

The role of executive function in social competence and behavioral problems in the last year of preschool

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Título: El rol de las funciones ejecutivas en la competencia social y en los problemas de conducta en educación infantil.

Resumen: Diversos estudios han encontrado relaciones entre las funciones ejecutivas, los problemas de conducta y la competencia social. Sin embargo, hasta la fecha, hay pocos estudios que hayan investigado el papel de los distintos componentes ejecutivos en la competencia social y los problemas de conducta más frecuentes en Educación Infantil. Por esta razón, el principal objetivo de este artículo es analizar la relación entre las funciones ejecutivas, los problemas de conducta y la competencia social en la etapa infantil. En el estudio participaron 260 alumnos/as en su último año de Educación Infantil. Los resultados del path analysis mostraron que todos los componentes de las funciones ejecutivas predecían, al menos, un factor de los problemas de conducta. Sin embargo, solo los déficits en flexibilidad y en memoria de trabajo predijeron la adaptabilidad y las habilidades sociales. En conclusión, los resultados del estudio muestran que, de las variables de funciones ejecutivas analizadas, son los déficits en inhibición los que se relacionan con un mayor número de problemas de conducta, mientras que la flexibilidad cognitiva es la que tiene una relación más elevada con la adaptabilidad y las habilidades sociales.

Palabras clave: funciones ejecutivas; problemas de conducta; competencia social; educación infantil; path analysis.

Abstract: Diverse studies have found a relationship between executive function, behavioral problems and social competence. However, until this moment, few studies have investigated the role of the distinct components of executive function in social competence, or in the most frequently encountered behavioral problems in childhood education. For this reason, the principal objective of this article is to evaluate the relation of the executive functions with behavioral problems and social competence in infancy. The study included 260 students in their last year of preschool. The results of path analysis showed that all components of executive functions predict, at least, a behavioral problem. However, only deficits in flexibility and working memory predicted adaptability and social abilities. In conclusion, the results of the study showed that of the variables of executive function analyzed, it is deficits in inhibition that relate to the greatest number of behavioral problems; whilst cognitive flexibility is the variable which has the strongest relationship with adaptability and social skills.

Keywords: executive function; behavioral problems; social competence; childhood education; path analysis.

Introduction

The stage of childhood education is a vital period for children's physical, social, emotional and cognitive development (Flores-Lázaro, Castillo-Preciado, & Jiménez-Miramonte, 2014; Sastre-Riba, Fonseca-Pedrero, & Poch-Olivé, 2015). During these years – which in western societies generally take place between the ages of 3 and 6 years – children experiment with the transition from home, where the majority of their interactions are with their parents, to school, where they spend a large part of their day and where they have to learn to relate to and interact with other boys and girls of the same age (van Lier & Deater-Deckard, 2016).

The new social environment of the classroom offers children valuable experience through which to learn and practice social and emotional skills; develop friendships with their peers; and to understand important social norms related to work. In this process of adapting children to school, social competence plays a fundamental role. Social competence is here understood as the repertory of abilities that allow people to contend with the demands of a social situation in an acceptable manner (McCloughlin, 2009); to initiate and sustain cooperative and positive social interactions; as well as

to know how to resolve conflicts or make friends (Hubbs-Tait, Osofsky, Hann, & Culp, 1994).

However, not all children have cordial relationships with their peers and teachers, and many of them find themselves with diverse behavioral problems throughout the length of this journey to maturity. Problems in relationships with teachers and equals are linked to childhood maladaptation, generating aggressive behavior, conflicts and socially unacceptable behaviors (Thapa, Cohen, Guffey, & Higgins-D'Alessandro, 2013). These types of behaviors are examples of what are known as behavioral problems, defined as being unable, or finding it difficult, to respect the rights of others (Gaik, Abdullah, Elias, & Uli, 2010). That is to say, the term covers all those types of behavior that imply an infraction of social norms, destruction of property and the humiliation, or transgression of the basic rights of, others (Clakins & Keane, 2009; Murray & Farrington, 2010).

In recent years there has been an increased preoccupation with the development of behavioral problems during early infancy, since behavioral problems are not only associated with adverse effects for victims but are also related to academic, social and psychological difficulties for the perpetrator (López-Rubio, Fernández-Parra, Vives-Montero, & Rodríguez-García, 2012; Montroy, Bowles, Skibbe, & Foster, 2014; Poland, Monks, & Tsermentseli, 2015).

Furthermore, behavioral problems at an early age are predictors of multiple problems in the stages that follow. Diverse investigations have demonstrated that negative social experiences with peers and teachers during one's first

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years, are linked with serious negative experiences at later ages, including suicidal thoughts, externalizing and internalizing problems, low academic performance, physical illnesses and low self-esteem (Cillessen & Lansu, 2015; McDougall & Vaillancourt, 2015; van Lier & Koot, 2010; Wang, Selman, Dishion, & Stormshak, 2010). In this line, Farrington (2005), established that the origin of behavioral problems is by nature multi-causal, and is generally associated with a series of risk factors that can increase the likelihood of the appearance of these problems, such as familial, contextual, academic or personal factors.

One of the predictors of behavioral problems and social competence in infants is executive function. Although there is no consensus on the definition of executive function, and multiple definitions can be found in the literature, in their review Baggetta and Alexander (2016) pointed out a series of conceptual similarities among researchers. Baggetta and Alexander defined executive function as the set of higher-order cognitive processes that allow control of behaviors essential to learning and carrying out tasks, and contribute to the supervision and regulation of these behaviors. Furthermore, they do not only influence the control exercised by executive function in the cognitive field, but also in socio-emotional and behavioral domains.

Another point of conceptual convergence is an agreement that the growth of executive function is multidimensional, being composed of three fundamental components: inhibitory control, working memory and cognitive flexibility (Diamond, 2013; Miyake et al., 2000). However, several authors define emotional control as another of the fundamental components of executive function (for example, García-Barrera, Kamphaus, & Bandalos, 2011).

Inhibitory control is the ability to deliberately control emotions, thoughts and behaviors, inhibiting the urge to carry out inappropriate behaviors (Diamond, 2013). Inhibitory control allows individuals to adjust and adapt their behaviors, and respect the established social norms. It has a fundamental role in the establishment of interpersonal relations and in the learning process. Furthermore, it is significantly related to adaptive behavior in infancy, and could be a predictor of its development (Allan & Lonigan, 2011; Gligorovic & Buha Durovic, 2012; Kim, Nordling, Yoon, Boldt, & Kochanska, 2013; Pallini & Laghi 2012).

The ability of children to inhibit their impulses plays a crucial role in their interactions with their peers and with adults, especially in childhood education. It is a common occurrence for children of preschool age to have conflicts with their peers, in situations in which other children obstruct or interfere with their goals (for example, one child takes a game away from another child who was playing with it). For many children, the natural tendency could be to employ physical aggression (for example, to hit the child who took the game) to achieve their objective. However, those children who are capable of inhibiting their natural tendency to use physical aggression (that is to say, the dominant response) and use dialogue in its place (that is to say, the sub-

ordinate response) to reach their goals, are likely to be seen as better playmates by their peers and teachers – and so are more socially competent. On the other hand, those children who are not capable of inhibiting their impulses are more disposed to exhibit externalizing problems, like physical aggression, and can be seen as bad playmates by their peers and teachers. This possible rejection could lead to internalizing problems like, for example, withdrawal (Rhoades, Greenberg, & Domitrovich, 2009).

Another component of executive function is the working memory, which refers to the ability to maintain information in the mind in order to be able to work with it. Working memory allows us to remember why we should behave in some ways and not in others (Diamond, 2013); for example, allowing children to remember why it is better to use dialogue than violence if one of their classmates takes the game they were playing with from them.

Another factor that is particularly relevant to executive function is cognitive flexibility, which refers to the capacity of individuals to flexibly adapt themselves to the demands of an environment, allowing people to adopt different perspectives and to look at the same thing from different points of view (Kiesel et al., 2010; Vandierendonck, Liefvooghe, & Verbruggen, 2010). Flexibility is crucial for creative problem solving and allows us to search for different solutions. Cognitive flexibility includes responses in which a child proposes an alternative solution and anticipates positive consequences for everyone involved in the problem. For example, when another child takes the game they were using, it allows a child to use dialogue and look for a solution which meets the needs of both parties (like proposing to play together). Therefore, cognitive flexibility has a relevant role in resolving conflicts, since it gives us the ability to generate a significant amount of solutions and to balance the satisfaction of our own desires with the interests of others (Maddio & Greco, 2010).

In spite of the fact that many authors have included emotional control as a part of inhibitory control, Zelazo et al. (2003) propose a model based on two dimensions of executive function. One dimension includes cognitive control or regulation, called ‘cold’ executive functions, and the other dimension is based in emotional control or regulation, labelled ‘hot’ executive function.

Emotional control, therefore, is considered as a hot executive function, and makes reference to the capacity of individuals to emotionally self-regulate in the face of environmental or internal signals (García-Barrera et al., 2011). Emotional control is a key factor in the prevention of hyperactivity (Maier et al., 2014; Posner et al., 2011) and of aggressive behavior (Duncombe, Havighurst, Holland, & Frankling, 2013).

For these reasons, and owing to the relationship between executive function and diverse psychopathological and behavior disorders found by a range of studies in adolescents and adults, an interest in studying the development of executive functions in infancy was born (Allan & Lonigan, 2014;

Biederman et al., 2010; Flores-Lázaro et al., 2014; Närhi, Lehto-Salo, Ahonen, & Marttunen, 2010; Stelzer, Cervigni, & Martino, 2011; Verlinden et al., 2014).

However, until the present day, few studies have investigated the role of the distinct components of executive function in social competence and the most commonly encountered behavioral problems in childhood education. The relative lack of studies in preschool age children is alarming, since this period of development is characterized by an increase in individual autonomy and represents a time during which social and cognitive demands are increased (Prencipe et al., 2011). Furthermore, it is an age in which behavioral problems become increasingly evident (Kessler et al., 2005). Therefore, the principle objective of this article is to evaluate the relation of the executive functions with behavioral problems and social competence in infancy. It is expected that deficits in executive function will relate significantly and positively with the different variables of behavioral problems, and will relate in a significant and negative manner with the two variables of social competence analyzed in this study (adaptability and social skills).

Method

Design

Based on the research objectives, the methodology used was ex post facto prospective. The participating schools were selected through incidental sampling, including those that, after explaining the research objectives, agreed to participate in the study.

Participants

The participants were 260 parents (82% mothers, 18% fathers) who evaluated 145 boys and 115 girls in their last year of preschool (M age = 5.48 years, SD age = 0.23) belonging to 10 different schools, 2 public schools (32%) and 8 privates but publicly funded schools (68%), situated in Andalucía (Spain). All the centers were presenting similar sociocultural contexts.

Ten children were excluded due to ascertained developmental disorders. In some Spanish schools, children with special needs or disabilities (e.g. Down syndrome, Asperger's syndrome...) are fully integrated into the regular classroom, nevertheless we preferred to initially verify the relationship of executive functions, behavior problems and social competence in children with typical development.

In Spain, children from 3 to 6 years old attend kindergarten that offer a pre-primary curriculum. Kindergartens are mostly public and free of charge for families. Attendance at kindergartens is non-compulsory, but it is almost universal: more than 95% of the target children attend kindergarten before to start the primary school at age of six (Ministerio de Educación, Cultura & Deporte, 2017).

Measures

Deficits in executive functions. Parents were administered the Behavioral Evaluation of Executive Function— infant version (BRIEF-P; Gioia, Espy, & Isquith, 2002; Spanish adaptation by Bausela & Luque, 2016). This scale is made up of 63 items articulated in 6 subscales: *Deficits in inhibition*, evaluating the presence of inhibitory control problems in the child, that is, in their capacity to inhibit, resist or to not react to an impulse, as well as the existence of difficulties in halting or 'braking' their own behavior at the appropriate moment (16 items, e.g. "Is unaware of how his/her behavior affects or bothers others"); *deficits in flexibility*, evaluating the presence of problems in the child with changing freely from one situation, activity or aspect of a problem to another, as required by circumstances (10 items, e.g. "Becomes upset with new situations"); *deficits in emotional control*, addressing the manifestation of problems with executive function within the emotional sphere and evaluating the existence of difficulties in moderating emotional responses in the child (10 items, "Overreacts to small problems"); *deficits in working memory*, measuring the presence of difficulties in maintaining information in the mind with the objective of completing a task or giving a response (17 items, "When given two things to do, remembers only the first or last"); deficits in planning and organization, for the present investigation the 10 items of the planning and organization scale were not used. Items were rated on a Likert scale ranging from 0 (never) to 2 (frequently). The reliability analyses conducted for this investigation confirmed the internal consistency along the scale in the Spanish sample: deficits in emotional control $\alpha = .86$; deficits in working memory $\alpha = .88$; deficits in flexibility $\alpha = .78$; and for the deficits in emotional control $\alpha = .82$.

Social competence and behavior problems. Parents were administered the Behavior Assessment System for Children (BASC; Reynolds & Kamphaus, 1992; the Spanish adaptation by González, Fernández, Pérez, & Santamaría, 2004). This scale is made up of 14 clinical scales and 5 global dimensions. However, for the current investigation only 73 items were used. They correspond to the scale of: *adaptability*, measuring the child's ability to easily adapt to changes in the environment (11 items, e.g. "Is stubborn"); *social skills*, evaluating needed to interact successfully with peers and adults in the areas of home, school and community skills (14 items, e.g. "Admit your mistakes"); *aggression*, evaluating evaluates the child's tendency to act in a hostile way, either verbally -or physically threatening others (13 items, e.g. "hitting other children"); *hyperactivity*, evaluating the child's tendency to be overly active, to hastily execute the work and activities and to act without thinking (16 items, e.g. "Shouts"); attention problems, he child's tendency to be easily distracted and unable to concentrate for a long period (8 items, e.g. "forgets things"); *Withdrawal*, evaluating the child's tendency to avoid others and to avoid social contact (11 items, e.g. "play alone"). The questionnaire presents a Likert scale with response values from 0 (never) to 3 (often). The reliability

analyses conducted for this investigation confirmed the internal consistency along the scale in the Spanish sample: adaptability $\alpha = .74$; social skills $\alpha = .86$; social skills $\alpha = .86$; aggression $\alpha = .75$; hyperactivity $\alpha = .87$; attention problems $\alpha = .80$; and Withdrawal $\alpha = .80$.

Procedure

The protocols were approved by the Committee on Bioethics in Human Research (University of Granada) which managed the project and all met the requirements of the Code of Ethics in Psychology and the Spanish Data Protection Act.

At first, we proceeded to contact various centers to meet the interest in participation in this study. Then, different areas 10 centers in Andalusia (Spain) decided to participate in the study. Once permission was obtained from the centers and teaching staff, we proceeded to send a letter to parents of children 5 years in which reported the research objectives and questionnaire executive functions enclosing and social competence for completion. Finally, parents who decided to collaborate delivered completed questionnaires. Once the questionnaires completed by the parents, proceeded to data analysis and report writing research.

The final stages were the data analysis and reporting. In addition, an individualized report of each student where the results are captured, in order to inform parents and teachers was conducted.

Data Analysis

Based on the research objectives, methodology used was such ex post facto prospective. First, descriptive analyses were performed to characterize the sample (arithmetic mean and standard deviation) in each of the study variables. Second, Pearson correlation coefficient was performed to examine the relations among the study variables. Then two Path Analysis models were performed using EQS 6.1 (Bentler, 2006), in order to verify if executive functions were related with on the one hand behavior problems, and on the other hand social competence. Models testing used maxi-

mum likelihood estimation method. In addition, robust statistics were used in order to account for the multivariate non-normality of variables; robust statistics included the Satorra-Bentler χ^2 test statistic and robust Comparative Fit Index (Satorra & Bentler, 1994), both of which adjust standard errors to calculate parameter estimates in situations where multivariate normality cannot be assumed. In evaluating the overall goodness of fit for the models, the following criteria were used: the robust Comparative Fit Index (CFI > .90), and the Root-Mean-Square Error of Approximation (RMSEA < .05).

Results

Descriptive statistics and correlations

Means, standard deviations, and range of scores of study variables are presented in Table 1.

Table 1. Means, standard deviations, and range scores of study variables.

	<i>M</i>	<i>SD</i>	Range
Deficits in inhibition	0.49	0.34	0-2
Deficits in flexibility	0.30	0.31	0-2
Deficits in working memory	0.35	0.31	0-2
Deficits in emotional control	0.41	0.34	0-2
Adaptability	2.31	0.38	0-3
Social Skills	2.25	0.45	0-3
Aggression	0.48	0.27	0-3
Hyperactivity	1.03	0.46	0-3
Attention problems	0.76	0.45	0-3
Withdrawal	0.81	0.45	0-3

Pearson correlation coefficients are reported in Table 2. The results showed a significant and negative correlation between variables measuring deficits in executive functions and social competence (adaptability and social skills). Moreover, a significant and positive correlation was found between the deficits in executive functions and behaviors problems (attention problems, hyperactivity, aggression and withdrawal). No significant relationship was found between deficits in inhibition and withdrawal.

Table 2. Pearson correlation coefficients between study variables.

	1	2	3	4	5	6	7	8	9	10
1. AD	1									
2. SS	.65**	1								
3. AG	-.25**	-.25**	1							
4. H	-.21**	-.31**	.57**	1						
5. AP	-.35**	-.39**	.37**	.61**	1					
6. WD	-.55**	-.24**	-.03	-.01	.14*	1				
7. DI	-.21**	-.28**	.53**	.76**	.53**	-.03	1			
8. DF	-.59**	-.31**	.21**	.27**	.34**	.60**	.30**	1		
9. DM	-.33**	-.34**	.33**	.53**	.77**	.15*	.63**	.37**	1	
10. DE	-.34**	-.25**	.59**	.56**	.37**	.17**	.61**	.44**	.43**	1

* $p < .05$; ** $p < .01$

Note. AD adaptability, SS social skills, AG aggression, H hyperactivity, AP attention problems, WD withdrawal, DI deficits in inhibition, DF deficits in flexibility, DM deficits in working memory, DE Deficits in emotional control

In order to explore the existence of differences in the study variables associated with children's gender, type of school (private vs. public), and gender of parent who completed the scales, we performed a series of ANOVA. Results revealed significant differences associated with children's gender in deficits in emotional control [$F(1.253) = 5.28, p = .022$] and attention problems [$F(1.255) = 5.07, p = .025$], with boys reporting lower levels of deficits in emotional control and higher levels of attention problems than girls. Results also revealed significant differences associated with the type of school in deficits in emotional control [$F(1.254) = 6.77, p = .010$] and aggression [$F(1.252) = 7.89, p = .005$], with children coming from public schools reporting lower

levels in both variables than those attending private schools. On the basis of these results, we decided to include children's gender and the type of school as control variables in the models tested.

Relations between executive functions and behavior problems

To determine whether deficits in inhibition, deficits in flexibility, memory problems, and emotional control problems foreboded behavior problems (aggression, hyperactivity, attention problems and withdrawal), a path analysis model. It evidenced a good fit to the data (see Table 3).

Table 3. Goodness-of-fit indexes for the two models tested.

	S-B χ^2	df	p	CFI	RMSEA	RMSEA 90% CI
Model 1 Deficits in executive function and behavior problems	12.59	13	.48	1.00	.00	.00-.06
Model 2 Deficits in executive function and social competence	7.16	11	.79	1.00	.00	.00-.04

Figure 1 presents the standardized parameter estimates. Deficits in inhibition were related positively with aggression, hyperactivity and negatively with withdrawal. Deficits in working memory were related positively with attention problems. Deficits in flexibility were related negatively with aggression and positively with withdrawal. Finally, deficits in emotional control were related positively with aggression and hyperactivity. Gender was related positively with deficits

in emotional control and negatively with attention problems only, with boys reporting lower levels of deficits in emotional control and higher levels of attention problems than girls. The type of school was related negatively with deficits in emotional control and aggression, with children coming from public schools reporting lower levels of both variables than those attending private schools.

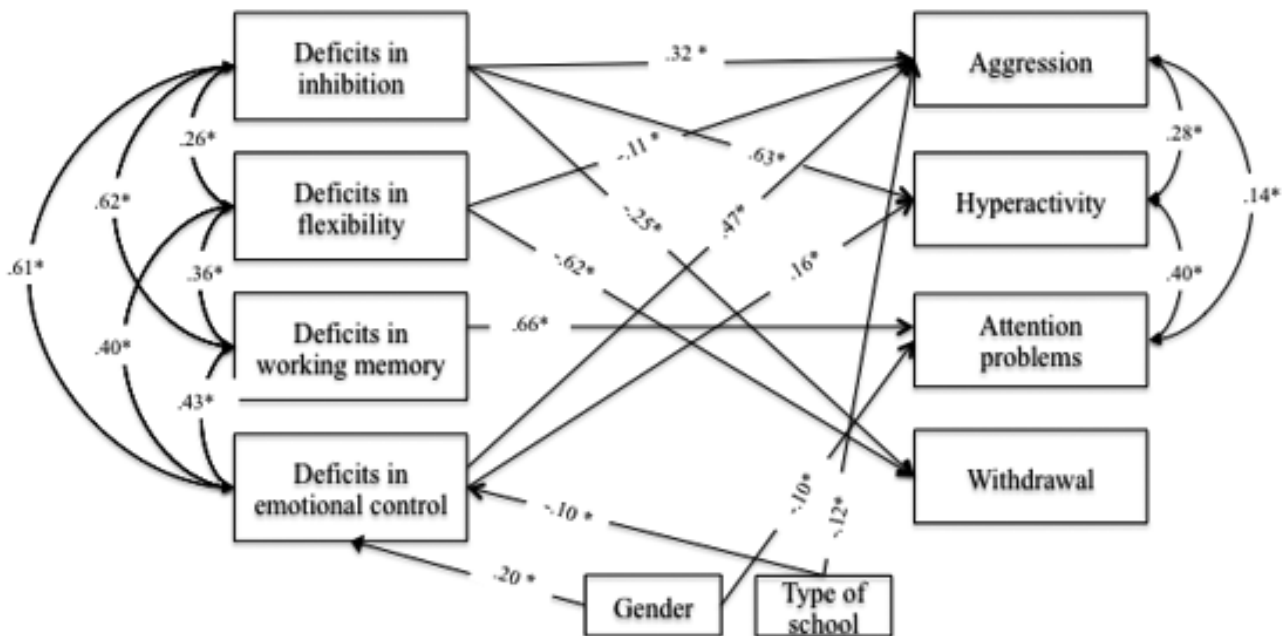


Figure 1. Statistical model of the relation between executive functions and behavior problems. Standardized solution. Not significant estimates are not reported. Residuals are not reported.

Relationships between executive functions and social competence

To determine whether deficits in inhibition, deficits in flexibility, memory problems, and emotional control prob-

lems foreboded adaptability and social skills, a path analysis model. It evidenced a good fit to the data (see Table 3). Figure 2 presents the standardized parameter estimates. Deficit in flexibility and in working memory were negatively related with adaptability and social skills. Gender positively affected

deficits in emotional control only, with girls reporting higher levels than boys. The type of school was related negatively with deficits in emotional control, with children coming

from public schools reporting lower levels than those attending private schools.

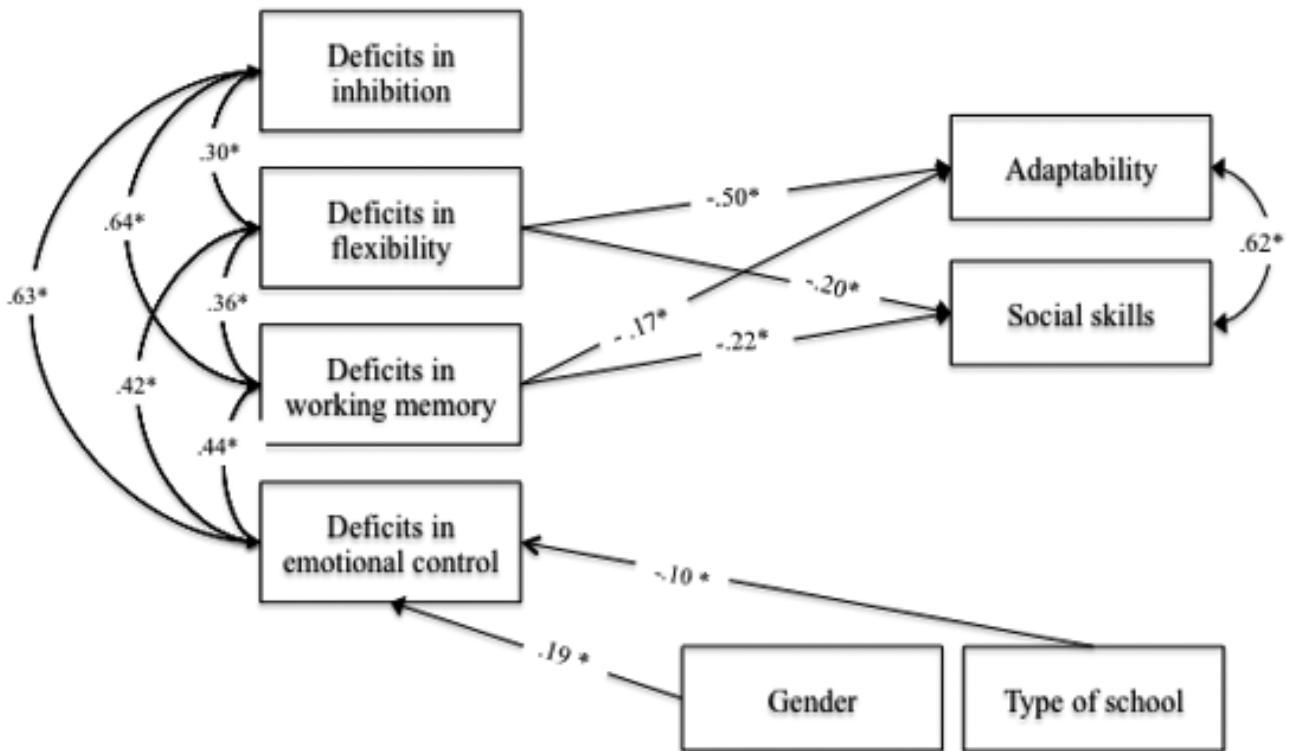


Figure 2. Statistical model of the relation between executive functions and social competence. Standardized solution estimates. Not significant estimates are not reported. Residuals are not reported.

Discussion

The number of children who present with disruptive behavior (for example, attention deficit hyperactivity disorder, or behavioral disorders) has increased dramatically in recent years. These disorders are associated with numerous long-term negative consequences, including academic failure, substance abuse and low self-esteem (Cillessen & Lansu, 2015; Diamond, 2013; McDougall & Vaillancourt, 2015). The children who present with behavioral problems in preschool are particularly likely to show a persistent prognosis (Moffitt, 1990). Identifying cognitive impairments that distinguish school-age children who demonstrate aggressive behavior from those who do not exhibit such difficult behaviors could help early detection, and the development of intervention programs (Ellis, Weiss, & Lochman, 2009). For this reason, the principal objective of this article is to evaluate the relation of the executive functions with behavioral problems and social competence in infancy.

Firstly, it was found that lack of inhibitory control correlated positively with aggression and hyperactivity, and negatively with reserved behavior. That is to say, children who had more difficulty resisting – or not reacting to – an impulse were observed to be acting more hostile, to be exces-

sively active, to act without thinking and to be less reserved. However, inhibitory control was not related to attention problems. In general, the study found a strong negative correlation between inhibitory control and externalizing problems like aggressive behavior (Di Norcia, Pecora, Bombi, Baumgartner, & Laghi, 2015), and hyperactivity (Ezpeleta & Granero, 2015; Pauli-Pott & Becker, 2011). In contrast, the relationship between inhibitory control and internalizing problems is more controversial. Several studies have shown a negative correlation between these two constructs (Eisenberg et al., 2001; Oldehinkel, Hartman, Ferdinand, Verhulst, & Ormel, 2007), while others have not found any relationship (Oosterlaan, Logan, & Sergeant, 1998; Rydell, Berlin, & Bohlin, 2003).

With regard to flexibility, it was found that children who have more difficulties to flexibly adapt to the demands of their environments were more reserved. These findings appear logical, since the ability to be flexible allows individuals to generate distinct solutions when faced with a problem, and to balance the satisfaction of their own desires with the interests of others (Maddio & Greco, 2010), without finding it necessary to evade others or avoid eye contact. On the other hand, the results show that children who scored more highly for aggression were more likely to lack cognitive flex-

ibility. That is to say, although they were able to change with ease from one activity or situation to another, they were not able to inhibit their aggressive behavior. Otherwise, the study did not find a relationship between deficits in flexibility on the one hand, and hyperactivity and attention problems on the other hand. Schoemaker, Milder, Dekovic and Matthys (2013) conducted a meta-analysis on this topic, which included 22 studies and which aimed to ascertain whether deficits in executive function are related to behavioral problems at pre-school age. The authors found that changes in inhibition are the best predictors of behavioral problems such as lack of attention span and hyperactivity. However, the effect size found between flexibility and attention-span deficit and hyperactivity was very small, while working memory moderately predicted behavioral problems.

In the current study, working memory was only found to be related with attention problems. Children who had a deficit in working memory were, at the same time, found to be more easily distracted and to have more difficulties in concentrating for a prolonged period. These findings could be explained because working memory and attention-span are functions with very similar mental structures. The prefrontal parietal network, which allows us to retain information in our working memory correlates with the prefrontal parietal system which allows us to respond to environmental stimuli, rejecting those which are irrelevant (for example, Gazzaley & Nobre, 2012; Ikkai & Curtis, 2011; Nobre & Stokes, 2011). In this line, several studies have shown that the development of working memory can be advantageous for the development of attention-span, preventing the appearance of attention problems (Diamond, 2013).

With regard to deficits in emotional control, they were found to be positively correlated with aggression and hyperactivity. Children who had difficulties in modulating their emotional responses behaved in a more hostile manner, and were more prone to act without thinking and to do tasks and activities hastily. Recent studies indicate that hyperactive children can find it more difficult to positively regulate their emotions in comparison with non-hyperactive children (Maier et al., 2014; Posner et al., 2011; Posner et al., 2013; Shaw, Stringaris, Nigg, & Leibenluft, 2014). Likewise, Duncombe et al. (2013) conducted a study with pre-school children, which found that deficits in emotional control are significantly related to an increased risk of disruptive behavior.

However, in spite of the fact that emotional and inhibitory control were the factors found to be most strongly related with behavioral problems – and in spite of the fact that diverse studies contend that these two variables play a fundamental role in children’s adaptability and social skills (Allan & Lonigan, 2011; Gligorovic & Buha Đurovic, 2012; Kim et al., 2013; Pallini & Laghi 2012) – in the current investigation inhibitory and emotional control did not predict a child’s ability to adapt easily to change, or their social abilities. These results could be due to the age of the children, and there is a need for further studies on this topic, to check if the tendency found here is confirmed. At the same time,

further studies could be conducted in the first years of primary school, to establish whether the relationship between inhibitory and emotional control is related to social abilities, or with their adaptability.

The factors which were most strongly related to adaptability and social skills were working memory and flexibility. The influence of these variables on social adjustment could be explained by the fact that those children with better working memory and more flexibility are able to employ constructive methods to resolve conflicts, since these functions give children the capacity to consider situations from distinct perspectives, remember why they should behave in a certain way (or not), propose alternative solutions and anticipate positive consequences for everyone involved in the given problem. All of this allows these children to interact and relate with others in an effective and satisfactory manner. Eisenberg et al. (2001) showed that children of pre-school age who use more creative and constructive methods to resolve conflicts are better accepted by their peers. Furthermore, children with a greater capacity for flexibility exhibit more cooperative behaviors than those children with low flexibility scores (Cairano, Bonino, & Miceli, 2006).

Despite not having a specific starting hypothesis on the relationship between the studied variables and gender, the latter was introduced as a control variable in the two models analyzed. The results showed that the girls presented with higher deficits in emotional control than the boys. Nonetheless, the boys obtained higher scores for attention problems than the girls. No other significant relationships were found between gender and the rest of the variables in the study (deficit in inhibitory control, lack of flexibility, deficit in working memory, aggression, hyperactivity, being reserved, adaptability and social abilities).

In Western popular culture, it is widely accepted that there are gender differences in children’s ability to control their emotions. Refrains such as “boys don’t cry” reflect beliefs and cultural expectations that permit girls to show happiness or sadness, while boys must be strong and control their emotions (Chaplin & Aldao, 2013). In this sense, the results obtained by the present study in relation to differences in emotional control between genders could be justified by Brody’s theory (2009). This author argues that differences in the expression of emotions between genders are the result of a combination of temperamental predispositions based in biology, and in the socialization of boys and girls to adopt gendered rules related to the display and exhibition of emotions. Brody’s theory proposes that, in the greater part of European cultures, girls are taught to be more emotionally expressive than boys.

On the other hand, in a similar manner to the results found in the present investigation Hölling, Erhardt, Ravens-Sieberer, & Schlack (2007) conducted a study, including 14.478 children, which found that boys tend to have greater problems with attention than girls. In this same line, the American Psychiatric Association (2000) confirmed that

boys are more frequently diagnosed with attention problems than girls.

In conclusion, the results of the study demonstrate that several executive functions play a fundamental role in the development of social competence and are a protective factor against behavioral problems. In spite of the need for more work on the role of executive function in behavioral problems and social competence, particularly at pre-school age, the results of this study could be a starting point for future investigations in this area.

Limitations and future lines of investigation

In spite of the results found, the present study has a series of limitations that should be taken into account before generalizing the results, or extrapolating from the established conclusions.

First of all, several variables in the study that could have an influence on executive function, behavioral problems and social abilities were not controlled for: such as parenting styles and social economic level.

Secondly, it is a cross-sectional study so it is not possible to draw conclusions as to whether these results will endure over time. The nature of peer to peer social relations changes considerably from infancy into adolescence owing to changes in the individual's capacity to reason, interpret and respond to relationships with others (Holmes, Kim-Spoon, & Deater-Deckard, 2016). Likewise, the acquisition of executive function begins at 12 months and extends until the age of 18 years, from which point executive function is established and begins to decline in old age (Diamond, 2013). For this reason, it would be interesting to carry out longitudinal studies that take into account said limitations.

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