

# Does first word development in bilingual French-Portuguese toddlers mirror monolingual one? A study exploring executive function abilities

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**Résumé.** L'objectif de ce travail est d'évaluer le développement lexical précoce chez les enfants bilingues et d'explorer le lien possible entre la taille du vocabulaire et les fonctions exécutives. Nous avons testé 15 bilingues français-portugais (7 de 16 mois et 8 de 24 mois). Leur développement langagier a été évalué avec l'Inventaire du développement communicatif français et portugais (adaptations du CDI MacArthur-Bates, Fenson et al., 2007). Des questionnaires parentaux ont été utilisés pour évaluer la dominance linguistique (PaBiQ, Tuller, 2015), les stades de développement (ASQ-3™, Squires et al., 2009) et les fonctions exécutives (BRIEF-P, Gioia, Aspy, & Isquith, 2003). Nous avons calculé la taille du vocabulaire dans chacune des langues, le vocabulaire total et le vocabulaire conceptuel total et comparé avec les normes des monolingues. Presque tous les participants ont un vocabulaire total dans chacune des langues (français ou portugais) et un vocabulaire conceptuel total similaire à celui des monolingues portugais et français. Leur vocabulaire total (français+portugais) est par contre supérieur à celui des monolingues. Il existe une corrélation entre la taille du vocabulaire et la mémoire de travail (Stokes & Klee, 2009), mais aucune avec l'inhibition. Ces résultats donnent un meilleur aperçu du processus de développement du langage bilingue.

**Abstract.** Does first word development in bilingual French-Portuguese toddlers mirror monolingual one? A study exploring executive function abilities. We aimed at observing early lexical development in French-Portuguese bilingual children and explore the link between vocabulary size and executive functions. We tested 15 bilingual French-Portuguese children, 7 were 16-month-old and 8 were 24-month-old. Their language development was assessed with the French and Portuguese Communicative Development Inventory (adaptations of MacArthur-Bates CDI [Fenson et al., 2007]). Parental questionnaires were also used to assess language dominance (PaBiQ [Tuller, 2015]), developmental stages (ASQ-3™; Squires et al., 2009) and executive functions (BRIEF-P; Gioia, Aspy, & Isquith, 2003). We also calculated the total words in each language, the total vocabulary (TV) in each language

and the total conceptual vocabulary (TCV) and compared them with the respective norms for monolinguals. The results showed that almost all participants had the same performance in vocabulary acquisition as their monolingual pairs of Portuguese and French, both for total words in each language and TCV. Moreover, their TV (Portuguese+French) exceeded the vocabulary of monolinguals. For executive functions, a significant correlation between vocabulary size and working memory appeared (Stokes & Klee, 2009), but not with inhibition. Our results shed light on the process of bilingual language development, and help to change beliefs about negative effects of bilingualism on children language development.

## 1 Introduction

In the literature, it is often stated that more than half of the world's population speaks more than one language, although for most languages of the world these numbers are not available. For Europe, these statistics are confirmed. The survey presented in Eurobarometer 386 (2012) states that 54% of the European population is able to hold a conversation in at least one additional language. For the French population, the percentage is 51%. In France, this number is comparable to the previous survey (Eurobarometer, 2005).

Although the majority of language acquisition studies are focused on monolingual children, the reality shows that monolingualism is far from being the most common language model. This lead to an increasing interest for the simultaneous acquisition of two mother tongues in the last decades. But up to now, the models of language acquisition in the context of plurilingualism in children are still scarce and not consensual, in part because of the high diversity among the plurilingual contexts and of the heterogeneity of the theoretical and methodological frameworks of research. Indeed, bilingual/plurilingual situations are pluralistic and often difficult to compare. One type of bilingualism has been described more extensively: the simultaneous early bilingualism which refers to the acquisition of two languages by a child that has been exposed to both these languages from birth. A large array of studies has demonstrated the impact of this type of bilingualism on the way children perceive, learn about, and interact within the world when compared to monolinguals. It can also bring benefits in language and communication skills (e.g., Davidson, Jergovic, Imami, & Theodos, 1997; Fennell, Byers-Heinlein, & Werker, 2007). In that situation, children develop the same grammatical competences in both languages as the monolinguals of each language (Meisel, 2007).

Language ability in each language can be evaluated by measuring vocabulary size (Gathercole, Thomas, & Hughes, 2008). The most widespread and adapted tool for measuring toddler vocabulary is the MacArthur-Bates Communicative Development Inventories (CDIs) (Fenson et al., 2007). It was used, in several studies, to assess both monolingual and bilingual vocabulary (e.g., Bleses et al., 2008; O'Toole et al., 2016). To compare the vocabulary of bilinguals and monolinguals, some of these studies only investigated the vocabulary size in one language whereas in others they looked at the Total Vocabulary (TV): the sum of the total words in both languages (L1 + L2 words, e.g., *banane* [French] + *banana* [EP] = 2 words). Finally, a third measurement is found in studies on bilingualism, the Total Conceptual Vocabulary (TCV) which is the number of 'concepts' lexicalized by the child, i.e., total of translation equivalent pairs in the two CDIs + words in each language that are not translation equivalents (Pearson, Fernández, & Oller, 1993) (e.g., *banane* [in French, means banana in English,] + *banana* [in EP, means banana in English] = 1 concept; *chien* [in French, means dog in English] + *laranja* [in EP, means orange in English] = 2 concepts). Both measures have advantages and disadvantages and they do not evaluate the same. On the one hand, the use of the TCV presents three major

issues. First, it does not take into consideration phonological development, which is an important part of vocabulary learning (McGregor, Friedman, Reilly & Newman, 2002). Secondly, it involves the identification of translation equivalents, assuming they are isomorphic across both languages (i.e., one word can have more than one translation). The last issue is the child's potential use of a word in one language to mean the macro category and in the other language to point out a subcategory: *barco* [in Spanish, means boat in English] being used for sailboats (triangles actually) and *boat* being used for all other boats; or *zapatos* [in Spanish, means shoes in English] being reserved for one special pair of sneakers and shoes being used for all the others" (Pearson et al., 1993, 115). On the other hand, using TV as a vocabulary measure can result in an overestimation of the lexical knowledge of bilingual children, because two words represent the same concept (Pearson et al., 1993).

The studies that compared directly TCV and TV showed different results. Pearson and colleagues (1993) found that TV and TCV score were similar for bilingual and monolingual toddlers. Junker and Stockman (2002) found larger vocabulary sizes for bilingual children than for monolingual children when using TV and no differences between bilinguals and monolinguals concerning the vocabulary size when using TCV. They also found that, for bilinguals, TV was significantly larger than TCV. Thordardottir and colleagues (2006) and Core and colleagues (2013) showed a smaller vocabulary sizes for bilingual children than for monolingual children when using TCV and no differences between bilinguals and monolinguals concerning the vocabulary size when using TV. These controversial results have been partly justified by language differences (Bleses et al., 2008).

Vocabulary size is highly influenced by language exposure. It is uncertain that children in a simultaneous bilingual situation will learn to speak the two languages. It can occur that they hear both languages but only speak one (Sirèn, 1991; Yamamoto, 2001). The parental language can explain why some children in that situation do not learn both languages and others do (e.g., Portes & Rumbaut, 2001). De Houwer (2007) suggested that children will learn to speak the majority language and that the minority language could not be spoken. The frequency of input for the minority language is lower, even if the parents speak both languages. Accordingly, the "one parent-one language" strategy is not enough for the child to acquire the minority language at least in production. A recommended practice is to encourage in this case that both parents use the minority language (COST Action IS0804 - <http://www.bi-sli.org/Clinicians-and-Educators.htm>).

The vocabulary size of a bilingual child appears to be similar to the vocabulary size of a monolingual child when the bilingual has a dominant exposure to one of the languages (e.g., de Houwer, 2010; Junker & Stockman, 2002). Cattani and colleagues (2014) found that the proportion of exposure to one language is the main predictor of the performance of bilingual toddlers, being that typically developing 2;6-year-olds bilinguals who hear English 60% of the time or more performed like their monolingual peers on a large variety of measures (English Exposure Questionnaire, British Picture Vocabulary Scale III, Preschool Language Scale 4, Object naming sub/task and Oxford Communicative Development Inventory). The effect of language exposure is very important in bilingual children as vocabulary size depends on the quantity of input, on the context, on the time of exposure and on the language combination (de Houwer, 2010; Thordardottir et al., 2006). Consequently, this variable has to be taken into consideration while studying the vocabulary of bilingual population (Gathercole et al., 2008).

To conduct a study on simultaneous bilingual development and evaluate the acquisition of both languages, it is crucial to study the developmental trajectory of bilingual children and the specificity of their learning strategies (e.g., Kehoe, 2015). Qualitative comparisons are rare and all the studies that observed an effect of language exposure on bilingual learning (Bridges & Hoff, 2014; Buac et al., 2014; de Houwer, 2009), regardless of the

methods used (transcripts, reception/production vocabulary tests or parental questionnaires), to our knowledge, did not combined all these methods.

Some studies point to the existence of a relationship between some of the major milestones in early lexical development and general cognitive development during the second year of childhood. There is an association between measures of children's general cognitive level and language development measures - vocabulary size or age of first words produced (Bates, Benigni, Bretherton, Camaioni, & Volterra, 1979; Corrigan, 1978; McCune-Nicholich, 1981).

It is possible to postulate that the emergence of executive functions depends on language development (e.g., Kuhn et al., 2014; Petersen et al., 2015), but also that language development depends on executive function processes (e.g., Hayiou-Thomas et al., 2004; Murphy et al., 2014) (see Netelenbos, Gibb, Li, & Gonzalez, 2018). In order to have fluent and semantically correct discourse we use executive function abilities as working memory, attention, inhibition, and planning. Online storage and processing of verbal tasks require working memory skills (e.g., children with specific language impairment have reduced working memory skills [Archibald & Gathercole, 2006]). Murphy and colleagues (2014) showed that children with speech sound disorders committed more false alarms than controls, on an auditory attention task, because of the lower inhibitory control and/or selective attention. Eaton and Ratner (2016) explored the relation between phonological development and some executive functions (working memory, inhibitory control, and cognitive flexibility) in 4- to 5-year-olds children. They found that children with better performance on digit span task had better speech sound production. They conclude that children who produce speech errors may have lower working memory ability. Bialystok and Viswanathan (2009) found that 7-year-olds bilingual children are faster than monolinguals in inhibitory control and cognitive flexibility tasks. Bialystok, Craik and Luk (2008a) explored lexical access in bilingual and monolingual adults and they found that the performance of monolinguals is better on tests of naming and letter fluency, when comparing with bilinguals, but not on category fluency. Regarding the vocabulary size, there was no differences between monolinguals and bilinguals. Moreover, they studied the effect of vocabulary size on executive processing (letter fluency task) and when vocabulary size was matched, the performance of bilinguals was equal to the performance of monolinguals and when bilinguals' vocabulary scores were higher than monolinguals' vocabulary scores, the performance of bilinguals was better than the performance of monolinguals.

Ortiz-Mantilla, Choudhury, Leavers and Benasich (2008) concluded that differences in language abilities in very-low-birth-weight infants might belong to a global deficit that influences a number of cognitive functioning areas. Earlier studies point to previous cognitive ability and previous linguistic development (e.g., Pérez-Pereira et al., 2014; Sansavini, Guarini, Savini, Broccoli, et al., 2011) as factors that affect vocabulary size. Pérez-Pereira and Raquel Cruz (2017) found that the most important factors that predict total vocabulary size or vocabulary composition are general cognitive development at 22 months and word production at 30 months of age. Finally, Stokes and Klee (2009) found a correlation between auditory working memory and vocabulary development with monolingual children 24-30 month old. Does the same happen with typically developing bilingual toddlers? As far as we know, there are no studies exploring the link between vocabulary size and executive function abilities in bilinguals. Therefore, we will test this relation specifically with working memory and inhibition.

The influence of bilingualism in linguistic abilities and executive functions is getting more attention. The working memory skill is the ability of using online information to better solve a problem. The inhibition skill is the ability to control the behavior and impulses and to adapt our behavior to the context (Gioia, Aspy, & Isquith, 2003). Developmentally suitable tasks allow the differentiation of executive functions in

preschool-aged children (Espy et al., 1999), being possible to discriminate working memory, flexibility and inhibition skills. Inhibition and working memory are fundamental executive functions and they develop earlier comparing with planning and problem solving, which are more complex skills (Espy et al., 2001), that is why we will explore these specific executive functions.

There are linguistic and cognitive advantages for bilinguals (e.g., Adesope, Lavin, Thompson, & Ungerleider, 2010; Bialystok, 2001). Scientific evidence supports the existence of a facilitation in executive functions due the language skills of bilingual children. The gesture use in 15 month old toddlers predict the social communication skills and vocal development at 2-3 years old, predicting the executive functions abilities at 4 years of age (Kuhn et al., 2014). The later self-regulation in 2-3-years-old children is predicted by receptive and expressive language abilities (Petersen et al., 2015). Some studies demonstrated that the metalinguistic awareness is better developed in bilingual children than in monolingual children (e.g., Bialystok, 1987, 1988; Galambos & Goldin-Meadow, 1990). In tasks that demand cognitive flexibility and selective attention, bilingual children have better performance than monolingual children (Bialystok, 2001). These tasks require inhibitory processes to suppress ambiguous characteristics of the stimulus to pay attention to the important ones, being the inhibitory control crucial for the executive function (Miyake et al., 2000; Posner & Rothbart, 2000). Specifically, 4- and 5-year-old bilinguals have an advantage in selectively paying attention to one cue in the context of a conflicting cue (Bialystok, 1999; Bialystok & Martin, 2004; Martin-Rhee & Bialystok, 2008). Moreover, 6-year-old bilinguals have a better performance on conflict tasks that involve the management of conflicting attentional demands (Carlson & Meltzoff, 2008). There is a facilitatory translation effect for bilingual toddlers in naming pictures when they know translation equivalents, because the two competing language systems are activated (Poulin-Dubois, Bialystok, Blaye, Polonia, & Yott, 2013). There is evidence that 7-month-old (Kovacs & Mehler, 2009) and 8-month-old (Ibanez-Lillo, Pons, Costa, & Sebastian-Galles, 2010) bilinguals seems to show inhibition earlier and a cognitive advantage comparing with monolinguals.

Accordingly, conflict inhibition impacts the relation between executive functions and bilingualism. This influence can be explained by the fact that bilinguals need to manage two languages and inhibit one language while using the other (inhibitory processing), practicing selective attention and cognitive flexibility (e.g., Beauvillain & Grainger, 1987; Costa, 2005; de Groot, Delmaar, & Lupker, 2000; Green, 1998). This mechanism improves the working memory and the inhibition capacities (e.g., Bialystok, Craik, & Luk, 2008). It seems that cognitive alterations from a bilingual environment are occurring during the first two years of life, suggesting that monolingual and bilingual children have a different language organization and that the two language systems are separated early in language acquisition (Poulin-Dubois, Blaye, Coutya, & Bialystok, 2011). Poulin-Dubois Blaye, Coutya and Bialystok (2011) examined the bilingual advantage in executive functioning tasks in 24-month-old children with less experience in language production. Bilingual children were better than monolinguals on the Stroop task, showing an advantage in conflict tasks. The authors concluded that the bilingual advantage in executive control appear earlier than demonstrated on previous studies. Therefore, it is important to explore and control the role of executive functions on language development in younger children.

The general aim of the present study is to observe the early lexical development of French-Portuguese bilingual children in France. Portuguese immigration in France has always been important (Brutel Chantal, 2014, 8% of the entrants in 2012 had Portuguese nationality). Furthermore, the French-Portuguese comparison is particularly interesting because of the phonological and lexical particularities of both languages (see Almeida, 2011). Specifically, we want to explore if French-Portuguese bilingual toddlers understand and/or produce the same number of words as their monolingual peers, in French, in



European Portuguese (EP) or in both languages, for TV and for TCV. Moreover, as the literature points to a relation between language skills and executive functions abilities, we want to explore for the first time in toddlers the association between measures of toddlers' general cognitive level and language development measures.

Considering the reviewed literature, we expect that the vocabulary scores in each language for bilinguals will be similar to their monolingual peers. We also expect that the conceptual vocabulary for bilinguals will be comparable with conceptual vocabulary of monolingual peers and that the total vocabulary will be higher (Thordardottir et al., 2006). In addition, we expect that working memory and inhibition abilities will be correlated with vocabulary size (Stokes & Klee, 2009).

## **2 Method**

### **2.1 Participants**

Parents and their children were recruited through local organizations, community events, online advertisements, radio stations and personal contacts on a volunteer basis. 15 bilingual French-Portuguese toddlers living in France and in Switzerland, seven of them were 16 month old and eight 24 month old (8 girls and 7 boys) were included in the study. No twins were included. All of them were typically developing children (information obtained with the ASQ-3). The fact that the toddlers were exposed to both languages since birth was an inclusion criterion. Parents reported that all toddlers were exposed to both languages since birth (except one child that was exposed to French at 3 months). Concerning the parental level of education, 2 mothers (13%) and 1 father (6.7%) had less than a High School Degree, 9 mothers (60%) and 9 fathers (60%) had a High School Degree and 4 mothers (26%) and 5 fathers (33.3%) had the Bachelor's Degree.

### **2.2 Procedure**

We asked all parents to fill in the French and EP versions of the MCDI, the PaBiQ and the Ages and Stages Questionnaire (approximately 30–40 mins). Additionally, the parents of the 24 month old toddlers filled in the Inhibition and Working Memory scales of the BRIEF-P (approximately 10 mins). The questionnaires were administered in the language that parents were most comfortable with.

#### **2.2.1 Vocabulary evaluation**

The toddlers' linguistic level was assessed with two parental reports: the French (Kern & Gayraud, 2010) and the Portuguese (Viana et al., 2017) Inventory of Communicative Development, adaptations of the MacArthur-Bates CDI (Fenson et al., 2007), a parental questionnaire which aims at accounting for the communicative development of children between 8 and 30 months, allowing the quantitative evaluation of the words' production and the grammatical and semantic composition of the lexical stocks. There are two CDI questionnaires available: (1) words and gestures, designed for children aged 8 – 16 months and (2) words and sentences, designed for children aged 16 – 30 months. We used the second version which traditionally only evaluates word production. We calculated the total produced words in French and in Portuguese and compared each total vocabulary to their respective norms. We also calculated the total vocabulary (the sum of the total words in French and EP) and the total conceptual vocabulary (total of translation equivalent pairs on the two CDIs) and compared each to the monolingual norms.

### **2.2.2 Language background questionnaire (PaBIQ)**

A third questionnaire was administered to the parents entitled Questionnaire for Parents of Bilingual Children (PaBiQ; Tuller, 2015) in French or in EP to obtain information about the quantity and quality of the exposure in both languages, their use by the children and to define their dominant language. Specifically, it includes questions about background factors related to the child and to the family that could have an impact on the developmental course of language acquisition in each language, such as the child's health and language development, parental education, age of onset and frequency of exposure to each language from the main and secondary caregivers. The language dominance index was calculated. For that, we obtained the language exposure score for each language by adding up these scores (/55): age of onset (/4), frequency of early exposition (/4), diversity of early contexts of exposure (/8), length of exposure (/4), present use at home (/16), present use during different activities and with friends (/14) and number of years in elementary school (/5). Posteriorly, we subtracted the language exposure/use score in French from the language exposure/use score for EP. The cut-offs used were: (1) balanced bilinguals, when toddlers had a language dominance index between -6 and +6, (2) French dominant, when they had a language dominance index below -6 and (3) EP dominant, when they had children a language dominance index above +6 (see Almeida et al., 2017).

### **2.2.3 Ages and Stages Questionnaires**

A fourth questionnaire was filled in by the parents, the Ages & Stages Questionnaires®, Third Edition (ASQ-3™; Squires, Twombly, Bricker, & Potter, 2009) to evaluate the developmental and social-emotional screeners to pinpoint delays. The questionnaire includes thirty items that evaluate the areas of communication, gross motor, fine motor, problem solving, and personal-social skills in a scale of three points ('yes', 'sometimes' and 'not yet'). We applied the ASQ at both 16 and 24 months of age. The ASQ-3 allowed us to check if all the participants had a normal general development. We used the EP (Lopes, Graça, Teixeira, Serrano, & Squires, 2015) and French (Squires & Bricker, 2016) versions according with the proficiency of the parents.

### **2.2.4 BRIEF-P**

We administered to the 24 month old children the Inhibition and Working Memory scales of the Behavior Rating Inventory of Executive Function - Preschool Version (BRIEF-P; Gioia, Aspy, & Isquith, 2003) to assess their executive behaviors. The inhibition scale includes 16 items about impulses and behavior control, suitable stop and modulation of the own behavior at the proper moment and context. The working memory scale contains 16 items describing behaviors about holding the information in mind for the purpose of completing a task or making the appropriate response and staying with, or sticking to an activity. The raw scores, T scores and percentile ranks were calculated. We used the EP (adapted and reproduced by special permission of the Publisher, Psychological Assessment Resources, Inc.) and the French (Roy & Le Gall, in preparation) versions according with the proficiency of the parents.

## **3 Results**

By using the PaBIQ, we assessed the language exposure and we calculated the language dominance (Almeida et al., 2017). The results showed that 7 of the participants had EP as

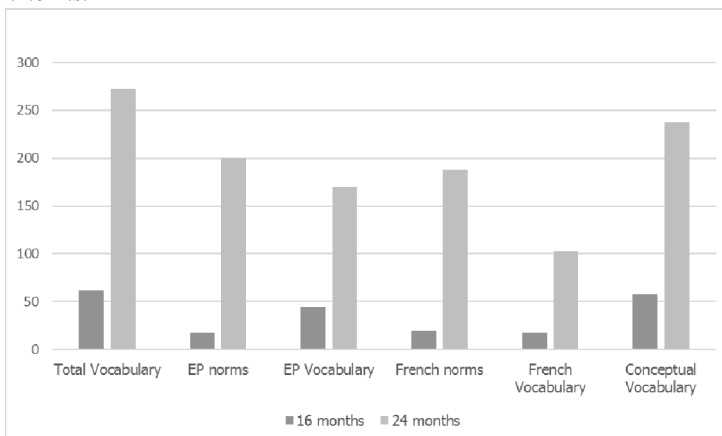
dominant language, 4 had French as dominant language and, for the remaining participants (3) there was no language dominance. The most talked language in toddlers' homes was EP (N = 10, 66.7%). In only 3 cases (20%) the most frequent language used at home was French and for the remaining cases, the use was balanced between languages (N = 2, 13.3%). In the other contexts, French was the most used language (N = 10, 66.7%) if compared with EP (N = 3, 20%) and with the balanced cases (N = 2, 13.3%). Regarding the language level of the mothers, 8 of them had the same level in both languages (53.3%) and 7 were more proficient in EP (46.7%). None of them were more proficient in French. Parents reported that 7 (46.7%) of the toddlers were usually/always exposed to EP, 3 (20%) half of the time and 5 (33.3%) never/rarely. Data about French language showed that 5 (33.3%) of the participants were usually/always exposed to French, 4 (26.7%) half of the time and 6 (40%) never/rarely.

Firstly, we examined if the scores of the toddlers of our study corresponded to the monolingual norms. The results of Portuguese and French CDI showed that most of our children are situated above the 10th percentile for both EP and French monolingual norms. They are in the low level of the distribution but they cannot be considered as presenting risk of language impairments. Concerning the EP vocabulary scores, 14 of the 15 children are above the 10th percentile and only 1 is at risk, which is usual for a normal distribution. Regarding the French vocabulary scores, 10 of the 15 children are above the 10th percentile and 5 are at risk considering the monolingual norm.

Subsequently, we compared the vocabulary size of the children of our study with the monolingual norms. Khi-square analysis showed that vocabulary size of our subjects in Portuguese corresponds to EP monolingual norms ( $\chi^2(1) = .07, p = .80$ ), being that 8 children are above the 50th percentile. The vocabulary size in French of these bilingual children is in general below the French norms ( $\chi^2(1) = 8.07, p = .005$ ): only 2 children are above the 50th percentile. French-Portuguese bilinguals of this study have the same performance in vocabulary acquisition in each language between 16 and 24 month old as their monolinguals when total conceptual vocabulary was considered both comparing with EP norms ( $\chi^2(1) = 1.67, p = .20$ ) or with French norms ( $\chi^2(1) = 3.27, p = .07$ ). Moreover, their total vocabulary (French + EP) exceeds total vocabulary of monolinguals ( $\chi^2(1) = 5.4, p = .02$ ).

**Fig. 1.** Number of words by age.

*Note that (1) EP norms means the mean of total words that girls and boys in 50th percentile say for EP norms and (2) Fr norms means the mean of total words that girls and boys in 50th percentile say for the French norms.*





For executive functions, high scores obtained on the BRIEF suggest a certain level of dysfunction. For the 24-month-old bilingual toddlers (the BRIEF-P is not available for 16 months old children), a significant positive correlation between vocabulary size (both TV and TCV) and working memory scores appeared ( $r_s = .76, p = .04$ ): in our sample, children with higher vocabularies seems to have worse working memory capacities. However, no significant correlation between vocabulary size and inhibition capacity was found ( $r_s = .52, p = .20$ ). Finally, a positive correlation between inhibition and working memory appeared ( $r_s = .77, p = .04$ ).

## 4 Discussion

The aims of our study were to explore (a) if French-Portuguese bilingual toddlers understand and/or produce the same number of words as their monolingual peers, in French, in EP or in both languages and (b) the association between measures of toddlers' general cognitive level and language development measures. To do so, we used the measures referred in the literature as the best to evaluate the bilingual children's vocabulary (Pearson et al., 1993). We expected that the vocabulary scores in each language for bilinguals would be similar to their monolingual peer's scores. We also expected that the conceptual vocabulary in bilinguals would be comparable to conceptual vocabulary of the monolingual peers and that the total vocabulary will be greater (Thordardottir et al., 2006). In addition, we expected that working memory and inhibition abilities would be correlated with vocabulary size (Stokes & Klee, 2009).

In sum, the results showed, as expected, that all the French-Portuguese bilinguals of this study had the same performance in vocabulary acquisition in EP when compared to the Portuguese norms for monolingual peers between 16 and 24 months and in TCV (e.g., de Houwer, 2010; Junker & Stockman, 2002; Pearson et al., 1993). The same happened in French for almost all the participants (except 5). Their TV (French + Portuguese) exceeded the vocabulary size of monolinguals.

Five toddlers could be considered at risk of language impairments because of their very low vocabulary size. However, it is important to note that this result has to be taken cautiously as French language may have been undervalued by the parents who were not able to identify the French words. Moreover, for the majority of these children the dominant language was EP with only four children having more than 60% of exposure to French (Catani et al., 2014) and the mothers were more proficient in EP than in French. Qualitative measures would be useful to complement the measure of vocabulary size.

Nevertheless, it is important to note that our measures may have some limitations. Using the CDI with bilingual population could lead to some shortcomings if one of the parents rate their children's vocabulary in both languages (e.g., some studies claim that more adults should report the child's vocabulary [de Houwer, Borstein, & Leach, 2005]). Differences not expected between the word frequencies in EP and French can occur (Peña, Bedore, & Kester, 2015). Moreover, in the PaBIQ questionnaire, parents of children in bilingual contexts can have difficulties to estimate the amount of input in each language, especially in the less dominant language (Quay, 2008).

We also found a relationship between vocabulary size and working memory. The relationship found is in contradiction with the previous literature which states that some executive function abilities are associated to language development (e.g., Bates et al., 1979; Corrigan, 1978; McCune-Nicholich, 1981) and in bilingual toddlers as well as it was found for monolingual children 24-30 month old (Stokes & Klee, 2009). It seems that our 24-month-old toddlers with a higher vocabulary size are not better performing multistep activities, sustaining problem-solving activities, executing basic mental manipulations and following difficult instructions. Is it due to the size of the sample, or its high variability? One path to explore is the possibility of a factor that was not taken into account in the

present study and may have led to blurred results. In the line, at that age, the vocabulary size is not related to inhibitory control and impulsivity, i.e., ability to resist impulses and to stop a behavior at the right moment (Gioia, Aspy, & Isquith, 2003). As inhibition is highly correlated with working memory in our sample, it is highly possible that with a bigger sample, no correlation at all will be found between vocabulary size and executive functions (Paap et al., 2015).

To conclude, our findings help in the understanding of the language development in bilinguals and contradict the beliefs about the disadvantages of raising a child in a bilingual environment. These beliefs can influence the parents not to speak both languages and the diagnostic of specialists (e.g., diagnose bilingual children with language impairments).

Future research should focus on the acquisition trajectory of bilingual children by combining data obtained through parental questionnaire with spontaneous data in longitudinal studies to account fully for bilingual lexical development considering both the environment (input) and the influence of the linguistic system (e.g., phonological complexity).

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