Caregiver ratings of executive functions among foster children in middle childhood: associations with early adversity and school adjustment

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Abstract

Children in foster care often present difficulties related to executive functions, such as poor school adjustment and impulsivity. Despite their importance, few studies have analyzed executive functions in foster children, especially beyond preschool age. This study sought to analyze the executive functions of a sample of 43 Spanish foster children aged between five and nine years (M = 7.51, SD = 1.29), using a caregiver-reported questionnaire. We also explored the relationship between executive functions and early adversity variables and teacher-reported school adjustment. Results indicate that participants experienced more executive function-related difficulties than the measure's standardization sample in almost all areas, particularly in behavioral regulation, although they were found to have age-appropriate executive function levels in some areas, such as monitoring and organization of materials. Prenatal substance exposure was associated with poorer planning/organization skills, whereas other early adversity variables showed no statistically significant associations with executive functions. A higher level of difficulty in inhibitory control and other areas were associated with poorer school adjustment as reported by teachers. The results of our study point to an important presence of executive function difficulties in foster children in middle childhood, a finding which highlights the need for early intervention efforts targeting these skills among this population.

Keywords: foster care; executive functions; middle childhood; early adversity; school adjustment.

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1. Introduction

Family foster care is the preferred alternative care measure for children who must be removed from their birth family due to neglect or abuse, as it provides them with a family context conducive to their development (United Nations General Assembly, 2010). In Spain, residential care has traditionally been the predominant alternative care option, and it was only at the turn of the new millennium that foster care placements began to increase (Palacios & Amorós, 2006). According to the Spanish child welfare statistics, 58% of all children in care in the country are placed in foster families (Observatorio de la infancia, 2017; to know more about foster care practices in Spain, see the excellent review of del Valle, López, Montserrat, and Bravo, 2009).

Developing a foster care system which meets the needs of both children and families can be challenging, given that foster children are at risk for several difficulties, especially impulsivity, externalizing behaviors, and poor school adjustment (Burns et al., 2004; Fantuzzo & Perlman, 2007; Salas, Fuentes, Bernedo, & García-Martín, 2016). Deficits in executive functions (EFs), the cognitive skills that sustain self-regulation, may be at the core of these problems (Blair & Ursache, 2011; Willcutt, Doyle, Nigg, Faraone, & Pennington, 2005). Associations have consistently been found between EF deficits and exposure to adverse childhood events (which are common among this population), such as neglect, family violence, and prenatal substance exposure, among others (Fisher, Leve, Delker, Roos, & Cooper, 2016; McEwen & Morrison, 2007; McLaughlin, Sheridan, & Nelson, 2017; Pears & Fisher, 2005; Sheridan, Peverill, Finn, & McLaughlin, 2017).

Given the role of EFs as antecedents of adaptation and adjustment and the risk factors for EF development to which foster children are exposed, it would appear useful to analyze

this area and related factors among that population. Since EFs are responsive to intervention, the knowledge gained may serve to guide targeted intervention efforts aimed at promoting foster children's adaptation and preventing further difficulties (Dozier, Albus, Fisher, & Sepulveda, 2002; McDermott et al., 2013).

Following this rationale, the present study analyzes the EFs of a sample of Spanish foster children in middle childhood, as well as the association between EFs and related predictor (early adversity) and outcome (school adjustment) variables.

1.1. Executive Functions

EFs are higher-order cognitive processes essential for goal-oriented behavior and the self-regulation of attention, emotion, and behavior. They include several components, typically inhibitory control (being able to inhibit predominant responses to respond to situational demands), working memory (holding relevant information in mind and working with it), and cognitive flexibility (managing to change one's perspective about something; Blair & Ursache, 2011; Hughes, 2011).

EFs and related constructs measured in childhood predict an impressive range of later outcomes, including health, substance use, and criminal behavior (Moffitt et al., 2011; Ogilvie, James, Stewart, Chan, & Shum, 2011). EFs also play a key role in school adjustment; they are necessary both for adapting to the changing rules and demands of the school environment (including successfully interacting with peers and teachers) and for the cognitive tasks involved in subjects like mathematics and literacy (Blair & Raver, 2015; Blair & Razza, 2007; McClelland et al., 2007; Neuenschwander, Röthlisberger, Cimeli, & Roebers, 2012).)

Researchers have traditionally measured EFs in childhood with child-adapted laboratory tasks such as the Day-Night task, the Dimensional Change Card Sort, recall tasks,

or computerized batteries (Garon, Bryson, & Smith, 2008; Hughes, 2011; Luciana & Nelson, 2002). Parent or teacher ratings of EFs have also been developed, with limited convergence with laboratory tasks but enhanced ecological validity given that they measure the application of EFs in daily activities at home and at school (Gioia, Kenworthy, & Isquith, 2010; Thorell, Veleiro, Siu, & Mohammadi, 2013). The consensus is that laboratory tasks and adult ratings of EFs measure different aspect of the same underlying construct, and previous research has shown that scores from both types of assessments can predict independent variance in ADHD symptoms or academic achievement (Gioia et al., 2010; Thorell et al., 2013; Toplak, West, & Stanovich, 2013).

Regarding EFs development, they start developing in infancy, show a marked improvement in the preschool years and continue to improve gradually throughout late childhood and adolescence (Hughes, 2011). The brain area which predominantly sustains EFs, the prefrontal cortex, shows a protracted development till late adolescence and is highly dependent on early experiences for its optimal development. If those early experiences are marked by adversity, deprivation of adequate stimulation, and continued stress, EFs and the capacity to self-regulate can be seriously hampered (McEwen & Morrison, 2013; McLaughlin, Sheridan, & Nelson, 2017).

1.2. Early Adversity and EFs

Most children in foster care have been exposed to at least some early adverse experiences that are detrimental to EF development (Fisher et al., 2016). The following is a brief summary of the most important ones.

Prenatal exposure to drugs or alcohol is a proven risk factor for several conditions, including developmental delays in different areas and disrupted brain development. It seems that most substances, including cocaine, alcohol, and nicotine, strongly impact the

development of the prefrontal cortex in prenatally exposed children, resulting in neurodevelopmental consequences such as attention and impulsivity problems and general EF impairment (Fisher et al., 2011; Green et al., 2009; Thompson, Levitt, & Stanwood, 2009). Despite the high prevalence of substance abuse problems among the birth parents of children in foster care (Besinger, Garland, Litrownik, & Landsverk, 1999; López, Montserrat, del Valle, & Bravo, 2010), few studies in the foster care literature have taken this factor into consideration, particularly in relation to EFs.

Child maltreatment predicts all kinds of negative outcomes, as well as general difficulties in self-regulation and EFs (Kim-Spoon, Haskett, Longo, & Nice, 2012; Rogosch, Cicchetti, & Aber, 1995). Although there is some empirical evidence pointing to a differential effect of different types of maltreatment (Sheridan et al, 2017), several studies have shown that cumulative exposure to multiple types of maltreatment (neglect, physical abuse, or emotional maltreatment) also predicts EFs and emotion regulation difficulties in children in preschool-age and middle childhood (Fay-Stammbach & Hawes, 2018; Kim & Cicchetti, 2009). These effects are likely due to the cumulative damage done by continued stressful experiences and the associated allostatic load on key brain areas for EFs (McEwen & Morrison, 2013).

Another known risk factor for EF development is institutional care. This kind of adversity entails a special type of structural neglect in which children are cared for by rotating caregivers and are deprived of continuous, stimulating interactions (van IJzendoorn et al., 2011). One of the most solid research findings with post-institutionalized adopted children is their long-term deficits in EFs, which are related to the length of institutionalization (Hostinar, Stellern, Schaefer, Carlson, & Gunnar, 2012; McDermott et al., 2013; Merz & McCall, 2011; Peñarrubia, 2015).

Less is known about the effects of less depriving residential care settings on EF development. Residential care facilities in countries with developed child welfare systems, as those in Spain, are much less depriving that the institutions where internationally adopted children spent their early years. Furthermore, unlike with most post-institutionalized adoptees, children in the Spanish child protection system enter residential care not as babies, but rather after years of family preservation services or multiple disruptions from care (López & Del Valle, 2015). To the best of our knowledge, the only study that has analyzed the EFs of pre-adolescent children in Spanish residential care centers found that they presented more problems than community controls in certain EFs, such as working memory and planning (Peñarrubia, 2015).

Another type of adversity experienced by children in alternative care is placement instability, with the frequent transitions between caregivers that this implies. A higher number of placement transitions has been associated with general EF deficits in a large sample of preschool-aged children within the child protection services (Roos, Kim, Schnabler, & Fisher, 2016), as well as with difficulties in inhibitory control in two samples of preschool-aged children in foster care (Pears, Bruce, Fisher, & Kim, 2010) and adopted from care (Lewis, Dozier, Ackerman, & Sepulveda-Kozakowski, 2007).

1.3. EFs among Foster Children

In recent years there has been a very active stream of research on the EFs of internationally-adopted children coming from depriving institutions, especially from Eastern Europe. This line of research has provided remarkable insights into the effects of early severe deprivation on EF development, as outlined above (e.g., Hostinar et al., 2012; McDermott et al., 2013; Merz & McCall, 2011; Peñarrubia, 2015).

However, much less research has been carried out on the EFs of children in family foster care. Although both populations have suffered early adversity, post-institutionalized adoptees and foster children in Western societies differ in significant ways: children in foster care typically have not been exposed to the gross deprivation characteristic of institutions, although they may have suffered more active maltreatment (e.g., physical abuse, domestic violence) and for a longer time (Pears & Fisher, 2005; Wretham & Woolgar, 2017).

Most studies analyzing EFs among foster children are evaluations stemming from two intervention programs carried out in the USA with preschool-aged children in foster care. Based on instruments such as a child-adapted Stroop task and neuropsychological batteries, the results revealed that foster children performed worse than community controls in different areas, including cognitive flexibility and inhibitory control (Horn, Roos, Beauchamp, Flannery, & Fisher, 2017; Lewis-Morrarty, Dozier, Bernard, Terracciano, & Moore, 2012; Lind, Lee, Caron, Roben, & Dozier, 2017; Pears, Fisher, Bruce, Kim, & Yoerger, 2010). In one of these studies, EF performance was found to predict both academic and social-emotional competence at school, as reported by teachers (Pears, Fisher, et al., 2010).

Another study with children adopted from foster care in the UK also showed deficits in EFs as compared with the measures' standardization samples. Interestingly, this study involved children in middle childhood and used both performance measures of EFs and a caregiver-reported questionnaire, which provides a different yet complementary assessment of EFs (Wretham & Woolgar, 2017).

Caregiver ratings of EFs add a useful point of view especially with foster children for several reasons. Reports of phenomenology, i.e. how the impairment manifests in daily activities, are especially useful when the impairment in that area is relevant, as in foster children's EFs (Dirks, De Los Reyes, Briggs-Gowan, Cella, & Wakschlag, 2012). Children's

difficulties in daily activities due to EF deficits represent one of the major challenges to foster carers (Octoman, McLean, & Sleep, 2014), and ratings are more likely to reflect those EF difficulties as manifested in daily activities than laboratory tests (Barkley & Fischer, 2011). Although caregiver ratings are certainly more vulnerable to informant biases and validity concerns, foster carers have been found to be reliable informants on the foster children under their care (Tarren-Sweeny, Hazell, & Carr, 2004), and caregiver-ratings of EFs have been used before with post-institutionalized and maltreated children of various ages demonstrating concurrent and construct validity with academic adjustment, early adversity exposure, or some EF performance-based measures (Fay-Stammbach & Hawes, 2018; Kim-Spoon, Haskett, Longo, & Nice, 2012; Merz & McCall, 2011).

The findings in relation to early adversity and EFs tend to be inconsistent. As mentioned above, while some studies reviewed above with preschool aged-children have found that factors such as number of placements predict poorer EFs (Pears, Bruce et al., 2010), others report negative findings (e.g., no link between polyvictimization and EFs performance; Horn et al., 2017) or even paradoxical ones (e.g., more maltreatment types associated with better EFs; Pears & Fisher, 2005). According to some authors, this is likely due to methodological difficulties for measuring early adversity variables and/or to the fact of analyzing high-risk samples, in which almost all participants have been exposed to diverse types of adverse events (Roos et al., 2016).

In sum, the studies reviewed suggest that children in foster care in preschool-age do show deficits in EFs as measured by laboratory tasks. Although the results on early adversity and EFs are not completely consistent, certain aspects such as maltreatment, prenatal exposure to drugs, and, especially, caregiver changes, seem to be associated with worse EFs. However, studies on the EFs of foster children are still scarce. Most of them have focused on preschool-aged children from the USA, have used laboratory tests for measuring EFs, and do

not include the most common types of adverse events at the same time but only some of them.

It is important to analyze the EFs of children in foster care in different Western societies to ascertain whether (as would be expected given their early adverse experiences and difficulties in areas related to EFs) they present EF difficulties that could be targeted by interventions. Furthermore, we know very little about EFs in this population in developmental stages other than the preschool period, such as middle childhood for instance, during which EFs continue to develop and new challenges appear (e.g., more demanding school tasks and the need to integrate in peer groups; Eccles, 1999; Hughes, 2011). The inclusion of different types of adverse events that negatively affect EF development could shed light on which factors are most closely associated with EF difficulties, considering the common co-occurrence of risk factors in this population (Turney & Wildeman, 2017). The use of caregiver-reported assessments of EFs may enhance our understanding of how the EF difficulties demonstrated in previous studies with performance-based measures manifest in daily life and activities, a highly valuable piece of information for intervention and support purposes.

1.4. The present study

Following these gaps in the literature, the primary goal of our study was to analyze the EFs of Spanish children in foster care aged between five and nine. Our secondary goal was to explore the association between EFs and other related variables.

In specific terms, the study had three aims: 1) to analyze caregiver-reported EFs in a sample of foster children in comparison with a standardization sample of low-risk children; 2) to explore the associations between relevant early adversity variables (prenatal substance

exposure, maltreatment, residential care placement, and frequent caregiver transitions) and EFs after controlling for relevant covariates; and 3) to examine correlations between EFs and teacher-reported school adjustment.

Based on previous findings, we hypothesized that foster children would present more EF difficulties than the standardization sample of low-risk children. The analyses of early adversity and EFs were largely exploratory, although given previous findings, we expected prenatal substance exposure, frequent caregiver transitions, and maltreatment to be associated with more EF difficulties. We also hypothesized that poorer EFs would correlate with worse school adjustment.

2. Method

2.1. Participants

The final sample for this study comprised 43 foster children (18 boys, 41.9 %) aged between five and nine years at assessment (M = 90.16 months, SD = 15.59), placed in 40 foster families. Their age of entry into care ranged from zero to 93 months (M = 46.19, SD = 24.84) and they had all been between five and 106 months in their current foster placement (M = 28.72, SD = 25.48). All participants except two had lived with their biological family prior to their entry into care from two to 93 months (M = 49.63, SD = 24.30). The main reason for placement was maltreatment in 32 children (74.4 %), parental substance abuse and other reasons in six children (14 %), resignation of parental rights or disappearance in two cases (4.7 %), parental entry into prison in two cases (4.7 %) and parental illness or disability in one case (2.3 %). According to case reports, 86 % of children had suffered neglect prior to their entry into care, 90.7 % emotional maltreatment, 46.5 % physical maltreatment, and 25.6 % sexual abuse. Most children (88.7 %) had suffered more than one type of maltreatment.

Fifteen of the foster children had been in residential care, from less than one to 34 months (M = 11.53, SD = 10.53). Regarding placement transitions, for 10 foster children (23.3 %) this was their first placement, 22 children had one previous placement (51.2 %), eight had two previous placements (18.6 %), and three had been in three previous placements before their current one (7 %). Twenty-five children (58.1 %) were in long-term foster care and 18 (41.9 %) were in a short-term placement. Five foster children had diagnosed disorders: two had been diagnosed with conduct disorder, two with enuresis and one with language development disorder. Finally, three children were using psychotropic medication (in two cases these were stimulants and in one case second-generation antipsychotics).

The foster caregiver's age ranged from 31 to 69 years (M = 48.14, SD = 8.03). The main foster caregivers were predominantly female (80 %). Most families (80 %) were two-parent households, and in 47.5 % of them, one or both foster caregivers had higher education qualifications. The foster carers had between 5 months and 15 years' experience (M = 57.84 months, SD = 48.07), and 17 of them had had previous foster placements (from one to 12; M = 3.82, SD = 3.09). In 12 families, there was another foster child living in the household and in one case there were three more besides the target child. In all but two cases the children in the same foster placements were siblings.

The teachers were the tutors or those teachers who spent more time with the target children in the public or private schools attended by the foster children.

2.2. Procedure

This study presents results from a broader project carried out in Southern Spain. Ethical approval for research involving human subjects was obtained from the Regional Government's Ethics in Biomedical Research Committee, guided by the Helsinki Declaration

(World Medical Association, 2008). Approval for the research project was also obtained from the Andalusian Child Protection Authorities and local foster care agencies.

Eligibility criteria were placement in non-kin foster care, age between four and nine years, lack of a severe disability and a minimum of five months in the foster placement at assessment. All 65 foster families with children that met the criteria in these regions were invited to participate through local foster agencies. Some foster caregivers declined to participate (n = 7), mainly because of lack of time or the fact of experiencing stressful circumstances, and some caseworkers refused consent for their families to participate (n = 6), mainly due to other ongoing assessments or transitions. Attrition analyses revealed no differences in available parameters (age of entry into care, gender, and age) between participating and non-participating children. From the initial group of 52 potential participants, we also excluded children aged under five years (n = 7), due to the age limit of the principal measure used. Two other children assessed were also excluded from the study for not answering the main questionnaire or not complying with the study eligibility criteria.

Participating foster families received a two-hour home visit by two trained psychologists. The purpose of this visit was to collect the data from the foster caregivers and children. Informed consent forms were signed and collected from all foster caregivers, and verbal assent was obtained from the children. They were not economically compensated but we provided them with a psychological report on the participating child. The caseworkers from the foster care agencies provided information through data collection sheets on the foster children's pre- and post-placement history.

The foster children's teachers were contacted via telephone and asked to complete an online questionnaire. For the subsample analyzed in this paper (N = 43), we obtained answers from 39 teachers (91 % response rate). The other 9 % of teachers refused to participate mainly

because of lack of time. There were not significant differences in demographic variables or behavior problems between children with and without teacher data. The data collection with the children's teachers began in November to ensure that every teacher had known the target child for at least a month and a half before participating. Teachers were not compensated for their participation.

2.3. Measures

2.3.1. EFs.

We used the Behavior Rating Inventory of Executive Functions (BRIEF; Gioia, Isquith, Guy, & Kenworthy, 2000), a caregiver-reported questionnaire on EF difficulties in everyday behavior for 5- to 18-year-old children. The instrument comprises 86 items on a 3-point scale (*never, sometimes,* or *often*) that taps into different EF areas, providing scores for eight subscales and three general indices.

The *inhibit* subscale (10 items) assesses the capacity to inhibit impulsive responses and stop a behavior when appropriate. The *shift* subscale (8 items) measures the ability to adapt to changes in routines and tasks and to solve problems in a flexible way. The *emotional control* subscale (10 items) taps into the modulation of emotional reactions in an adaptive way. The *initiate* subscale (8 items) reflects the capacity to independently embark on a goal-oriented task and generate ideas without prompting. The *working memory* subscale (9 items) measures the ability to hold relevant information in mind for task-completion. The *plan/organize* subscale (12 items) assesses skills related to planning and organizing steps in a goal-oriented task, as well as to organizing and understanding ideas. The *organization of materials* subscale (6 items) measures the capacity to keep personal belongings and spaces

ordered and organized. The *monitoring* subscale (8 items) reflects the ability to supervise one's own behavior and performance, both during a task and in social relations.

The inhibit, shift, and emotional control subscales combine to form the *behavioral regulation index* (BRI), reflecting general, basic regulation of behavior, emotions and attention. The *metacognition index* (MI) is composed of the initiate, working memory, plan/organize, organization of materials, and monitoring subscales, and provides a score on one's capacity to cognitively self-manage tasks and monitor one's own performance. The *global executive composite* (GEC) is a summary score of both indices, and, therefore, of the full scale.

The BRIEF has been translated and adapted to Spanish following the international guidelines for adaptation of psychology tests, including double translation, analysis of readability, and psychometric analyses (see Maldonado Belmonte, 2016). *T* scores standardized for age and gender are provided by the official BRIEF scoring app with a mean of 50 and a standard deviation of 10 (PAR Inc Mobile, 2011). Since the BRIEF questionnaire measures difficulties in EFs, a higher score indicates greater EF impairment. *T* scores higher than 65 (1.5 *SD* above the mean) indicate problems of clinical significance. Given that Spanish standardized scores are not available for this version of the BRIEF, we decided to use standardized scores derived from the original USA standardization sample. Previous studies suggest that EF development and their measurement by caregiver-ratings do not differ significantly between different Western societies (Gauvain & Perez, 2015; Thorell et al., 2013). The standardization USA sample comprised 1419 children without a history of special education or psychotropic medication usage (43 % boys; Gioia et al., 2000). Internal consistency was excellent in our study for most of the BRIEF scales: Cronbach's alphas ranged from .81 to .97 in all subscales and indices except the Initiate ($\alpha = .74$) and Organization of Materials ($\alpha = .68$) subscales. Adequate test-retest reliability and validity

scores for this measure have been reported elsewhere (Gioia et al., 2000; Strauss, Sherman, & Speer, 2006).

2.3.2. Sociodemographic, adversity, and placement variables

A data collection sheet was completed by foster care caseworkers to gather information on the foster family, children's adversity, and placement history. It comprises sections on the child's and foster caregiver's sociodemographic information, characteristics of the foster placement, child's records within the child protection services, and documented pre-placement experiences of adversity. In this study, the data sheet was used to gather information on the following variables:

Prenatal substance exposure: This was coded as present if the child had documented prenatal exposure to drugs and/or alcohol. The exposure reported was mainly to alcohol or a combination of alcohol and other drugs (cocaine, opioids, etc.). Due to the very small number of children with specific exposure, it was not possible to disaggregate this group by type of exposure.

Maltreatment history*:* The initial maltreatment report at entry into the child protection services was collected for each child. This report is systematized through a regional maltreatment classification system (Observatorio de la Infancia en Andalucía, 2011) and presents several possible indicators for each maltreatment type that are selected as present or not present by the child protection services worker. We summed the number of indicators on each maltreatment type to obtain a continuous score of maltreatment for each child that can be considered a proxy of overall maltreatment severity from a cumulative risk perspective (Masten & Wright, 1998).

Following best practices in this field, we selected those indicators that unambiguously reflect each maltreatment type and discarded those linked to consequences for child

development or parenting behaviors that do not necessarily imply maltreatment, although they may be associated with it (e.g., "child is fearful of adults"; Barnett, Manly, & Cicchetti, 1993). The number of possible indicators was 25 for physical, school, and medical neglect, 6 for emotional neglect, 10 for physical abuse, 16 for emotional maltreatment, and one for sexual abuse. The complete list of indicators for each maltreatment type and the number of foster children with each indicator is presented in Supplement 1.

Residential care placement*:* This risk factor was coded as present if the child had spent at least six months in residential care prior to their current foster placement.

Frequent caregiver transitions: This was coded as present if the child had had two or more in-care placements (either foster or residential) before the foster placement at assessment, or if he or she had a documented history of frequent caregiver changes before entering care as reported by foster care caseworkers.

Sociodemographic and placement variables: Several variables were collected as potential control variables: age at entry into care, time in current foster placement, foster family structure (biparental or single family), presence of other foster children in the foster placement, and foster caregivers' education. This last variable was treated as an ordinal variable with the following categories: 1 = "no formal education", 2 = "elementary education", 3 = "secondary education/high school", 4 = "professional training", and 5 = "College degree".

2.3.3. School adjustment.

School adjustment was measured by four Likert-type questions answered by the foster children's teachers on their *learning capacity*, *academic performance*, *academic motivation*, and *type of teacher-child relationship*. The response options for the first three were 1 = "Well below average", 2 = "Below average", 3 = "Average", 4 = "Above average", and 5 = "Well

above average". For type of teacher-child relationship, the response options to the question "For you as a teacher, interacting with this child is" were 1 = "Much more difficult than with other children", 2 = "More difficult than with other children", 3 = "The same as with other children", 4 = "Easier than with other children", and 5 = "Much easier than with other children". The scores for the four questions were summed to obtain one overall school adjustment score, with higher scores indicating better school adjustment (Cronbach's α = .73). Previous research has shown that teachers are reliable informants of children's academic functioning when measured with this type of rating (Henricsson & Rydell, 2006), and the same ratings of academic achievement have been found to correlate with parent ratings of EFs in a wide cross-cultural study including a Spanish sample (Thorell et al., 2013).

2.3.4. IQ.

We used the Kaufman Brief Intelligence Test (K-BIT; Kaufman & Kaufman, 1990) to assess IQ, which (according to recommendations) should be controlled for when analyzing EFs. The K-BIT is a widely used short test for measuring intelligence in children and adults (from age four) and comprises two subtests of progressively more difficult items: an expressive vocabulary test measuring crystallized intelligence and an abstract reasoning test (similar to Raven matrices) measuring fluid intelligence. The measure provides standardized norms for age and gender and has a well-established reliability and validity.

2.4. Data analyses

A single imputation strategy was used for handling missing data, given the very small percentage of missingness (only two cases with missing data; Cole, 2008). We conducted student's *t* means comparisons to compare BRIEF scores in the foster sample with the standardization sample of community children.

We evaluated several potentially confounding variables: gender, age, age at entry into care, time in current foster placement, foster family structure, presence of other foster children in the foster family, foster caregiver's education and child's IQ. To be considered as a confounding variable, the variables should be related with both the independent and the dependent variables. None of the mentioned variables were related to any of the BRIEF scores, and therefore they were not controlled for in the main analyses. We also tested the associations of the adversity variables among them. None were significantly related among them, and therefore they were not controlled for neither.

Next, we used the Pearson product-moment (with cumulative maltreatment and school adjustment) and point-biserial correlations (with prenatal substance exposure, residential care placement, and frequent caregiver transitions) to explore the relationships between the adversity variables, school adjustment, and the BRIEF scores. We detected outliers in the emotional control, planning, monitoring, metacognition and global executive composite subscales/indices, which were modified by truncating them to the next highest value to keep the data points free from biasing results (Osborne & Overbay, 2008).

We also conducted chi-square tests to explore associations between scoring within the clinical range on the BRIEF scales (coded non-clinical/ clinical) and categorical early adversity variables, whereas point-biserial correlations were used for the continuous early adversity and school adjustment variables.

3. Results

3.1. Description of EFs in foster children

Table 1 shows foster children's mean *T* scores on the different BRIEF scales. Their mean scores were higher (indicating more EF difficulties) than the standardization community sample's mean of 50 in the global executive composite, the behavioral regulation

index and the metacognition index, as well as on the inhibit, shift, initiate, working memory, and plan/organize subscales.

Large effect sizes in the means comparisons were found in the initiate, working memory and, especially, the shift subscales, indicating the EF areas in which the foster children in our sample had more difficulties according to their caregiver's reports. 22% of foster children scored in the clinical range for EF difficulties in the overall GEC score, although this percentage was higher in the BRI (26 %) and on some specific subscales.

Table 1

Mean level of EFs among foster children, comparison with standardization community sample and percentage of foster children with clinical scores

BRIEF scale/index	*M* (*SD*)	*t* (43)[a]	*d*	% of clinical scores[b]
Inhibit	57.42 (12.09)	3.98	**.74*** **	24 %
Shift	62.09 (14.70)	5.36	**1.18*** **	38 %
Emotional control	51.02 (10.57)	0.62	.10	12 %
Initiate	58.79 (11.82)	4.82	**.87*** **	28 %
Working memory	58.14 (10.10)	4.79	**.81*** **	28 %
Plan/organize	57.26 (10.76)	4.37	**.70*** **	22 %
Organization of materials	47.72 (8.95)	−1.64	−.22	4 %
Monitor	49.95 (11.28)	−0.29	−.05	12 %
Behavioral regulation	57.07 (13.26)	3.47	**.70** **	26 %
Metacognition	55.14 (11.18)	2.98	**.**48** **	20 %
Global executive composite	56.33 (12.28)	3.35	**.56** **	22 %

Note. Values in bold indicate medium and large effect sizes (Cohen, 1988) in comparison with the standardization sample's mean of 50 (*SD* = 10).

[a]Equal variances assumed or not assumed in each *t* test following the results of the Hartley test for equal variances.

[b]Percentage of children in the sample with a *T* score higher than the clinical cut−off of 65. In the standardization sample, only 10 % of children presented clinical scores.

*** $p < .001$, ** $p < .01$

3.2. Early Adversity and EFs

Table 2 presents descriptive data for the early adversity variables studied. As shown in Table 3, prenatal substance exposure was positively significantly associated with more difficulties in the plan/organize subscale (r_{pb} = .32, p < .05). Neither cumulative maltreatment, residential care placement, nor frequent caregiver transitions were associated with EF difficulties.

Table 2

Descriptive data for the early adversity variables

Variables	*M* (*SD*) or *n*	%
Prenatal exposure		
Yes	8	18.6
No	35	81.4
Cumulative maltreatment	10.67 (10.23)	-
RC placement		
Yes	11	25.6
No	32	74.4
Freq. caregiver transitions		
Yes	11	25.6
No	32	74.4

Note. RC = residential care

Regarding associations with scoring within the clinical range on the BRIEF scales, prenatal substance exposure was positively associated with scoring in the clinical range on the plan/organize subscale, χ^2 (1, N = 43) = 8.48, p < .01, and the GEC, χ^2 (1, N = 43) = 3.94, p < .05. Neither residential care placement, cumulative maltreatment, nor frequent caregiver transitions were associated with scoring within the clinical range on any BRIEF subscale.

Table 3
Correlations between early adversity variables, EFs, and school adjustment

	Inhibit	Shift	Emotion Control	Initiate	WM	Plan	Org. of materials	Monit.	BRI	MI	GEC
Prenatal exposure	.18	.23	.21	.18	.17	.32*	.23	.26	.23	.25	.23
Cumulative maltreatment	−.12	−.04	−.27	−.23	−.02	−.21	−.11	−.18	−.16	−.18	−.16
RC placement	.08	.00	.15	.13	.17	.10	.13	.22	.09	.18	.14
Freq. caregiver transitions	−.06	−.14	.13	−.06	−.04	−.04	.18	.04	−.02	.02	.01
School adjustment[a]	−.33*	−.35*	−.15	−.18	−.37*	−.20	−.12	−.07	−.30	−.22	−.26

Note. RC = Residential care; WM = Working memory; BRI = Behavioral Regulation Index; MI = Metacognition Index; GEC = Global Executive Composite.
[a]$n = 39$.
* $p < .05$

3.3. EFs and School Adjustment

The sample's mean score for the school adjustment variable was 11.13 (SD = 2.32). As a reference point, selecting the "average" or "same as with other children" option in all four questions on the school adjustment scale would result in a score of 12. Table 3 shows the correlation coefficients between BRIEF scores and the school adjustment score. Greater EF difficulties on the inhibit ($r = -.33$, $p < .05$), shift ($r = -.35$, $p < .05$), and working memory ($r = -.37$, $p < .05$) subscales were associated with poorer school adjustment.

Scoring within the clinical range on the inhibit subscale was significantly associated with lower school adjustment scores ($r_{pb} = -.32$, $p < .05$). No other significant correlations between scoring within the clinical range on the other BRIEF scales and school adjustment were found. Regarding IQ, the sample presented an IQ within the normal range (M = 96.91, SD = 11.52) and this score was also associated with better school adjustment ($r = .33$, $p < .05$).

4. Discussion

Our primary goal in this study was to analyze the EFs of Spanish foster children aged between five and nine years, as reported by caregivers. We also sought to explore the associations between EFs and other related elements, namely early adversity and school adjustment.

As expected, the foster children in our sample were found to have more EF difficulties in everyday behavior than the controls (community children in the standardization sample), especially in relation to behavioral regulation. Prenatal substance exposure emerged as the only early adversity variable analyzed that was associated with poorer EFs. As hypothesized,

statistically significant relationships were also found between worse school adjustment and difficulties in inhibitory control, shift, and working memory.

4.1. EFs in Foster Children

The foster children in our sample were found to have more EF difficulties than the community standardization sample in all areas except organization of materials, monitoring and emotional control. Although the sample did not reach clinical scores at a group level, the means comparisons revealed medium and large effect sizes in most EF areas. These results are consistent with those reported by previous studies showing EF deficits in preschool-aged foster children in the USA (Horn et al., 2017; Lewis-Morrarty et al., 2012; Lind et al., 2017; Pears, Fisher et al., 2010), as well as with other studies using the same measure with other groups of children exposed to early adversity or at risk for EF difficulties (Fay-Stammbach & Hawes, 2018; Merz & McCall, 2011).

The foster children in our sample seemed to show more caregiver-reported EF difficulties than internationally adopted (Merz & McCall, 2011) or physically abused children from USA (Kim-Spoon et al., 2012), but less than British children adopted from care (Wretham & Woolgar, 2017) or children with ADHD (McCandless & O'Laughlin, 2007). The higher level of behavioral regulation difficulties over metacognition difficulties both in our sample and in the British sample of children adopted from care may point to a high exposure to threat-related adversity among foster children, which has been associated with more behavioral regulation difficulties (Kim-Spoon et al., 2012; Sheridan et al., 2017; Wretham & Woolgar, 2017). Given the persistence of self-regulation problems in children exposed to early adversity, it is likely that, if a remedial intervention is not implemented, these difficulties in EFs will continue to be present beyond preschool-age, as indeed our findings suggest.

The use of a measure of EFs in everyday behavior that emphasizes ecological validity suggest that foster children's EF difficulties manifest beyond the performance-based measures in controlled and structured environments used in previous studies. EF difficulties seem to be evident in foster children's daily life, routines, school tasks, and interactions with peers, at least as perceived by their foster caregivers (Gioia, Kenworthy, & Isquith, 2010). This seems to be particularly true for those foster children in the clinical range of EF difficulties, who constitute approximately one fifth of the sample. Caring for children with serious self-regulation problems can be challenging for foster caregivers, and specialized professional support may be necessary in these cases (Octoman, McLean, & Sleep, 2014).

Nevertheless, we should not forget that many foster children may have adequate EFs, and the use of appropriate strategies and sensitive, responsive care by foster caregivers can effectively aid EF development in foster children (Lind et al., 2017). Furthermore, the foster children in our sample were found to have age appropriate EF levels in some areas, such as monitoring, organization of materials, and emotional control.

4.2. Early Adversity and EFs

We selected several early adversity variables based on previous studies on early adversity and EF development. Although the small sample size precluded more complex analyses, we believe that our correlational analyses may constitute an initial step, providing hints for future studies, particularly given the shortage of research in this area.

Prenatal substance exposure was found to have a statistically significant positive association with difficulties in one of the more complex EF areas: the ability to plan and organize the steps required to achieve a goal, which requires the combination of several EFs. Prenatal substance exposure also showed small to medium sized (non-significant) correlations with several other EF areas as monitoring, emotional control, or with the

metacognition and behavioral regulation indices; given statistical power limitations it is likely that these associations are not due to chance but reflect real associations between these factors. Considering the extant animal and human evidence on the long-term effects of this risk factor on brain development and EFs (Fisher et al., 2011; Green et al., 2009; Thompson et al., 2009), it seems that prenatal exposure to drugs or alcohol may be a relevant factor for understanding foster children's self-regulation outcomes in both intervention and research (Fisher et al., 2016).

Neither frequent caregiver transitions, residential care placement, nor cumulative maltreatment were significantly correlated with EFs in any area. In the case of frequent caregiver transitions, this negative finding was unexpected, given that this variable has emerged consistently in the literature as a predictor of worse EFs among foster children and adoptees (Lewis et al., 2007; Pears, Bruce et al., 2010). Our study may have lacked the statistical power to detect such an effect, or our categorization of this variable may not have been optimal.

Regarding residential care placement, it may be that the foster children in our sample did not spend long enough in residential care for an effect of this circumstance to be detected in their EFs, or it could be a matter of developmental timing; residential care settings may be especially detrimental for EF development in infancy, whereas the children in our study entered residential care later on in their development. The study by Peñarrubia (2015) found deficits in the EFs of children in Spanish residential care centers, although it is not possible to ascertain whether the residential setting itself or the pre-placement adversity was the more determinant factor. Clearly more research is needed into the developmental consequences of residential care centers in developed child welfare systems.

In the case of cumulative maltreatment, it showed a clear non-significant trend for negative associations with EF difficulties in several areas, especially with emotional control and planification. It is not clear the reason for this counterintuitive finding, although similar paradoxical findings have been reported before (Pears & Fisher, 2005). The information gathered from child welfare records tends to be incomplete, and it is therefore possible that the score constructed from this information fail to accurately reflect the extent of the children's adversity experiences.

4.3. EFs and School Adjustment

Foster children's difficulties in inhibitory control and other EFs (shift and working memory) were negatively associated with school adjustment as reported by teachers. This finding is consistent with the demonstrated importance of inhibitory control and other EFs for complying with classroom demands, dealing with the cognitive tasks involved in different subjects, and interacting adequately with classmates and teachers (Blair & Razza, 2007; Neuenschwander et al., 2012; Pears, Fisher et al., 2010). EFs, such as being able to shift attention among schemes or problems, restrain dominant impulses, or hold required information in mind, are essential for self-regulation which, according to current conceptualizations, is the key to school readiness (Blair & Raver, 2015). Besides being directly involved in academic learning activities (e.g., solving a mathematical problem), EFs also help children to be engaged in the classroom, to be competent partners for playing with peers, and to make sense of the complex information transmitted in school (Blair & Raver, 2015; Blair & Razza, 2007; McClelland et al., 2007).

Furthermore, the correlations between EF difficulties and school adjustment were independent of IQ (which was also associated with school adjustment), thereby highlighting the privileged role of EFs and self-regulation for school adjustment beyond general cognitive

functioning. For foster children, the deleterious effects of early adversity on EFs may place them especially at risk of school failure and maladaptation (Pears, Fisher et al., 2010). However, since they are responsive to intervention, EFs may be a key target of initiatives aimed at improving foster children's school adjustment.

4.4. Limitations and Future Research

This study has several limitations which should be taken into consideration. First, the sample size was small from a statistical point of view, which limited the data analyses and implied less sensitivity to statistical significance and, thus, a higher risk of Type II errors. Nevertheless, the present study analyzes a very specific and protected population which is difficult to access, and few studies attain large numbers of participants.

Another clear limitation of our study is that the comparisons were made with the BRIEF standardization sample from the USA. Although there have not been reported differences in EF development or parent ratings between Western societies in the literature (Gauvain & Perez, 2015; Thorell et al., 2013), a community, low-risk group from a closer context would be a better matched control group. Nevertheless, we believe that it can be safely assumed that the USA standardization sample is a reasonable reference point for typical EF development in our study, especially considering the large effect sizes found in the means comparison.

Regarding the adversity variables, even though we included the most relevant early adversity variables for EFs according to the scientific literature, there may be other, unmeasured, confounding risk factors that might affect EFs in foster children. Furthermore, aspects such as developmental timing or type of prenatal exposure are likely relevant to the link between early adversity and EF development (Roos et al., 2016). In the case of prenatal exposure to drugs, information on the frequency and intensity of drug use during pregnancy

would be convenient for better understanding of the effects (Thompson, Levitt, & Stanwood, 2009). Although local convenience sampling may limit the generalizability of the findings, the foster children in our sample were broadly similar to the Spanish population of foster children (Observatorio de la infancia, 2017), as well as to foster children in other countries, in terms of their early experiences and current placement circumstances (Fisher et al., 2016).

In future research, the directions identified in this study could be expanded with a bigger sample size, which may permit more sophisticated analyses (particularly mediation). A more comprehensive model with longitudinal assessments would allow us to analyze the relationships between early adversity, EFs, and current adjustment over time, and thus to explore different adjustment paths among foster children across various developmental stages. Adolescence is a particularly relevant period, in which the EF difficulties and dysregulation present in middle childhood may develop into substance abuse problems, school failure, or antisocial behavior (Fisher et al., 2011).

4.5. Conclusions and implications for practice

Our study provides the first evidence that Spanish foster children in middle childhood may present EF difficulties to some extent, and that, in a significant percentage of these children, these self-regulation difficulties can be severe. This may hamper foster children's adaptation to key contexts, such as school, as our findings suggest, and may place them at risk for later problems in adolescence (Fisher et al., 2011; Moffitt et al., 2011).

Given that early intervention focused on responsive and sensitive care has been shown to enhance EFs in foster children, it would be sensible to promote these evidence-based practices in foster care agencies' intervention models (Lind et al., 2017). Even after early childhood, children can benefit from training in EFs, and research has shown that those with poorer EFs benefit the most (Diamond & Lee, 2011). These and other effective practices

provide practitioners with a clear means of promoting foster children's self-regulation and, therefore, their overall adaptation and well-being.

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