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Effortful control is associated with children's school functioning via learning-related behaviors

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ABSTRACT

The goal of the current study was to identify factors that contribute to individual differences in school functioning. We proposed a model including direct effects of Effortful Control (EC) on Spanish 6- to 12-year olds' (N = 142) academic achievement and social adaptation at school, with these relations partially mediated by learning-related behaviors (LRBs). Parents rated children's EC; teachers reported children's LRBs and children' social adaptation in school; children' social preference was assessed through classmates' nominations. Children's academic achievement was measured through standard tests and grades. Analyses were run using structural equation models, controlling by gender, intelligence, age, socioeconomic status, and school. EC was positively and directly related to social adaptation in school. EC was also indirectly related to academic achievement and social adaptation through LRBs. The findings highlight the potential relevance of children's EC and LRBs for adjustment in elementary school.

1. Introduction

In modern societies, school education is expected to provide students with the key knowledge and skills essential for full participation as citizens. In support of this notion, researchers have found that school success is related to long-term consequences for the individuals such as emotional wellbeing and prosocial values (Bryant, Schulenberg, Bachman, O'Malley, & Johnston, 2000), educational attainment (Marjoribanks, 2005), employment aspirations (Caspi, Wright, Moffitt, & Silva, 1998), and socioeconomic position (Guglielmi, 2008).

However, in every country, some students fail to reach a baseline level of acceptable performance. The Programme for International Student Assessment (PISA) reported that, on average, more than one in five students in Organization for Economic Cooperation and Development (OECD) countries did not reach a minimum level in mathematics, reading, or science, and most of these students were not expected to continue their education beyond compulsory schooling (Instituto Nacional de Evaluación Educativa, 2016). As stated by PISA report, 10.3% of students are low performers in Spain but more dramatically, the percentage of school leavers is much higher (21.85%) in comparison with the average percentage in the European Union (11.1%) (Instituto Nacional de Estadística, 2015). Given the relevance of schooling for children's future development, we sought to identify factors that contribute to individual differences in school functioning with the ultimate goal of implementing interventions designed to prevent children from experiencing school failure.

Two main aspects of school functioning were considered in this study: academic achievement and social adaptation. Academic achievement represents performance outcomes that indicate the extent to which a student has accomplished specific goals that were the focus of activities in the instructional environment (Steinmayr, Meißner, Weidinger, & Wirthwein, 2014). At school, it includes the acquisition of knowledge and the understanding of a variety of intellectual domains. Among them, reading and mathematics abilities are considered of special relevance for academic success because they provide the instrumental basis for further complex knowledge.

Social adaptation status "refers to the adequacy of behavioral responses of the individual to the social task demands in particular social fields and at particular stages of life" (Kellman, 1994, p. 149). Among other aspects, adaptive behaviors at school include those related to social skills, which involve the deployment of positive interactions with teachers and peers (Raver & Knitzer, 2002; Rimm-Kaufman & Chiu, 2007). Additionally, children's social status among their classmates has been deemed a marker of social adaptation (Parker & Asher, 1987; Rubin, Bukowski, & Parker, 1998). Peers' reports of students' social acceptance have been related to helpfulness, rule conformity,

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friendliness, and prosocial interactions (Coie, Dodge, & Kupersmidt, 1990; Powers, Bierman, & Conduct Problems Prevention Research Group, 2013). In contrast, aggressive behaviors exhibited in the school setting are strongly related to failure in interactions with peers (Coie & Dodge, 1988; Crick & Grotpeter, 1995) and are considered maladaptive (Reynolds & Kamphaus, 2004).

In analyzing the factors which contribute to children's academic success and social adaptation in school, researchers have focused on effortful control (EC; Duckworth & Allred, 2015; Eisenberg, Valiente, & Eggum, 2010b; Posner & Rothbart, 2007; Rueda, 2015). EC represents the tendency to be able to employ top-down control to self-regulate (Nigg, 2017; Rothbart, 2011). The main components of EC include attentional control processes, the inhibition of prepotent behaviors in response to instructions or social demands, and the capacity to perform an action when there is a strong tendency to avoid it (Rueda, 2015). These abilities, which can be observed by parents in daily situations, are proposed to reflect individual differences in the efficiency of the executive attention network (Rothbart, Sheese, & Posner, 2007). Although EC overlaps in part with the operations covered by executive functions (Bridgett, Oddi, Laake, Murdock, & Bachmann, 2013; Eisenberg & Zhou, 2016; Liew, 2012), EC has shown a unique contribution to school functioning other than that predicted by executive functions (e.g., Blair & Razza, 2007; Neuenschwander, Röthlisberger, Cimeli, & Roebers, 2012), a difference that might be partly due to some differences in the typical measures used to assess EC and executive functioning.

Individual differences in EC have been associated with academic performance (Neuenschwander et al., 2012; Valiente et al., 2011, 2013; Valiente, Lemery-Chalfant, & Castro, 2007). According to Zhou, Main, and Wang (2010), students with high EC likely perform better academically than their counterparts with low EC due to their greater ability to focus, maintain, and self-regulate their attention, and to effortfully inhibit prepotent responses as needed. Moreover, associations between EC and diverse aspects of social adjustment such as prosocial behavior, social competence, and low levels of externalizing behaviors have also been found (Alessandri et al., 2014; Chang, Olson, Sameroff, & Sexton, 2011; Mintz, Hamre, & Hatfield, 2011; Zorza, Marino, de Lemus, & Acosta Mesas, 2013; for a review, see Eisenberg, Spinrad, and Eggum, 2010a). Eisenberg et al. (2010b) suggested that children's abilities to manage attention, emotion, and behavior likely contribute to their tendencies to behave in constructive and socially appropriate ways in social interactions at school.

EC covers a set of dispositional self-regulatory abilities necessary to cope with cognitive and social demands, but success at school will ultimately depend on the actual behaviors children exhibit in the classroom environment. Among the behaviors, learning-related behaviors (LRBs) and classroom participation are especially relevant. LRBs refer to adaptive responses to demands and learning tasks in educational contexts (Morgan, Farkas, Hillemeier, & Maczuga, 2009; Sasser, Bierman, & Heinrichs, 2015). More specifically, we refer to a set of behaviors which involve organizational skills and appropriate habits of study (Reynolds & Kamphaus, 2004). At elementary school, they include behaviors such as attending to teachers' explanations, carefully analyzing problems before solving them, completing the assigned tasks, participating in teamwork, and striving even on non-preferred subjects. LRBs are expected to influence academic achievement and social adaptation because they reflect children's level of engagement in classroom activities (Fantuzzo, Perry, & McDermott, 2004) and allow them to benefit maximally from classroom learning opportunities, which in turn facilitates the performance of domain-specific academic content and social skills (Brock, Rimm-Kaufman, Nathanson, & Grimm, 2009; Neuenschwander et al., 2012). Consistent with this expectation, researchers previously have found that LRBs are associated with better academic achievement (Neuenschwander et al., 2012; Sánchez-Pérez, Fuentes, López-López, Pina, & González-Salinas, 2015; Sasser et al., 2015). Concerning social outcomes, LRBs have been found positively related to good social skills (McDermott et al., 2009; Sasser et al., 2015), positive peer connections (Fantuzzo et al., 2004), and lower levels of disruptive behaviors (Coolahan, Fantuzzo, Mendez, & McDermott, 2000; Fantuzzo et al., 2004; Sasser et al., 2015).

EC and LRBs are two constructs that reflect different aspects of self-regulatory skills (Neuenschwander et al., 2012). Consequently, they are expected to have unique contributions to school functioning. Whereas EC is theorized to regulate approach and withdrawal behavioral tendencies via attentional, inhibitory control and effortful activation mechanisms, as reported by parents in the context of daily situations (Rothbart, 2011), teachers' ratings of classroom LRBs refer to the actual behaviors exhibited by children in coping with academic tasks, and reflect the use of metacognitive abilities (Reynolds & Kamphaus, 2004) as well as motivation (Neuenschwander et al., 2012).

Moreover, the contribution of EC to school functioning could be mediated in part by LRBs. In fact, LRBs constitute a more proximal gateway to classroom learning compared to EC skills because they support effortful and active participation in learning situations and maximize the child's exposure to classroom instruction (Sasser et al., 2015; Stipek, Newton, & Chudgar, 2010). Additionally, EC and LRBs are partially interrelated. Previous research has shown that EC is associated with LRBs (Neuenschwander et al., 2012; Valiente et al., 2013). As Duckworth and Allred (2015) suggested, the skills involved in EC likely promote self-regulation of work-related impulses, permitting the child to sustain attention and effort despite frustration, boredom, or confusion, which would facilitate the use of LRBs. In turn, the deployment of such behaviors would be expected to have a positive impact on children's academic achievement and social adaptation at school.

In line with this expectation, Neuenschwander and collaborators' (2012) study found in a sample of Swiss children that better EC indirectly predicted higher academic performance through LRBs, a teacher-reported measure composed of task persistence, efficiency in completing homework, and self-reliance. In that study, children's ages corresponded to kindergarten and first years of elementary school. In our study, we tested the mediational role of LRBs in a Spanish sample with a broader and older age range (grade 2 to grade 6).

With respect to social adaptation, to our knowledge, the indirect relation between EC and social adaptation at school via LRBs has not been sufficiently explored. However, Sasser et al.'s (2015) study can be taken as relevant to this issue because they focused on a cognitive measure of self-regulation and addressed the mediational role of LRBs. They assessed pre-kindergarten children's executive functioning (including working memory, inhibitory control, and attentional shifting) and found that it was positively associated with higher social competence and lower aggression in elementary school, and these associations were mediated by LRBs. In our study, we sought to test the mediational role of LRBs in the EC-to-social adaptation association at school in school-age children.

1.1. The present study

The present study was designed to examine the associations between EC and school functioning in a sample of elementary school children. We predicted that EC would relate to individual differences in children's academic achievement and social adaptation in school directly and through partial mediation by LRBs (see Fig. 1). The proposed model may be especially relevant for explaining students' school functioning at the ages considered in this study because both EC and LRBs largely depend on executive control, and middle childhood is considered crucial for the development of metacognitive monitoring and control processes (Metcalfe & Finn, 2013).

Additionally, the specific instructional system followed by the schools in this study may rely on particular skills to be successful. Similar to most state-run primary schools in Spain, the two schools in this study presented several characteristics, as reported by their head-teachers. First, classrooms arranged students' seats in parallel rows facing the board most of the time because teachers gave explanations

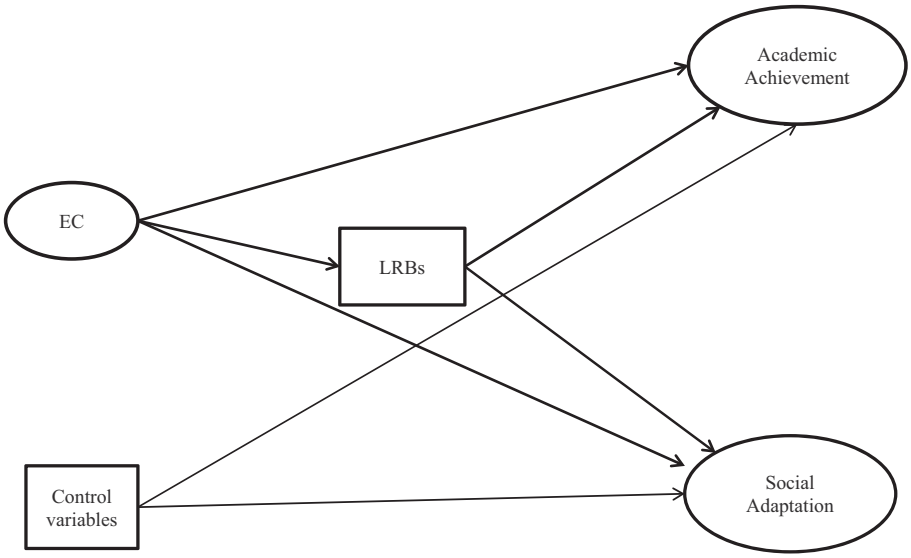

Fig. 1. Hypothesized model for school functioning by EC and LRBs. Abbreviations for variables: EC = Effortful Control, LRBs = Learning-related behaviors.

directed to the whole group. In these situations, students are expected to work individually and pay attention to the teacher rather than to work cooperatively with their classmates. Second, classrooms were composed of 25–30 students, making close monitoring of children's behaviors by teachers difficult. Third, teachers experienced difficulties in attending to diverse levels of performance because children were not assigned to subgroups based on their level of attainment and because teachers did not receive additional help from assistants or volunteers in the classroom. Fourth, students were expected to devote 1 h per day to homework at least, plus some extra time at home to study for the frequent exams they took throughout the year. In summary, the schools of this study are characterized by a heavy load of individual work at school and at home, and by a high student-teacher ratio; in such situations, children's individual differences in EC and LRBs would be particularly relevant for school functioning.

Academic achievement and social adaptation—the indices of school functioning—were assessed via multiple methods and informants. When measuring academic achievement, some researchers have opted for using just standard achievement tests (Blair & Razza, 2007; Howse, Lange, Farran, & Boyles, 2003; Valiente, Lemery-Chalfant, & Swanson, 2010), whereas others have used solely teachers' reports (Hintsanen et al., 2012; Valiente et al., 2011, 2013; Zhou et al., 2010). However, each measurement strategy has its limitations; standard tests might not cover the range of children's knowledge (DuPaul, Rapport, & Perriello, 1991), whereas teachers' reports can be affected by subjective bias (Keogh, 2003; Martin, 1989; Pullis, 1985). The measurement of academic achievement in this study overcame these limitations by including both children's performance on standard tests (mathematics and reading skills) as well as the grades given by teachers in these specific subjects.

The social adaptation index of this study included teachers' reports of children's social behaviors (social skills and aggression) in the classroom as well as the peers' reports of their liking of children (social preference). As suggested by Rubin, Bukowski, and Parker (2006), meaningful information concerning children's social interactions is provided by teachers. Teachers, compared to peers, might be more objective because they are not members of the evaluated peer group. On the other hand, their assessment might be influenced by their adult perspective, which may differ from the child's viewpoint. For that reason, we also incorporated children's reports, which are a useful strategy to capture the peers' perspective based on varied experiences as well as to consider the judgment of those who ultimately determine their peers' social status and integration in the classroom (Rubin et al., 2006).

Finally, we included in the model additional factors that have been found to relate to school functioning: children's intelligence, gender, age, and family's socioeconomic status (SES). Intelligence has been positively related to both academic performance (Heaven & Ciarrochi, 2012; Karbach, Gottschling, Spengler, Hegewald, & Spinath, 2013) and children's social adaptation in the classroom (Mestre, Guil, Lopes, Salovey, & Gil-Olarte, 2006). Gender has been related to social functioning, with girls showing higher levels of social adjustment (Card, Stucky, Sawalani, & Little, 2008; Yang, Chen, & Wang, 2014), whereas gender differences in academic achievement have been less consistent (see Robinson & Lubienski, 2011, for a review of gender achievement gaps) and merit further attention. Additionally, because we included participants with a wide range of ages in our study, children's age was taken into account as a control variable. We also considered family SES because children from higher SES families tend to exhibit better academic achievement and social outcomes (Chang et al., 2011; Mintz et al., 2011; Sirin, 2005). Given the potential relations between the aforementioned factors and school functioning, we included them in the model when they significantly related to any of the independent or dependent variables.

2. Method

2.1. Participants

Participants were enrolled in two primary schools located in the Region of Murcia, SE, Spain. These two schools participated in a broader research project in the previous academic year, and wished to continue their involvement in the following study, which implemented an intervention program designed to improve students' mathematical abilities. Results reported in this paper correspond to the pre-test phase of the overarching study. Initially, all families from both schools were contacted (386 families); 225 of which agreed to participate in this study. However, because we were interested in studying school functioning in typically developing children, we did not include data from children with special needs (17) or with learning/language problems (23). We also excluded those children whose parents decided to drop out at any stage of the study (20). Additionally, we did not include first-grade children (23) because they had recently initiated the process of learning to read during the months we collected the data.

A total of 142 participants (74 boys, 68 girls) enrolled in the 2nd to 6th grade (students' distribution from 2nd to 6th grade: 24, 31, 33, 31,

and 23 children) and aged 6 to 12 years ($M = 8.96$, $SD = 1.48$) constituted the final sample. Most children came from two-parent households (87.9%) and White-European backgrounds (85.2%), followed by African (8.3%), Latin-American (3.7%), and other ethnic group backgrounds (2.8%). Regarding children's native language, Spanish was the first language for 86.6% of the sample and the second language for 13.4%.

In terms of parents' education, 71.1% of the mothers were educated at the elementary school level, 17.8% at the high school level, and 11.1% at the university level. For fathers, the analogous percentages were 66.4%, 22.4% and 11.2%, respectively. Regarding monthly family income, 28.8% reported an income < 750€ per month (< $808), 28.8% reported between 751€ and 1200€ (between and $809 and $1293), 21.6% reported between 1201€ and 1600€ (between $1295 and $1725), 11.2% reported between 1601€ and 2000€ (between $1726 and $2156), 8.8% reported between 2001€ and 3000€ (between $2157 and $3234), and 0.8% reported > 3000€ (> $3234). These sample's descriptive statistics were compared with a representative sample of the same region (for more details of this sample, see Diamantopoulou, Pina, Valero-Garcia, Gonzalez-Salinas, & Fuentes, 2012). *T*-test analyses showed that the sample of the current study ($N = 142$) was significantly lower in mother's, t (512) = 5.33, $p < 0.001$, and father's education, $t(484) = 4.17$, $p < .001$, as well as family income, $t(454) = 6.11$, $p < 0.001$, compared to the total sample. Low SES families were over represented in this sample.

2.2. Measures

2.2.1. Effortful control

Parents' reports of children's activation control, attentional focusing, and inhibitory control (components of EC; Rothbart, 2011) were obtained using the Temperament in Middle Childhood Questionnaire (TMCQ; Simonds & Rothbart, 2006), which was validated in a previous study in Spanish population (González-Salinas et al., 2012). Items assess children's behaviors that can be observed in daily situations. Parents evaluated the extent to which each item accurately described their child's behavior within the previous 6 months (1 = almost always untrue to 5 = almost always true, with an additional option of "Not applicable" if parents did not observe their child in the specified situation). Activation control reflects the capacity to perform an action when there is a strong tendency to avoid it (e.g., "Has a hard time getting moving when tired" [reversed item]). Cronbach's alpha for the 15 items included in this scale was 0.69; however, the item "Can make him/herself take medicine or eat food that s/he knows tastes bad" had a negative item-test correlation. This item was removed from further analyses, and the Cronbach's alpha for the final scale was 0.71. Attentional focusing is the tendency to maintain one's attentional focus on task-related channels (7 items, e.g., "When working on an activity, has a hard time keeping her/his mind on it" [reversed item], $\alpha = 0.87$). Inhibitory control is the capacity to plan and suppress inappropriate approach responses under instructions or when attending to social demands (e.g., "Has a hard time waiting his/her turn to talk when excited" [reversed item]). The alpha of this 8-item scale was 0.53, with an average item-test correlation of 0.26. Although this alpha was a bit low, the scale was retained given its relatively strong correlation with the other two subscales ($rs = 0.47$ to 0.50, $ps = 0.001$) and because it was combined with the other two subscales on a latent construct in the model (see below). Items on each of the three subscales were averaged (after reversing items when appropriate).

2.2.2. Learning-related behaviors

These behaviors are often reported by teachers; although teacher's beliefs about students' *teachability* may affect their perceptions of students' behaviors (Keogh, 2003), teachers are in a privileged position to observe them in the classroom. Teachers completed the Study Skills scale from the Spanish version of the Behavior Assessment System for Children (BASC; Reynolds & Kamphaus, 2004; Spanish version by González, Fernández, Pérez, & Santamaría, 2004). The BASC is a comprehensive multidimensional battery that has proved to be a reliable instrument for representative and clinical samples, with a high internal consistency and test–retest reliability (Reynolds & Kamphaus, 1992), and this scale has been used previously in school ages (Brackett, Rivers, Reyes, & Salovey, 2012). The subscale Study Skills is defined as the students' skills that lead to solid school achievement, including organizational skills and positive study habits (e.g., "before solving a problem, s/he analyses the problem carefully", "s/he studies with other children"). Teachers reported the frequency with which children showed a specific behavior related to academic competence (from 1 = never to 4 = almost always). The total score was the average of all items ($n = 12$; $\alpha = 0.93$).

2.2.3. Academic achievement

Children's math and language grades were obtained from report cards following the official five-mark system, which ranged from unsatisfactory (0) to outstanding (4). Teachers evaluated students' achievement in the first trimester of the academic year taking into account exam scores, work in class, and homework.

In addition, children completed the math tests (Calculation, Math Fluency, Quantitative Concepts and Applied Problems) from the Woodcock-Johnson III (WJ-III) Achievement battery (Woodcock, McGrew, & Mather, 2001; Spanish validation developed by Diamantopoulou et al., 2012). In the current study, we used the *Brief Mathematics* score provided by the WJ-III. This math index includes Calculation and Applied Problems scales and previous researches have employed it as an index of math abilities (Jordan, Glutting, & Ramineni, 2010; Jordon, Kaplan, & Hanich, 2002). In the Calculation scale, children were asked to do mathematical calculations (maximum correct answers = 45, $\alpha = 0.78$); whereas Applied Problems required the child to analyze and solve mathematical problems (maximum correct answers = 62, $\alpha = 0.89$). Descriptive statistics of these scales in our sample are shown in Table 1. Reading ability was assessed with the *Batería de Evaluación de los Procesos Lectores – Revisada* (Reading Processes Assessment Battery-Revised; PROLEC-R, by Cuetos, Rodríguez, Ruano, & Arribas, 2007). This battery is a reliable and validated

Table 1
Sample descriptive data. Means, standard deviations (in parentheses), minimum and maximum scores for the standardized academic variables.

	PROLEC scales					WJ scales	
	Name or sound of letters	Same-different	Word reading	Pseudo-word reading	Punctuation marks	Calculation	Applied problems
Girls	19.27 (1.05)	18.74 (1.54)	38.22 (2.73)	36.05 (4.12)	9.37 (2.08)	16.96 (3.50)	34.31 (5.86)
Boys	18.96 (2.32)	18.84 (1.24)	38.53 (2.03)	35.77 (3.45)	9.25 (2.20)	17.78 (3.30)	35.29 (6.02)
Total	19.11 (1.82)	18.79 (1.39)	38.39 (2.39)	35.90 (3.77)	9.31 (2.14)	17.38 (3.41)	34.82 (5.94)
Min. score	1	13	28	21	2	9	21
Max. score	20	20	40	40	11	26	49

PROLEC = Batería de Evaluación de los Procesos Lectores – Revisada (Reading Processes Assessment Battery-Revised; PROLEC-R, by Cuetos et al., 2007); WJ = Spanish Woodcock-Johnson III Achievement battery (Woodcock et al., 2001).

instrument to measure several reading processes in Spanish samples (Cuetos et al., 2007). Specifically, each child completed five subtests. (1) Name or Sound of Letters, in which the child was asked to name or say the sound of 20 written letters to test whether s/he recognized quickly and automatically all the letters of the alphabet (maximum correct answers = 20). (2) Same-Different, in which children were shown pairs of stimuli (words or pseudo-words) and they had to report if the two stimuli were the same or different. This subtest analyzes whether the child is able to segment/identify the letters, or if s/he exhibits a logographic reading (maximum correct answers = 20). (3) Word Reading, in which the child read 40 words with the aim of evaluating the process of letters' recognition (maximum correct answers = 40). (4) Pseudo-word Reading subtest, in which the child read 40 pseudo-words; this subtest indicates the ability to pronounce new or unknown words (maximum correct answers = 40). (5) Punctuation Marks, in which the child was required to read a text attending to eleven punctuation marks (dots, commas, question and exclamation marks) to measure the prosodic elements or intonation of the written language (maximum correct answers = 11). All subtests were scored based on response accuracy (each correct answer added one point) and on the time required to complete the subtest (measured in seconds). Higher scores and shorter time to complete the tasks indicate better performance. The PROLEC-R provides the following equation for calculating the Ability Index for each subtest: correct answers divided by time and multiplied by 100. Because our interest was overall reading achievement, we used a composite score obtained by standardizing the five ability indexes and averaging the scores (Cronbach's $\alpha = 0.77$), with an item-test correlation ranging from 0.31 to 0.75. Descriptive statistics of these scales in our sample are shown in Table 1.

2.2.4. Social adaptation at school

Teachers completed the Social Skills and Aggression scales of the Behavior Assessment System for Children (BASC; Reynolds & Kamphaus, 2004; Spanish version developed by González et al., 2004), an instrument used for the assessment and identification of emotional disorders, personality constructs, and behavioral problems in school-age children, with good internal consistency coefficients (Merenda, 1996; Sandoval & Echandia, 1994; Vaughn, Riccio, Hynd, & Hall, 1997). Teachers rated the frequency (1 = never to 4 = almost always) with which a child tended to act in a hostile manner (verbally or physically) that would threaten others (Aggression scale; $\alpha = 0.96$; 14 items) or successfully interacted with peers and adults (Social Skills; $\alpha = 0.92$; 12 items). Aggression items were reversed to obtain a scale of Low Aggression. The two scales were significantly correlated, $r = 0.28$, $p = 0.001$.

Information about each child's social preference in the context of academic and leisure activities was obtained using a sociometric questionnaire. Children chose 3 classmates with whom they would like to share academic activities ("most liked" nominations) and 3 classmates with whom they would not ("least liked" nominations). The same questions were asked concerning leisure activities. All classmates completed the questionnaire, but for the analyses we only considered the children involved in this study. Following the procedure of Coie, Dodge, & Coppotelli (1982), we summed the nominations that a child received in each category ('most liked' and 'least liked' nominations in academic and leisure contexts) and standardized the value within class. As suggested by Peery (1979), we obtained two indices of social preference, one in academic and the other in leisure context, with the formula 'most liked' minus "least liked," (note that there were approximately equal numbers of boys and girls in the classes).

2.2.5. Control variables

The raw scores of the non-verbal subtest from the Spanish version of the Kaufman Brief Intelligence Test (K-BIT, Kaufman & Kaufman, 1990; $\alpha = 0.80$) were used to assess children's cognitive abilities. This subtest is recommended when children do not master the language or have a first language different from the language of the test (Kaufman & Kaufman, 1990), as was true for close to 15% of children in our sample. Child's gender was coded as 0 for girls and 1 for boys. Parents reported information about their number of years of schooling (ranged from 6 to 17 years for both parents, years $M = 9.99$ (mothers) and 10.04 (fathers); $SD = 2.97$ (mothers) and 3.37 (fathers). Family income was coded using a Likert scale, ranging from $1 = < 750$ *Euros* to $6 = > 3000$ *Euros*. A socioeconomic status index was computed by standardizing and then averaging mother's years of schooling, father's years of schooling, and monthly family income.

2.3. Procedure

The study was approved by the Ethics Committee of the University of Murcia. The head teachers of the two schools were given letters describing the research project and consent forms to distribute to the families. Parents who decided to enroll received the temperament and socio-demographic questionnaires with instructions to complete them at home and, once completed, to return them to school. A research assistant was available at each school to answer any questions raised by the parents.

Assessments of children were divided into 3 individual sessions and were administered by trained research assistants. Verbal consent was obtained from every child before each session. Children completed the WJ-III in the first session, K-BIT in the second session, and the PROLEC-R in the last session. In addition, assistants were counterbalanced between sessions, and no child was ever evaluated twice by the same assistant. Peer social preference was measured once the individual assessment sessions had concluded. A sociogram was collectively administered in the classroom. All classmates completed the questionnaire, although answers were coded only for the children who participated in this study. After receiving instructions from a member of our research group, teachers reported children's grades and completed the Social Skills, Aggressive Behavior, and Study Skills scales from the BASC. All the measures were gathered in the first trimester of the academic year (from September to December 2012).

2.4. Data analyses

Descriptive and correlational analyses were conducted with SPSS, version 22 (IBM, 2013). First, we checked for outliers and the normality of all variables. All variables had normal distributions, and no problematic kurtosis or skewness was identified. Structural equation analyses were run in MPlus, version 6.1 (Muthén & Muthén, 2010). The clustered nature of our sample (children were enrolled in two different schools) was taken into account by introducing school as a control variable in the SEM models. Given our sample size and the number of indicators considered in this study, we ran separate structural equation models for each of the two latent dependent variables (i.e., academic achievement and social adaptation in school).

3. Results

Descriptive statistics, including means and standard deviations, are presented in Table 2.

3.1. Correlational and t-test analyses

In the zero-order correlations, EC indexes (activation control, attentional focusing and inhibitory control) and LRBs were positively correlated with one another (see Table 3). Furthermore, the variables tapping into EC and LRBs were positively related each other and to most of the academic and social indicators. Regarding potential control variables, child's intelligence correlated positively with all academic indicators; SES correlated positively with most of the academic variables and with both leisure and academic social preference. Age was

Table 2
Sample descriptive data. Means, standard deviations (in parentheses), minimum and maximum scores for the variables under study.

	Activ. Contr.	Attent. Foc.	Inhib. Control	LRBs	Math Grades	Lang. Grades	Math Abil.	Read. Abil.	Social Skills	Low Aggr. Beh.	Acad. Social Pref.	Leis. Social Pref.	Intell.	SES	Age
Girls	3.41	3.21	3.54	2.59	2.54	2.77	489.49	−0.06	2.76	3.50	0.57	0.37	25.10	−0.05	8.82
	(0.50)	(0.85)	(0.47)	(0.68)	(1.31)	(1.56)	(17.71)	(0.90)	(0.39)	(0.26)	(1.62)	(1.70)	(5.78)	(0.83)	(1.56)
Boys	3.30	3.17	3.35	2.36	2.46	2.39	492.88	0.04	2.60	3.76	0.00	0.18	25.82	−0.06	8.95
	(0.49)	(0.89)	(0.47)	(0.59)	(1.22)	(1.34)	(17.60)	(0.90)	(0.45)	(0.39)	(1.64)	(1.52)	(5.06)	(0.80)	(1.36)
Total	3.35	3.19	3.44	2.47	2.50	2.57	491.22	−0.01	2.68	3.43	0.27	0.27	25.48	−0.06	8.89
	(0.49)	(0.87)	(0.48)	(0.64)	(1.26)	(1.26)	(17.68)	(0.90)	(0.42)	(0.31)	(1.65)	(1.61)	(5.41)	(0.81)	(1.46)
Min. score	1.77	1	2.25	1.25	0	0	449	−2.43	1.79	2.54	−4.58	−4.66	15	−1.44	6
Max. Score	4.71	5	4.75	3.92	4	4	524	1.86	3.96	3.93	4.15	4.05	38	2.15	12

Activ.Contr. = Activation Control; Attent. Foc. = Attentional Focusing; Inhib.Control = Inhibitory Control; LRBs = Learning-related behaviors; Lang. Grades = Language grades; Math Abil. = Math abilities; Read. Abil. = Reading abilities; Low Aggr. Bah. = Low aggressive behavior; Acad. Social Pref. = Academic Social Preference; Leis. Social Pref. = Leisure Social Preference; Intell. = Intelligence; SES = Socioeconomic status.

positively associated with academic abilities and negatively associated with grades and LRBs. With respect to gender, girls outperformed boys in LRBs, $t(138) = 2.13$, $p = 0.035$; language grades, $t(134) = 1.74$, $p = 0.084$; academic social preference, $t(138) = 2.05$, $p = 0.042$; low aggressive behavior, $t(138) = 2.45$, $p = 0.016$; and social skills, $t(139) = 2.21$, $p = 0.029$. Children's school yielded significant differences in language and math grades, $t(134) = -3.78$, $p < 0.001$ and $t(134) = -3.26$, $p = 0.001$, respectively, as well as in math abilities, $t(139) = -3.02$, $p = 0.003$. Therefore, age, gender, intelligence, SES, and school were included as covariates in the models.

3.2. Structural equation modeling

Two structural equation models were computed, one for academic achievement and the other for social adaptation. Control variables were included as predictors of dependent variables when their correlation with LRBs or with one or more indicators of the potential latent variables was at least marginally significant, $p \leq 0.10$ (see Table 2), and when t-Student analyses yielded significant differences. Specifically, child's intelligence and school were introduced as control variables for academic performance; SES and gender were taken into account for children's LRBs, academic and social adaptation variables; LRBs and academic variables were regressed on child's age.

The goodness of fit of each model was assessed with multiple indicators, including the Bentler Comparative Fit Index (CFI), the Tucker-Lewis Index (TLI), the Root Mean Square Error of Approximation (RMSEA), and the Standardized Root Mean Squared Residual (SRMR). To handle missing data, we used maximum likelihood estimation because it generally produces adequate parameter estimates with less bias than traditional missing data techniques (Peugh & Enders, 2004).

3.2.1. Academic achievement model

Prior to testing the complete academic model, we computed a confirmatory factor analysis (CFA) including only the two latent variables (i.e., EC and academic achievement) to test the measurement model. The model fit was adequate, CFI = 0.98, TLI = 0.96, RMSEA = 0.08, and SRMR = 0.05. As expected, the EC latent variable was composed of inhibitory control, activation control, and attentional focusing scales. Academic achievement was composed of math and language grades, and math and reading abilities. Age was introduced in the CFA as a control variable for the academic indicators. The standardized factor loadings of indicators ranged from 0.49 to 0.91 (Fig. 2 shows the standardized factor loadings of the indicators for the complete model).

The academic model (see Fig. 2) yielded a satisfactory goodness of fit, CFI = 0.98, TLI = 0.95, RMSEA = 0.06, SRMR = 0.05. The results showed that EC was not directly associated with academic achievement, $p = 0.722$. However, it was positively related to LRBs and, in turn, LRBs was associated with academic achievement. An indirect effect was found, in which LRBs mediated the relation between EC and academic achievement; indirect standardized coefficient = 0.32, $p < 0.001$, 95% CI = [0.176, 0.468].

Pathways including control variables were added when they correlated with either the mediator or dependent variables. Only significant paths are shown in Fig. 2. Children with higher intelligence obtained better academic achievement. Children's school was also significantly associated with academic achievement. Finally, child's intelligence and SES were positively related to EC.

Table 3
Zero-order correlations for all the variables under study.

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Activation control	1														
2	Attentional focusing	0.47***	1													
3	Inhibitory control	0.50***	0.47***	1												
4	LRBs	0.25**	0.56***	0.37***	1											
5	Math grades	0.21*	0.42***	0.20*	0.57***	1										
6	Language Grades	0.20*	0.48***	0.24**	0.62***	0.83***	1									
7	Math abilities	0.17†	0.22*	0.23*	0.11	0.30***	0.18*	1								
8	Reading abilities	0.22*	0.28**	0.19*	0.26**	0.33***	0.33***	0.32***	1							
9	Social Skills	0.37***	0.32**	0.29**	0.59***	0.24**	0.36***	0.11	0.18*	1						
10	Low aggr. Beh.	0.28**	0.44**	0.45***	0.41***	0.14	0.21*	0.13	0.13	0.40***	1					
11	Academic social pref.	0.21*	0.40***	0.14	0.50***	0.41***	0.50***	0.11	0.15†	0.38***	0.28**	1				
12	Leisure social pref.	0.11	0.31**	−0.01	0.34***	0.27**	0.34***	0.10	0.09	0.23**	0.19*	0.75***	1			
13	Intelligence	0.08	0.17†	0.12	0.13	0.32***	0.22*	0.70***	0.60***	0.01	0.02	0.13	0.08	1		
14	SES	0.19*	0.27**	0.06	0.27**	0.52***	0.41***	0.17*	0.06	0.09	−0.07	0.26**	0.17*	0.20*	1	
15	Age	0.03	−0.11	0.14	−0.21*	−0.19*	−0.23**	0.71***	0.64***	−0.04	0.01	−0.09	−0.03	0.53***	−0.15†	1

LRBs = Learning-related behaviors; Low Aggr. Beh. = Low Aggressive Behavior; Pref = Preference; SES = Socioeconomic status; ***$p \leq 0.001$, **$p \leq 0.01$, *$p \leq 0.05$. †$p < 0.10$.

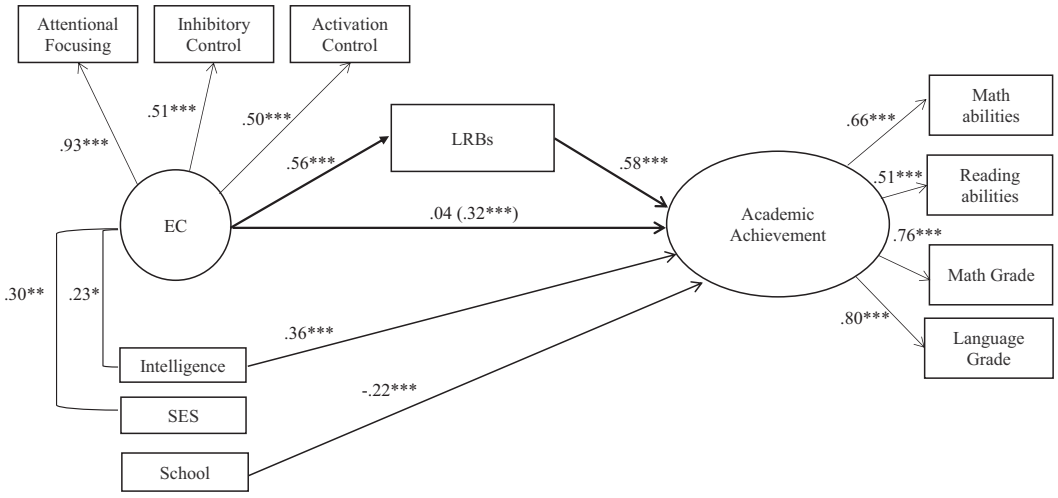

Fig. 2. Predicting academic achievement by EC, LRBs, intelligence, SES, age, gender, and school. Solid arrows represent significant paths, with standardized loadings and significance. Paths from control variables to dependent and independent variables were estimated in the model, but omitted in the graph when they were non-significant. Indirect standardized coefficient is in parentheses. Abbreviations for variables: EC = parent-report of Effortful Control, LRBs = teacher-report of learning-related behaviors, SES = Socioeconomic status. ***$p \leq 0.001$, **$p \leq 0.01$, *$p \leq 0.05$.

3.2.2. Social adaptation model

First, a CFA was computed to test the measurement model including only the two latent variables, that is, EC and social adaptation. The model fit was adequate, CFI = 0.97, TLI = 0.94, RMSEA = 0.08 and SRMR = 0.06. EC configuration was similar to that obtained in the academic model, and social adaptation was comprised of social skills, low aggressive behavior, academic social preference, and leisure social preference. The standardized factor loadings of indicators ranged from 0.35 to 0.72 (Fig. 3 shows the standardized factor loadings of the indicators for the complete model).

The complete social adaptation model showed an adequate goodness of fit, CFI = 0.97, TLI = 0.93, RMSEA = 0.06, SRMR = 0.06 (see Fig. 3). High EC and LRBs were both directly associated with better social adaptation. The mediational analysis also confirmed the indirect effect from EC to social adaptation through LRBs; indirect standardized coefficient = 0.29, $p < 0.001$, 95% CI = [0.159, 0.423]. Regarding control variables, better EC was positively correlated to higher family SES; younger children were scored as higher on LRBs than older students; and girls exhibited better social adaptation and LRBs compared with boys.

4. Discussion

Success at school has a positive impact on children's development and well-being but in every country, a proportion of students fail to reach a baseline level of acceptable school performance. The present study contributed to the effort to identify factors that could explain individual differences in school functioning, which could be considered in further designing intervention programs at school. Using multiple methods and reporters, we found that children's EC was directly associated with social adaptation in elementary school, and indirectly related to academic performance and social adaptation through mediation by children's LRBs. These relations were tested controlling for family SES, and children's intelligence, gender and age. This broad approach to the study of school functioning constitutes one of the main contributions of the present research.

As expected, children's EC reported by parents was positively associated with teachers' ratings of LRBs. The skills involved in EC, such

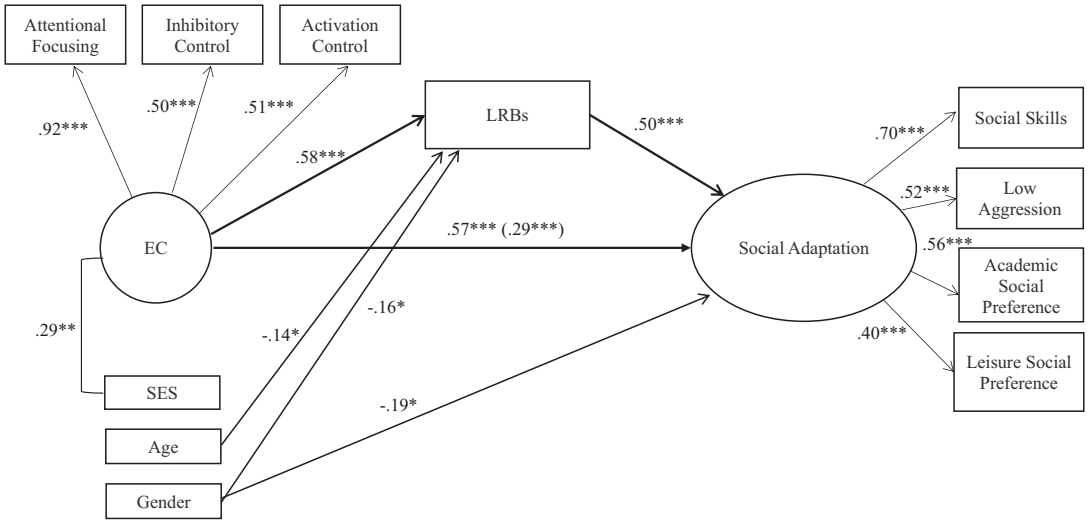

Fig. 3. Predicting social adaptation by EC, LRBs, age, gender and SES. Solid arrows represent significant paths, with standardized loadings and significance. Paths from control variables to dependent and independent variables were estimated in the model, but omitted in the graph when they were non-significant. Indirect standardized coefficient is in parentheses. Abbreviations for variables: EC = parent-report of Effortful Control, LRBs = teacher-report of learning-related behaviors, SES = Socioeconomic status, ***$p \leq 0.001$, **$p \leq 0.01$, *$p \leq 0.05$.

as ability to focus attention while ignoring possible distractors, to suppress prepotent responses, to flexibly attend to the situations demands, and to voluntarily initiate behaviors to cope with tasks requests, probably permit the deployment of self-regulatory behaviors in connection to work and in the interpersonal sphere (Duckworth & Allred, 2015; Zhou et al., 2010), such as those involved in LRBs. Moreover, the positive association found between EC and LRBs could be explained in part by their underlying mechanisms; although other skills and motivation are involved in LRBs, executive control skills are believed to underlie, or overlap partly, with EC (Posner & Rothbart, 2007) and LRBs (Brock et al., 2009).

In turn, LRBs were directly related to school functioning, a finding that replicated the positive relation previously found between children's LRBs and academic achievement (Neuenschwander et al., 2012; Sánchez-Pérez et al., 2015). In our sample, those children who exhibited behaviors oriented to learning such as following the teacher's instructions in the classroom, completing day-to-day work, persisting in problem solving, and participating in teamwork, tended to obtain higher scores on both standard tests and grades. In other words, the use of metacognitive abilities altogether with a high degree of engagement in coping with academic tasks as reflected in LRBs (Fantuzzo et al., 2004; Neuenschwander et al., 2012) seems to constitute a crucial factor for a higher academic achievement in elementary school.

The finding of a positive relation between LRBs and children's social adaptation in the elementary-school years is consistent with, but also extends, the prior finding that preschoolers with better LRBs exhibited positive social relationships, higher popularity among their peers, and lower levels of aggressive behavior (Fantuzzo et al., 2004; Sasser et al., 2015). It has been suggested that the self-regulatory aspects involved in LRBs facilitate enhanced cooperation, attention, motivation, and persistence, and may provide increased opportunities for social participation, coordinated play, and even feedback from teachers, which are essential for the development of social competence and control of aggression (Sasser et al., 2015). Alternatively, bearing in mind that LRBs and social behaviors in our study were reported by teachers, it is possible that teachers' perceptions might have been biased, providing a more positive view of social behaviors in the classroom for those students with better LRBs.

Of most importance, LRBs appeared to play a mediational role in the association between EC and school functioning. This finding suggests that the dispositional self-regulatory abilities indexed by EC constituted a remote effect, whereas the deployment of LRBs by children in their classrooms was a proximal influence on school functioning. Concerning academic performance, our finding is consistent with previous research (Neuenschwander et al., 2012; Valiente et al., 2007; Valiente, Lemery-Chalfant, Swanson, & Reiser, 2008), and supports Duckworth's (2015) model in which the quality and quantity of learning experiences mediate the relation of students' EC to academic performance. Given that these mediational relations were found when we controlled for intelligence, we can conclude that academic achievement does not rely solely on children's general cognitive abilities, but also on the effort and the quality of strategies students use in coping with learning at school.

Regarding social adaptation, we found that higher EC was positively associated with social skills and acceptance among peers, and negatively associated with the presence of aggressive behaviors, and this association was partially mediated by LRBs. Higher EC in children might facilitate the use of LRBs; in turn, the active participation involved in LRBs provides opportunities for social interactions with teachers and peers, leading to the development of social skills and the control of aggression (Sasser et al., 2015). To our knowledge, mediation by LRBs of the relation of EC to social outcomes has not been examined previously, although Sasser et al. (2015) found similar mediation by LRBs of the relation between executive functioning in kindergarten children and later social skills and reduced aggression in elementary school.

Additionally, we observed a direct association between EC and social adaptation in school. Children rated by their parents as relatively high in EC were viewed by their teachers as more socially skilled and less aggressive than their less regulated peers, and were better liked by their classmates. This result replicates previous findings (Chang et al., 2011; Sasser et al., 2015; Zorza et al., 2013). One explanation for these results is that children with higher EC better manage their attention, emotion, and behavior, which may contribute to their tendencies to behave in constructive and socially appropriate ways in social interactions at school (Eisenberg et al., 2010b).

The models in this study were tested using children enrolled in two State Spanish schools where success in academic performance largely relied on students' individual work, both in classroom and at home. Interestingly, similar results have been found in samples coming from other educational systems, such as in China (Zhou et al., 2010), Sweden (Neuenschwander et al., 2012), Italy (Alessandri et al., 2014), and the United States (Blair & Razza, 2007; Chang et al., 2011; Eisenberg et al., 2005; Eisenberg et al., 2010a; Valiente et al., 2008). As Zhou et al. (2010) suggested, regardless of differences in the educational context, this convergence in findings provides empirical support for the idea that individual differences in EC underlie children's academic and socio-emotional competence across cultures.

Additional personal and family characteristics (i.e., the participation of SES, intelligence, age and gender) were considered as control variables in this study because previous research suggested that they were relevant for predicting children's school functioning. Consistent with previous studies (Fernald, Marchman, & Weisleder, 2013; Noble et al., 2015), SES was positively related to academic achievement. Less-educated parents with lower income levels tend to experience more difficulties in providing their children with cognitively stimulating materials and experiences, which may negatively affect their children's academic performance (Bradley & Corwyn, 2002).

Children's intelligence was positively associated with academic achievement, as measured via grades and standard tests, in line with a vast body of previous evidence (Alloway & Alloway, 2010; Karbach et al., 2013). Contrary to our expectations, age was negatively associated with LBRs. In our sample, teachers scored older children as lower in the use of LRBs compared to younger ones. Perhaps teachers of higher educational levels established higher standards or expectations in regard to children's academic learning skills. Finally, consistent with prior findings (e.g., Card et al., 2008; Yang et al., 2014), teachers reported that girls, compared to boys, exhibited better social skills and less aggressive behavior, and girls were better accepted by the peer group. However, it is possible that the gender difference for aggression were due to the instrument used, which tapped direct rather than indirect aggression; indirect aggression tends to be more common for girls (Card et al., 2008).

4.1. Strengths and limitations

There are several strengths of the present study. First, a considerable number of variables, including personal and home environment characteristics, were examined to better account for both academic and social functioning at school. Second, the constructs were assessed with a variety of instruments (i.e., ratings and standardized tests) and multiple informants (teachers, parents, and peers), providing more robust measures and minimizing the problem of common reporter biases.

Despite these strengths, a main limitation of this study is that the data were all concurrent so it is impossible to draw any conclusions regarding the direction of the effects. Even so, this limitation is somewhat tempered by the strong conceptual approach to ordering variables in the model. A second limitation is related to the measurement of the EC latent construct. Whereas activation control and attentional focusing showed acceptable indexes of internal consistency, inhibitory control did not. A larger study of > 1000 Spanish elementary school children (González-Salinas et al., 2012) reported satisfactory levels of internal consistency for all EC scales, giving support to its use in Spanish

population in the range 6–12 years.

Also, it is worth mentioning the sample of this study is not representative of its geographic area because only two schools participated and the families were of lower SES than the average in their geographic area. However, the present results are in consonance with the literature reviewed here, which involved diverse family socioeconomic conditions.

4.2. Conclusions and future directions

In conclusion, the predictors of children's school functioning found in two State Spanish schools were similar to those found in studies conducted in other countries, supporting the notion that children's effortful self-regulation and children's efficiency in learning behaviors are relevant for school success across cultures. Our results highlight the potential relevance of children's EC and LRBs as factors jointly accounting for individual differences in academic performance and social adaptation in elementary school.

Implications for intervention programs in the school context could be derived from this study; probably low achievers could benefit from training self-regulation and related abilities covered by EC and LRBs, respectively. Some initiatives involving inhibitory and attentional control training have proved effective for enhancing children's adjustment to school (O'Connor, Cappella, McCormick, & McClowry, 2014; Riggs, Greenberg, Kusché, & Pentz, 2006). Significant improvements have also been found in academic achievement by training metacognitive skills (Kramarski & Mevarech, 2003; Teong, 2003).

Future research should test this model longitudinally to examine if the direction of the associations and the indirect pathways found here are confirmed. It would also be useful to assess the applicability of this model to other educational levels; presumably, effortful self-regulation and learning skills contribute to academic and social success in secondary and university levels.

Because teaching-learning processes that occur in school are complex, the significance of EC and LRBs found in this study could be moderated by a number of other elements not examined in this work. Additional research is needed to evaluate the moderator effect of these factors; based on Duckworth (2015), we point to the relevance of children's motivation and engagement, or quality of teacher-child relationships, as possible moderators.

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Conflict of interest statement

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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