was made in one period of 45 minutes for each classroom.

Measures

Parent involvement was measured by a Spanish questionnaire, namely, the Parent Involvement Questionnaire [CIF], which has been elaborated and used in previous research (Veas, Castejón, Gilar, & Miñano, 2015). This questionnaire is aimed at students who value the perception of involvement of their parents in the educational process, their monitoring and level of importance of the educational process to themselves. The instrument is structured as 20 items that evaluate 4 factors: the

perception of support, organization, and interest in the educational process (PSOIEP) (e.g. *My parents think that I will successfully complete Compulsory Education*); expectations (e.g. *My parents discuss my post-Compulsory Education plans with me*); school relationship (e.g. *My school informs my parents of curricula and of academic and professional opportunities*); and time of support with homework (e.g. *My parents assist me with questions, homework, interest research, etc.*). Students answer on a Likert scale ranging from 1 to 5, depending on the frequency with which they do the activity in each statement (1 = never or hardly ever; 5 = always or mostly). In our study, we obtained Cronbach's alpha values of .70 for the first factor, .65 for the second, .65 for the third, and .71 for the last factor.

To measure metacognition, we used the metacognitive subscale of the Learning Strategies Questionnaire, developed by Beltrán, Pérez, and Ortega (2006). This test is composed of 50 items and evaluates four large subscales, of which only 11 items from the metacognitive subscale were used. The aim of the metacognitive subscale is to measure metacognitive strategies based on SRL activities, which imply the ability to plan, monitor, and evaluate the actions involved (e.g. *I start to study without any specific plan*). The instrument is based on a Likert scale ranging from 1 to 5, depending on the frequency with which they do the activity in each statement (1 = never; 5 = always). The value of the reliability coefficient for the metacognition subscale was .77.

Grade point averages (GPAs) were used as an indicator of academic achievement, considered to be the assessment or evaluation of the overall achievement obtained at the school level. Therefore, our construct is concerned with the level of achievement obtained in courses based on the degree of meeting the evaluation criteria for different courses in the school year. 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 presented a high reliability, with Cronbach's alpha values of .93 for first-grade participants, and .94 for the second-grade participants. In the present study, all subjects were compulsory for students; thus, it was not possible for choice of examination to affect the measurement of the latent construct (Korobko, Glas, Bosker, & Luyten, 2008).

Data analysis

First, 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 first considered by the authors. Whether a linear mixed model was necessary was determined using the intraclass correlation coefficient (ICC). An analysis was conducted to test the variability in academic achievement for a two-level factor (8 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 Martin, 2007). The intraclass correlation coefficient was low ($ICC = .05$), indicating that only 5% of the variation in achievement was due to schools. This percentage was not significant: the between-school variance estimate was .18 (Std. error = .11), Wald test $Z = 1.66, p = .10$. The variation of achievement due to classrooms showed $ICC = .14$, 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 between classroom L2 units (Zhang, Zyphur, & Preacher, 2009), meaning that the direct, indirect and total effects can vary between L2 units.

We tested the mediational hypotheses using the MLmed macro for SPSS (Rockwood & Hayes, 2017), with robust standard errors (REM estimation). 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). Four independent multilevel mediation analyses were conducted, using each of the four parent involvement variables: the perception of support, organization, and interest in the educational process; expectations; school relationship; and time of support with homework. The scores on metacognitive strategies were used as the mediator in each corresponding model. A general representation of the model can be seen in Figure 1.

[Figure 1 near here]

Results

Table 1 displays the descriptive statistics for all the measures. The skewness statistics for each of the measures were adequate.

[Table 1 near here]

The bivariate correlations of all the measures are displayed in Table 2. The predictor variables, mediation variable (metacognition), and outcome variable of academic achievement were all significantly correlated, fulfilling the first condition for the test of a mediation effect. A negative correlation between time of support with homework and academic outcomes was observed, whereas the rest of the correlations were positive. 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.

[Table 2 near here]

Tables 3 and 4 show results of a multilevel analysis investigating direct relationships between parent involvement variables, metacognition strategies and academic achievement, as well as the indirect effects of metacognition strategies at both the within- and between-subjects levels. All parent involvement variables were significantly and positively associated with metacognition strategies and academic achievement at both levels, aside from school relationship, which had a null direct relation with academic achievement at the between-subjects level when the metacognition effect was considered, and time of support with homework, which had a negative direct effect on academic achievement at both levels. Expectation was the most powerful variable in predicting academic achievement.

Tables 3 and 4 also show significant indirect effects of all parent involvement variables and academic achievement through metacognition strategies both at the within- and between-subjects level in a 1-1-1 multilevel mediation model, showing the importance of variability of the classrooms at L2 to be considered. The major indirect effect was found at this level with school relationship as a predictor, with a point estimate of .17, $Z_{\text{Sobel}} = 3.26, p \leq .001, 95\% \text{ CI } [0.078, 0.282]$, followed by perception of support, organization and interest in the educational process, with a point estimate of .22, $Z_{\text{Sobel}} = 0.073, p \leq .05, 95\% \text{ CI } [0.088, 0.377]$. When considering the within-subjects level, we can observe minor and similar indirect effects from the predictors perception of support, organization and interest in the educational process, with a point estimate of .04, $Z_{\text{Sobel}} = 7.56, p \leq .001, 95\% \text{ CI } [0.032, 0.543]$; expectations, with a point estimate of .04, $Z_{\text{Sobel}} = 8.076, p \leq .001, 95\% \text{ CI } [0.031, 0.509]$; and school relationship, with a point estimate of .04, $Z_{\text{Sobel}} = 7.7, p \leq .001, 95\% \text{ CI } [0.030, 0.050]$. Time of support with homework also had significant indirect effect through metacognition strategies, with a point estimate of .02, $Z_{\text{Sobel}} = 4.978, p \leq .001, 95\% \text{ CI } [0.012, 0.028]$.

[Table 3 near here]

[Table 4 near here]

Discussion

Given the complex nature of the variables involved in the academic process, it is essential to analyse the different levels of interaction during adolescence, as it is an important stage in which cognitive and metacognitive processes can be consolidated as salient elements in development. According to the MASRL model (Efklades, 2011), different types of metacognition are relevant for the optimal development of individuals in academic contexts. As metacognitive knowledge is mainly used at the Person level, using generalized conclusions based on environmental stimuli, metacognitive skills are even more important at the Task \times Person level, in which different strategies—planning, monitoring, and evaluation—are used to accomplish the demands of specific tasks (Panadero, 2017). Moreover, parent involvement in education can be an important way to facilitate positive youth development (Hill & Taylor, 2004). In this sense, the aim of the present study was to examine the relations among parent involvement—considered a multidimensional construct—as well as metacognitive strategies and academic achievement in a multidimensional mediational model, considering the hierarchical data structure.

The results partially confirmed the first hypothesis, as time of support with homework had a significant relation with metacognition, despite the negative direct effect on academic achievement found previously (Karchach et al., 2013). This result confirms the importance of parent involvement variables and metacognitive strategies in the educational context (Hill & Craft, 2003; Hill & Taylor, 2004; Joe & Davis, 2009; Yip, 2007). Moreover, these results support the conclusions of Pattall, Cooper, and Robinson

(2008), who found that parent involvement in homework is more related to intermediate variables than it is to academic performance. There are also remarkable similarities with Núñez et al. (2015), who found that students may not completely understand their parent's support or how they can affect their own behaviours, mainly due to youth or inability. In this case, it may be that students feel greater pressure or anxiety to obtain high grades (Checa & Abundis-Gutiérrez, 2017), but can develop strategies for monitoring their actions during homework.

On the other hand, expectations had the highest predictive power on academic achievement. This result is consistent with a previous meta-analysis (Castro et al., 2015) and suggests that positive thinking from parents leads to an increase in children's self-confidence when performing different academic tasks and better confidence in parent-child communication.

The second hypothesis was also confirmed, where metacognition emerged as an important mediator for the parent involvement constructs at the within- and between-subjects levels, including parents' support of children's homework. This finding affirms the contradictions found in previous studies. For example, whereas Xu (2008, 2010) found that the effect of parent involvement on student homework time management was mediated by attitudes and motivation, and the strength of the association depended on grade level (Núñez et al., 2015), it is possible that students increase their monitoring level during homework tasks to decrease their parents' control. However, monitoring is not sufficient to obtain better academic performance, and other variables, such as motivation, self-concept, or goal orientations, are necessary for educational progress. In this sense, the multilevel mediational model confirms the importance of considering the variability between classrooms, as the direct and indirect effects of metacognition strategies are influenced by the classroom level (L2), and so different contextual

variables are affecting both cognitive and motivational individual factors, such as teacher effects or classroom climate (Morin et al., 2014).

Given the results of the present research, as well as the information above, the mediating effect of metacognitive strategies in the relation between parent involvement and academic achievement both at the student level (L1) and class level (L2) allows us to confirm two important findings. First, both at the group and individual level, social interactions between parents and children are necessary for academic success (Pino-Pasternak, Whitebread, & Tolmie, 2010). Moreover, as the difficulty of learning increases in secondary education, together with psychological changes during adolescence, students need to fulfil their personal goals. This leads us to a second point: parent involvement can improve children's engagement through their autonomy, which allows better emotional functioning (Wang & Eccles, 2012). This implies the need for future studies where motivational factors can be examined as an important mediator beyond metacognition for both achievement and emotional well-being (Wang & Sheikh-Khalil, 2014).

Previous research has supported the empirical relation between parenting constructs and metacognition (Kontos, 1983; Robinson et al., 2009). However, most studies have focused on experimental parent-child dyad comparisons at early ages. The present study highlights the importance of metacognition during early adolescence, apart from other self-regulatory or cognitive processes.

In terms of educational implications, the effects of the parent involvement variables highlight the need for them to be considered key for inclusion as contextual variables in educational models. For this reason, parents should also be considered important educators who should pay attention to different learning procedures to ensure that all students are given opportunities to succeed and to foster a climate of acceptance and

security. Therefore, fluid communication lines between families and schools, together with realistic parent expectations, will entail managing a set of strategies that enable students to assume responsibility for and control over their own learning process. These strategies can be learned, modified, and improved by implementing an appropriate curriculum designed to teach learning strategies and skills, enhancing perceptions of self-efficacy, setting realistic goals, and encouraging a learning climate that contributes to student engagement with this process (Rósario et al., 2012; Schunk & Ertmer, 2000). Indeed, metacognition and affect would be key contributors to motivation during the realization of tasks, and therefore, the creation of positive expectations when dealing with difficulties (Efklides, 2011). Interactions with parents can adopt an indirect style, including support and communication about school matters, while encouraging their children's autonomy and responsibility (Fernández-Alonso, 2017).

Finally, some limitations of the present study must be addressed. First, because parents' expectations are normally associated with students' previous achievement (Núñez et al., 2015), the classification of students with high and low achievement should be performed in future studies to observe different influence patterns of the target variables as a function of achievement. On the other hand, it is important that there is not a generalized validated scale in Spain that measures parent involvement in adolescence, and for this reason, future psychometric revisions are mandatory. Moreover, the parent involvement variables were assessed by students' self-reports; thus, this study did not obtain the reporters' views of parents. Metacognitive strategies were also measured by self-report questionnaire. However, according to recent literature, problem-solving activities or on-line learning tasks can be used and generalized in all age groups to derive a better understanding of the relations of metacognitive processes to themselves and to other academic factors, as external and objective codification criteria can be used

(Veenman, 2011; Veenman, Bayelaar, De Wolf, & Van Haaren, 2014). 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 et al., 2011; Morin et al., 2014).

References

- Beltrán, J., Pérez, L., & Ortega, M. (2006). *CEA: Cuestionario de Estrategias de Aprendizaje [Learning Strategies Questionnaire]*. Madrid, Spain: TEA.
- Castro, M., Expósito-Casas, E., López-Martín, E., Lizasoain, L., Navarro-Asencio, E., & Gaviria, J. L. (2015). Parental involvement on student academic achievement: A meta-analysis. *Educational Research Review, 14*, 33-46. doi: 10.1016/j.edurev.2015.01.002
- Checa, P., & Abundis-Gutiérrez, A. (2017). Parenting and temperament influence on school success in 9-13 year olds. *Frontiers in Psychology, 8*: 543. doi: 10.3389/fpsyg.2017.00543
- Chiu, M. M., Chow, B. W., & McBride-Chang, C. (2007). Universals and specifics in learning strategies: Explaining adolescent mathematics, science and reading achievement across 34 countries. *Learning and Individual Differences, 17*(4), 344-365. doi: 10.1016/j.lindif.2007.03.007
- Cooper, H., Jackson, K., Nye, B., & Lindsay, J. J. (2001). A model of homework's influence on the performance of elementary school students. *Journal of Experimental Education, 69*, 181-199. doi: 10.1080/00220970109600655
- Dearing, E., Kreider, H., Simmpkins, S., & Weiss, H. B. (2006). Family involvement in school and low-income children's literacy: longitudinal association between and within families. *Journal of Educational Psychology, 98*, 653-664. doi: 10.1037/0022-0663.98.4.653
- Deci, E.L., Driver, R. E., Hotchkiss, L., Robbins, R. J., & McDougal Wilson, I. (1993). The relation of mothers' controlling vocalizations to children's intrinsic motivation. *Journal of Experimental Child Psychology, 55*, 151-162. doi: 10.1006/jee.1993.1008

- Dent, A. L., & Koenka, A. C. (2016). The relation between Self-Regulated Learning and Academic Achievement Across Childhood and Adolescence: A Meta-Analysis. *Educational Psychology Review*, 28, 425-474. doi: 10.1007/s10658-015-9320-8
- Dinsmore, D. L., Alexander, P. A., & Loughlin, S. M. (2008). Focusing the conceptual lens on metacognition, self-regulation, and self-regulated learning. *Educational Psychology Review*, 20, 391-409. doi: 10.1007/s10648-008-9083-6
- Dumont, H., Trauwein, U., Lüdtke, O., Neumann, M., Niggli, A., & Schnyder, I. (2012). Does parental homework involvement mediate the relationship between family background and educational outcomes? *Contemporary Educational Psychology*, 37, 55-69. doi: 10.1016/j.cedpsych.2011.09.004
- Effeney, G., Carroll, A., & Bahr, N. (2013). Self-regulated learning and executive function: Exploring the relationships in a sample of adolescent males. *Educational Psychology: An International Journal of Experimental Educational Psychology*, 33, 773-796. doi: 10.1080/01443410.2013.785054
- Efklides, A. (2008). Metacognition. Defining its facets and levels of functioning in relation to Self-Regulation and Co-regulation. *European Psychologist*, 13(4), 277-287. doi: 10.1027/1016-9040.13.4.277
- Efklides, A. (2011). Interactions of metacognition with motivation and affect in self-regulated learning: the MASRL model. *Educational Psychologist*, 46(1), 6-25. doi: 10.1080/00461520.2011.538645
- El Nokali, N. E., Bachman, H. J., & Votruba-Drzal, E. (2010). Parent involvement and children's academic and social development in elementary school. *Child Development*, 81(3), 988-1005. doi: 10.1111/j.1467-8624.2010.01447

- Fan, X., & Chen, M. (2001). Parental involvement and students' academic achievement: a meta-analysis. *Educational Psychology Review*, *13*(1), 1-22. doi: 10.1023/A:1009048817385
- Fernández-Alonso, R., Álvarez-Díaz, M., Woitschach, P., Suárez-Álvarez, J., & Cuesta, M. (2017). Parental involvement and academic performance: Less control and more communication. *Psicothema*, *29*(4), 453-461. doi: 10.7334/psicothema2017.181
- Flavel, J. H. (1979). Metacognition and cognitive monitoring: A new area of cognitive development inquiry. *American Psychologist*, *34*, 906-911. doi: 10.1037/0003-066X.34.10.906
- Follmer, D. J., & Sperling, R. A. (2016). The mediating role of metacognition in the relationship between executive function and self-regulated learning. *British Journal of Educational Psychology*, *86*, 559-575. doi: 10.1111/bjep.12123
- García, T., & Pintrich, P. R. (1994). Regulating motivation and cognition in the classroom: the role of self-schemas and self-regulatory processes. In D. H. Schunk & B. J. Zimmerman (Eds), *Self-regulation of learning and performance: issues and educational applications*. Hillsdale: Erlbaum.
- Ginsburg, G., & Bronstein, P. (1993). Family factors related to children's intrinsic/extrinsic motivational orientation and academic performance. *Child Development*, *64*, 1461-1474. doi: 10.1111/j.1467-8624.1993.tb02964
- González, A. L., & Wolters, C. A. (2006). The relation between perceived parenting practices and achievement motivation in mathematics. *Journal of Research in Childhood Education*, *21*(2), 203-217. doi: 10.1080/025685540609594589

- Gordon, M., & Cui, M. (2012). The effect of school specific parenting processes on academic achievement in adolescence and young adulthood. *Family Relations*, 61(5), 728-741. doi: 10.1111/j.1741-3729.2012.00733.x
- Green, J., Liem, G. D., Martin, A. J., Colmar, S., Marsh, H. W., & McInerney, D. (2012). Academic motivation, self-concept, engagement, and performance in high school: Key processes from a longitudinal perspective. *Journal of Adolescence*, 35(5), 1111-1122. doi: 10.1016/j.adolescence.2012.02.016
- Grolnick, W. S. (2009). The role of parents in facilitating autonomous self-regulation for education. *Theory and Research in Education*, 7, 164-173. doi: 10.1177/1477878509104321
- Grolnick, W. S., & Ryan, R. M. (1989). Parent styles associated with children's self-regulation and competence in school. *Journal of Educational Psychology*, 81, 143-154. doi: 10.1037/0022-0663.81.2.143
- Grolnick, W. S., & Slowiaczek, M. L. (1994). Parents' involvement in children's schooling: A multidimensional conceptualization and motivational model. *Child Development*, 65, 237-252. doi: 10.1111/j.1467-8624.1994.tb00747.x
- Guskey, T. R. (2013). Defining student achievement. In J. Hattie and E. M. Anderman (Eds). *International guide to student achievement* (pp. 3-6). New York, NY: Routledge.
- Hill, N., & Craft, S. (2003). Parent-school involvement and school performance: Mediated pathways among socioeconomically comparable African American and Euro-American families. *Journal of Educational Psychology*, 95, 74-81. doi:10.1037/0022-0663.95.1.74

- Hill, N. E., & Taylor, L. C. (2004). Parental school involvement and children's academic achievement: Pragmatics and issues. *Current Directions in Psychological Science, 13*, 161-164. doi: 10.1111/j.0963-7214-2004.00297.x
- Hill, N. E., & Tyson, D. F. (2009). Parental involvement in middle school: A meta-analytic assessment of the strategies that promote achievement. *Developmental Psychology, 45*(3), 740-763. doi: 10.1037/a0015362
- Hokoda, A., & Fincham, F. D. (1995). Origins of children's helpless and mastery achievement patterns in the family. *Child Development, 87*, 375-385. doi: 10.1037/0022-0663.87.3.375
- Jeynes, W. H. (2005). A meta-analysis of the relation of parental involvement to urban elementary school student academic achievement. *Urban Education, 40*(3), 237-269. doi: 10.1177/0042085905274540
- Jeynes, W. H. (2007). The relationship between parental involvement and urban secondary school student academic achievement. A meta-analysis. *Urban Education, 42*(1), 82-110. doi: 10.1177/0042085906293818
- Joe, E. M., & Davis, J. E. (2009). Parental influence, school readiness and early academic achievement of African American boys. *The Journal of Negro Education, 78*(3), 260-276.
- Karbach, J., Gottschling, J., Spengler, M., Hegewald, K., & Spinath, F. M. (2013). Parental involvement and general cognitive ability as predictors of domain-specific academic achievement in early adolescence. *Learning and Instruction, 23*, 43-1. doi: 10.1016/j.learninstruc.2012.09.004
- Kitsantas, A., & Zimmerman, B. J. (2009). College students' homework and academic achievement. The mediating role of self-regulatory beliefs. *Metacognition and Learning, 4*(2), 97-110. doi: 10.1007/s11409-008-9028-y

- Kontos, S. (1983). Adult-child interaction and the origins of metacognition. *Journal of Educational Research*, 77, 43-54. doi: 10.1080/00220671.1983.10885494
- Korobko, O. B., Glas, C. A. W., Bosker, R. J., & Luyten, J. W. (2008). Comparing the difficulty of examination subjects with Item Response Theory. *Journal of Educational Measurement*, 45(2), 139-157. doi: 10.1111/j.1745-3984.2007.00057.x
- Ling-Feng, W., & Yu-Hong, J. (2004). Self-concept of pupils and its relationship to the parents' patterns of rearing and educating. *Chinese Journal of Clinical Psychology*, 12, 142-144.
- Lorenz, F., & Wild, E. (2007). Parental involvement in schooling-results concerning its structure and impact on students' motivation. In M. Prenzel & L. AllolioNäcke (Eds.), *Studies on the educational quality of schools. The final report on the DFG Priority Program* (pp. 299-316). Münster: Waxman.
- Lu, L., Weber, H. S., Spinath, F. M., & Shi, J. (2011). Predicting school achievement from cognitive and non-cognitive variables in a Chinese sample of elementary school children. *Intelligence*, 39, 130-140. doi : 10.1016/j.intell.2011.02.002
- Lüdtke, O., Marsh, H. W., Robitzsch, A., & Trautwein, U. (2011). A 2 x 2 taxonomy of multilevel latent contextual models: Accuracy-bias trade-offs in full and partial error-correction models. *Psychological Methods*, 16(4), 444-467. doi : 10.1037/a0024376
- Matthews, J. S., Pointz, C. C., & Morrison, F. J. (2009). Early gender differences in self-regulation and academic achievement. *Journal of Educational Psychology*, 101(3), 689-704. doi: 10.1037/a0014240

- Marsh, H. W., & Martin, A. J. (2011). Academic self-concept and academic achievement: Relations and causal ordering. *British Journal of Educational Psychology*, *81*(1), 59-77. doi: 10.1348/000709910X503501
- Mega, C., Ronconi, L., & De Beni, R. (2014). What makes a good students? How emotions, self-regulated learning, and motivation contribute to academic achievement. *Journal of Educational Psychology*, *106*, 121-131. doi: 10.1037/a0033546
- Meyer, D., & Turner, J. C. (2002). Using instructional discourse analysis to study scaffolding of student self-regulation. *Educational Psychologist*, *37*, 17-25. doi: 10.1207/S1532698EP3701_3
- Moilanen, K. L., & Manuel, M. L. (2017). Parenting, self-regulation and social competence with peers and romantic partners. *Journal of Applied Developmental Psychology*, *49*, 46-54. doi: 10.1016/j.appdev.2017.02.003
- Morin, A. J. S., Marsh, H. W., Nagengast, B., & Scalas, F. (2014). Doubly latent multilevel analyses of classroom climate: An illustration. *The Journal of Experimental Education*, *82*(2), 143-167. doi: 10.1080/00220973.2013.769412
- Neitzel, C. L., & Stright, A. D. (2003). Mothers' scaffolding of children's problem solving: Establishing a foundation of academic self-regulatory competence. *Journal of Family Psychology*, *17*, 147-159. doi: 10.1037/0893-3200.17.1.147
- Niggli, A., Trautwein, U., Schnyder, I., Luedtke, O., & Neumann, M. (2007). Parental homework support can be beneficial, but parental intrusion is detrimental: Family background, parental homework supervision, and performance gains. *Psychologie in Erziehung Und Unterricht*, *54*(1), 1-14.
- Nisbet, J., & Shucksmith, J. (1986). *Learning strategies*. Boston, MA: Routledge and Kegan Paul.

- Núñez, J. C., Suárez, N., Rosário, P., Vallejo, G., Valle, A., & Epstein, J. L. (2015). Relationships between perceived parental involvement in homework, student homework behaviors, and academic achievement: differences among elementary, junior high and high school students. *Metacognition and Learning*, *10*(3), 375-406. doi: 10.1007/s11409-015-9135-5
- Okpala, C. O., Okpala, A. O., & Smith, F. E. (2001). Parental involvement, instructional expenditures, family socioeconomic attributes, and student achievement. *The Journal of Educational Research*, *95*(2), 110-115. doi: 10.1080/00220670109596579
- Oyserman, D., Brickman, D., & Rhodes, M. (2007). School success, possible selves, and parent school involvement. *Family Relations*, *56*, 479-489. doi: 10.1111/j.1741-3729.2007.00475.x
- Panadero, E. (2017). A review of self-regulated learning: Six models and four directions for research. *Frontiers in Psychology*, *8*: 422. doi: 10.3389/fpsyg.2017.00422
- Pardo, A., Ruiz, M. A., & San Martín, R. (2007). Cómo ajustar e interpretar modelos multinivel con SPSS [How to fit and interpret multilevel models with SPSS]. *Psicothema*, *19*(2), 308-321.
- Patall, E. A., Cooper, H., & Robinson, J. C. (2008). Parent involvement in homework: a research synthesis. *Review of Educational Research*, *78*, 1039-1101. doi: 10.3102/0034654308325185
- Phillipson, S., & Phillipson, S. N. (2012). Children's cognitive ability and their academic achievement: The mediation effects of parental expectations. *Asia Pacific Education Review*, *13*(3), 495-508. doi: 10.1007/s12564-011-9198-1

- Pianta, R. C., Smith, N., & Reeve, R. E. (1991). Observing mother and child behavior in problem-solving situation at school entry: Relations with classroom adjustment. *School Psychology Quarterly*, *6*, 1-5. doi: 10.1037/h0088238
- Pino-Pasternak, D., Whitebread, D., & Tolmie, A. (2010). A multidimensional analysis of parent-child interactions during academic tasks and their relationships with children's self-regulated learning. *Cognition and Instruction*, *28*, 219-272. doi: 10.1080/07370008.2010.490494
- Pintrich, P. R. (2000). The role of goal orientation in self-regulated learning. In M. Boekaerts, P. R. Pintrich, and M. Zeidner (Eds), *Handbook of Self-Regulation* (pp. 452-502). San Diego, CA: Academic Press.
- Richman, E. R., & Rescorla, L. (1995). Academic orientation and warmth in mothers and fathers of preschoolers: Effects on academic skills and self-perceptions of competence. *Early Education and Development*, *6*, 197-213.
- Robinson, J. B., Burns, B. M., & Winder Davis, D. (2009). Maternal scaffolding and attention regulation in children living in poverty. *Journal of Applied Developmental Psychology*, *30*, 82-91. doi: 10.1016/j.appdev.2008.10.013
- Roebken, H. (2007). The influence of goal orientation on student satisfaction, academic engagement and achievement. *Electronic Journal of Research in Educational Psychology*, *5*(3), 679-704.
- Rockwook, N. J., & Hayers, A. F. (2017, May). MLmed: An SPSS macro for multilevel mediation and conditional process analysis. *Poster presented at the annual meeting of the Association of Psychological Science (APS), Boston, MA.*
- Rogers, M. A., Theule, J., Ryan, B. A., Adams, G. R., & Keating, L. (2009). Parental involvement and children's school achievement. *Canadian Journal of School Psychology*, *24*(1), 34-57. doi: 10.1177/0829573508328445

- Rosário, P., González-Pienda, J. A., Pinto, R., Ferreira, P., Lourenço, A., & Paiva, O. (2010). Efficacy of the program “Testas’s (mis)adventures” to promote the Deep approach to learning. *Psicothema*, 22, 828, 834.
- Ruffman, T., Slade, L., & Crowe, E. (2002). The relation between children’s and mothers’ mental state language and theory-of-mind understanding. *Child Development*, 73, 734-751. doi: 10.1111/1467-8624.00435
- Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, 55, 68-78. doi: 10.1037/0003-066X.55.1.68
- Salonen, P., Leppola, J., & Vauras, M. (2007). Scaffolding interaction in parent-child dyads: Multimodal analysis of parental scaffolding with task and non-task oriented children. *European Journal of Psychology of Education*, 22, 77-96. doi: 10.1007/BF03173690
- Schraw, G., & Dennison, R. S. (1994). Assessing metacognitive awareness. *Contemporary Educational Psychology*, 19, 460-475. doi: 10.1006/ceps.1994.1033
- Shunk, D. H., & Ertmer, P. A. (2000). Self-regulation and academic learning, self-efficacy enhancing interventions. In M. Boekaerts, P. Pintrich, & M. Zeidner (Eds.), *Handbook of self-regulation* (pp. 631-649). San Diego, NY: Academic Press.
- Sobel, M. E. (1986). New results on indirect effects and their standard errors in covariance structure models. *Sociological Methodology*, 16, 159-186. doi: 10.2307/270922
- Stright, A. D., Neitzel, C. L., Sears, K. G., & Hoke-Sinex, L. (2001). Instruction begins in the home: relations between parental instruction and children’s self-regulation

- in the classroom. *Journal of Educational Psychology*, *101*, 207-218. doi:
10.1037/0022-0663.93.3.46
- Tabachnick, B. G., & Fidell, L. S. (2007). *Using multivariate statistics*. Boston:
Pearson.
- Turner, L. A., & Johnson, B. (2003). A model of mastery motivation for at-risk
preschoolers. *Journal of Educational Psychology*, *95*, 495-505. doi:
10.1037/0022-0663.95.3.495
- van Grinsven, L., & Tillema, H. (2006). Learning opportunities to support student self-
regulation: Comparing different instructional formats. *Educational Research*, *48*,
77-91. doi: 10.1080/0013880500498495
- Van Voorhis, F. L. (2011). Costs and benefits of family involvement in homework.
Journal of Advanced Academics, *22*(2), 220-249. doi:
10.1177/1932202X1102200203
- Veas, A., Castejón, J. L., Gilar, R., & Miñano, P. (2015). Academic achievement in
early adolescence: the influence of cognitive and non-cognitive variables. *The
Journal of General Psychology*, *142*(4), 273-294. doi:
10.1080/00221309.2015.1092940
- Veenman, M. V. J. (2011). Alternative assessment of strategy use with self-report
instruments: A discussion. *Metacognition and Learning*, *6*, 205-211. doi:
10.1007/s11409-011-9080-x
- Veenman, M. V. J., Bavelaar, L., De Wolf, L., & Van Haaren, M. G. P. (2014). The on-
line assessment of metacognitive skills in a computerized learning environment.
Learning and Individual Differences, *29*, 123-130. doi:
10.1016/j.lindif.2013.01.003

- Wang, M. T., & Eccles, J. S. (2012). Social support matters: Longitudinal effects of social support on three dimensions of school engagement from Middle to High school. *Child Development, 83*(3), 877-895. doi: 10.1111/j.1467-8624.2012.01745.x
- Wang, M. T., & Sheikh-Khalil, S. (2013). Does parental involvement matter for student achievement and mental health in High School? *Child Development, 85*(2), 610-625. doi: 10.1111/cdev.12153
- Wertsch, J. C., McNamee, G. D., McLane, J. B., & Budwig, N. A. (1980). The adult-child dyad as a problem-solving system. *Child Development, 51*, 1215-1221. doi: 10.2307/1129563
- Wilder, S. (2014). Effects of parental involvement on academic achievement: a meta-synthesis. *Educational Review, 66*(3), 377-397. doi: 10.1080/00131911.2013.780009
- Winters, F. I., Greene, J. A., & Costich, C. M. (2008). Self-regulation of learning within computer-based learning environment: A critical analysis. *Educational Psychology Review, 20*(4), 429-444. doi: 10.1007/s10648-008-9080-9
- Xu, J. (2008). Models of secondary school students' interest in homework: a multilevel analysis. *American Educational Research Journal, 45*, 1180-1205. doi: 10.3102/0002831208323276
- Xu, J. (2010). Predicting homework time management at the secondary school level: a multilevel analysis. *Learning and Individual Differences, 20*, 34-39. doi: 10.1016/j.lindif.2009.11.001
- Yamamoto, Y., & Holloway, S. D. (2010). Parental expectations and children's academic performance in sociocultural context. *Educational Psychology Review, 22*, 189-214. doi: 10.1007/s10648-10-9121-z

- Yip, M. C. (2007). Differences in learning and study strategies between high and low achieving university students: A Hong Kong study. *Educational Psychology, 27*(5), 597-606. doi: 10.1080/01443410701309126
- Zeegers, P. (2004). Student learning in higher education: a path analysis of academic achievement in Science. *Higher Education Research and Development, 23*, 35-56. doi: 10.1080/00220679809597566
- Zhang, Z., Zyphur, M. J., & Preacher, K. J. (2009). Testing multilevel mediation using hierarchical lineal models. *Organizational Research Methods, 12*(4), 695-719. doi: 10.1177/1094428108327450
- Zeliman, G. I., & Waterman, J. M. (1998). Understanding the impact of parent school involvement on children's educational outcomes. *Journal of Educational Research, 91*(6), 370-380. doi: 10.1080/00220679809597566
- Zimmerman, B. J. (2000). Attaining self-regulation: a social cognitive perspective. In M. Boekaerts, P. R. Pintrich, and M. Zeidner (Eds), *Handbook of Self-Regulation* (pp. 13-40). San Diego, CA: Academic Press.
- Zimmerman, B. J., & Moylan, A. R. (2009). Self-regulation: where metacognition and motivation intersect. In D. J. Hacker, J. Dunlosky, and A. C. Graesser (Eds), *Handbook of Metacognition in Education* (pp. 299-315). New York, NY: Routledge.

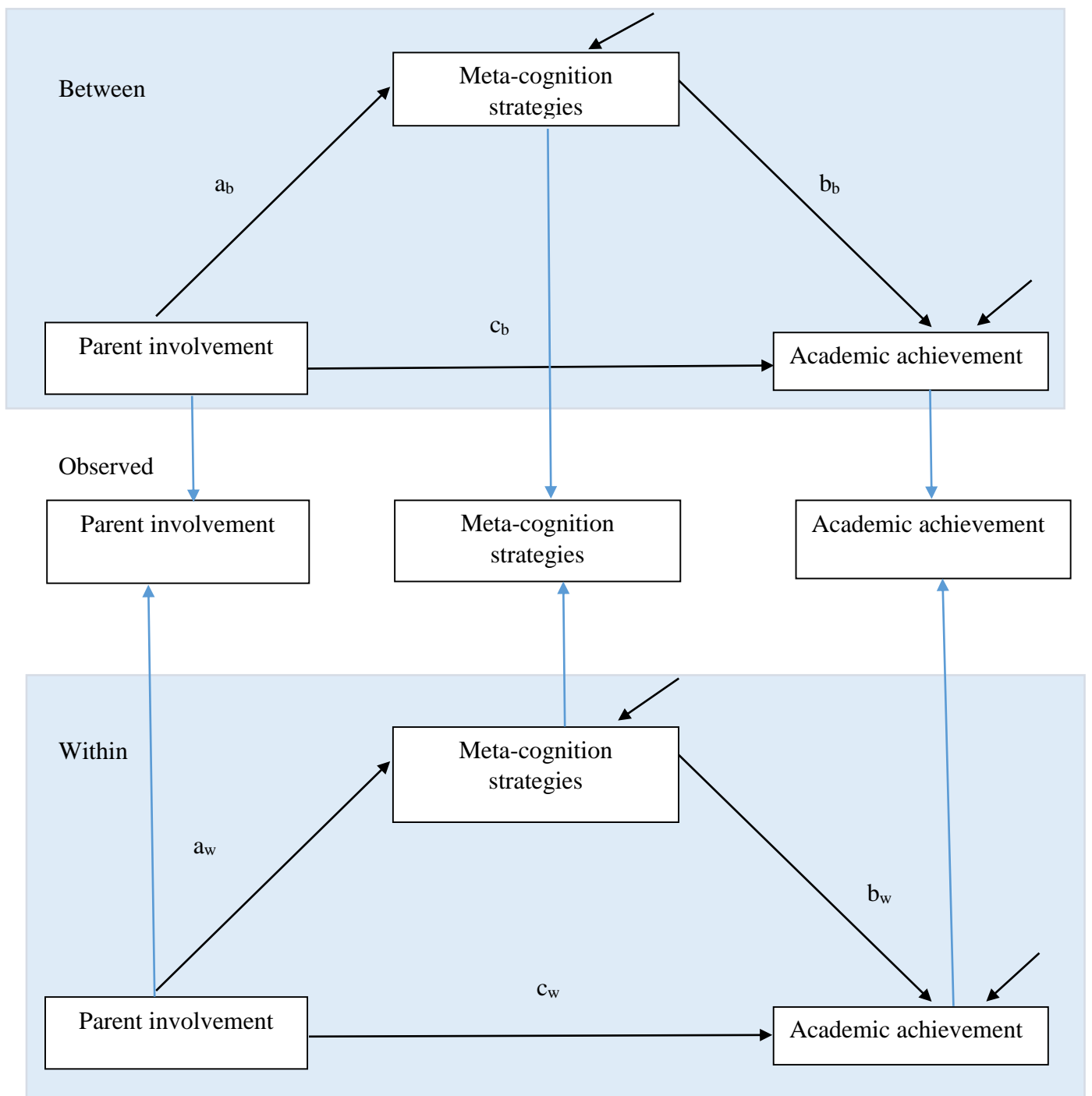


Figure 1. 1-1-1 Multilevel mediational model between Parent Involvement, Metacognition strategies and Academic achievement.

Table1

Descriptive statistics for parent involvement measures and metacognition strategies.

	M	SD	Range	Minimum	Maximum
1. Perception of support, organization and interest in the educational process	21.03	3.31	18	7	25
2. Expectations	20.87	3.7	19	6	25
3. School relationship	18.95	3.88	20	5	25
4. Time of support with homework	16.04	4.78	20	5	25
5. Metacognition strategies	37.38	6.56	42	13	55
6. Academic Achievement	6.3	1.77	8.56	1.44	10

Table 2

Correlations among measures of parent involvement, metacognition strategies and academic achievement

	1	2	3	4	5	6
1. Perception of support, organization and interest in the educational process	-					
2. Expectations	.45*	-				
3. School relationship	.41*	.39*	-			
4. Time of support with homework	.44*	.21*	.49*	-		
5. Metacognition strategies	.28*	.33*	.29*	.15*	-	
6. Academic Achievement	.24*	.40*	.17*	-.11*	.40*	-

Note. *Correlation is significant at the .01 level (2-tailed).

Table 3

Multilevel mediation model predicting academic achievement with perception of support and expectations as predictors

Parameter	Academic achievement (PS as predictor)		Academic achievement (Expectations as predictor)	
	Estimate	SE	Estimate	SE
Between-subjects				
Intercept	.28**	.06	.21	.05
Path a _b	1.39**	.21	.88**	.17
Path b _b	.15*	.04	.10**	.03
Path c _b	.07	.11	.24**	.06
Indirect effect	.22*	.07	.09*	.03
Residual variance outcome	2.31**	.09	2.17**	.08
Within-subjects				
Path a _w	.48**	.05	.88**	.17
Path b _w	.09**	.01	.07**	.006
Path c _w	.07**	.01	.12**	.01
Indirect effect	.04**	.005	.04**	.005

Note. Models are random intercept models. PS = Perception of support, organization, and interest in the educational process. * $p \leq .05$. ** $p \leq .01$ (significance based on Sobel's Z-test of mediation).

Table 4

Multilevel mediation model predicting academic achievement with school relationship and time of support with homework as predictors

Parameter	Academic achievement (School relationship as predictor)		Academic achievement (Time of support with homework as predictor)	
	Estimate	SE	Estimate	SE
Between-subjects				
Intercept	.28**	.07	.24**	.06
Path a _b	.94**	.16	.44*	.19
Path b _b	.18**	.04	.20**	.03
Path c _b	.00	.07	-.16**	.05
Indirect effect	.17**	.05	.09*	.04
Residual variance outcome	2.35**	.09	2.31**	.08
Within-subjects				
Path a _w	.42**	.04	.19**	.03
Path b _w	.09**	.01	.10**	.00
Path c _w	.02*	.01	-.05**	.00
Indirect effect	.04**	.00	.02**	.00

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