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Literacy, metalinguistic, and executive functions processing in bilingual children speakers of similar typology languages in a border area

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Abstract

This study aimed to analyze whether there are differences between bilingual (Brazilian Portuguese and Spanish) and monolingual (Brazilian Portuguese) school children regarding reading and writing learning achievement, in executive functions (EF) components and metalinguistic abilities. Twenty-three bilingual and 23 monolingual children, aged 6 to 8 years, were assessed in terms of their writing, reading, and metalinguistic abilities, and with verbal and non-verbal tasks testing EF. A bilingual advantage was observed in reading and writing abilities and in 16 of the 44 EF measures, including subcomponents of working memory, inhibition, cognitive flexibility, and executive attention, mainly in non-verbal paradigms, while monolingual children outperformed bilingual ones in three scores: counting errors (Five Digits Test), omission of bells (Bells test) and sequential trial B (Trail Making Test). There were moderate and weak effect sizes in metalinguistic subcomponents showing bilingual advantage. Literacy improvement seems to have the potential to increase linguistic and cognitive abilities.

Introduction

The use of two or more languages is natural and common in many countries around the world. For instance, in the Brazilian scenario, linguistic diversity includes 274 indigenous languages, 56 languages of immigration, the languages of Afro-Brazilian communities, and creole languages (Hubner, 2016), together with border languages (Morello & Seiffert, 2019), used in family and social contexts. In academic, scientific, and technological contexts, as in many other countries, the English language is the lingua franca, used mainly in the written modality. In the case of immigration languages or dialects, speakers do not always show balanced fluency in the languages they manage. In some cases, they do not master writing and reading skills – only oral ones (speaking and oral comprehension) passed down over generations – because they did not receive formal education in these two abilities.

Concerning the literacy development and school performance of bilingual children, studies are still scarce, and data are still inconclusive regarding the impact of bilingualism on these two educational aspects. Research has postulated that similar aspects in two languages can allow bilinguals to use the literacy skills acquired in one of the languages to obtain gains in the other one (Proctor, August, Snow & Barr, 2010). The Van der Vel de Kremin, Arredondo, Hsu, Satterfield, and Kovelman (2019) study, comparing bilingual Spanish–English and monolingual English children, revealed that bilinguals performed better in phonological and orthographic representations than did monolinguals when reading in English. This suggests that the experiences of bilingual children with Spanish contributed directly and positively to literacy in English.

On the other hand, a good amount of research has concentrated lately on investigating the impact of bilingualism on cognitive functions. For example, bilingual experience may affect the development of executive functions (EF) (Bialystok, Craik, Green & Gollan, 2009; Chung-Fat-Yim, Himel & Bialystok, 2019) due to the richer linguistic environment influence on the quality of cognitive development (Goldin-Meadow, Levine, Hedges, Huttenlocher, Raudenbush & Small, 2014). The EF consist of a set of processes of general control that are fundamental to the self-regulation of thoughts and planning for the achievement of objectives (Diamond, 2013; Paap, Johnson & Sawi, 2015). Bilingualism is a phenomenon in which the individual is capable of communicating actively in two languages or dialects as a function of their daily needs (Grosjean, 2010; Jaekel, Jaekel, Willard & Leyendecker, 2019).Thus, the bilingual cognitive advantage would derive from the necessity of controlling and monitoring the use of two (or more) distinct competing languages in the brain (Green & Abutalebi, 2013; Kroll, Bobb & Hoshino, 2014), which would create higher cognitive demands on bilinguals as compared to monolinguals.

The interface between EF and bilingualism has increasingly raised interest in educational and clinical research. Some studies indicate that EF develop earlier in bilingual children than in monolingual ones (Bialystok, 2010; Carlson & Meltzoff, 2008; Hartanto, Toh & Yang, 2019). In addition, bilingual children tend to overcome their monolingual peers in tasks that evaluate the comprehension of the abstract structure of a language (Bialystok, 2015); however, these advantages seem to become evident when tasks include conflict management (Bialystok, 2015). Moreover, the bilingual experience can help develop basic interpersonal communication skills (Jaekel et al., 2019), and help manage more complex and multitask language processing as compared to monolinguals in contexts in which more EF are recruited (Poarch & Bialystok, 2015).

In relation to other cognitive gains, Bialystok and Viswanathan (2009) propose that the benefits of bilingualism affect executive functioning more broadly, also influencing performance in tasks involving conceptual knowledge, such as problem-solving. In other words, bilingualism would impact children's school performance because bilinguals would be quicker and more accurate than monolingual children in finding an answer or a solution to adversity.

From an opposite perspective, Sánchez-Azanza et al. (2017) stress that the number of studies challenging the bilingual advantage hypothesis has increased notably in the last decade. For example, Paap and Sawi (2014) administered four tasks (antisaccade, attentional network test, Simon task, and color-shape switching) to evaluate the bilingual advantage. The results were not significant in some tasks, while in others the monolingual group had an advantage over the bilingual one. According to Paap, Johnson, and Sawi (2015), studies should verify whether the differences reported in the performance of bilinguals and monolinguals are due to other causes rather than to bilingualism, and whether the dependent variables used actually measure EF. Similarly, Antón, Carreiras and Duñabeitia (2019) argue that differences in performance between young adult groups may be an effect of uncontrolled factors or imperfectly matched samples and that domain-specificity of the executive functions and working memory must be taken into account when one is discussing results comparing bilinguals' and monolinguals' performances.

Few studies investigate the relationship between bilingualism and specific executive components (Bialystok et al., 2009; Valian, 2016). Jaekel et al. (2019) found no effects of bilingualism on performance in tasks of processing speed, inhibition, and cognitive flexibility by bilingual and monolingual children. Another study including more than 4,000 bilingual children found that bilingualism moderated the effects of lower socioeconomic level in tasks of inhibition and cognitive flexibility; also, the authors found that only socioeconomic level was a predictor of working memory performance (Hartanto et al., 2019).This shows the need for matching SES when comparing groups' performance in EF components and other cognitive and linguistic variables under analysis.

Metalinguistic knowledge and ability intrinsically related to EF due to its demands on monitoring, analyzing, and controlling linguistic processing at a conscious level have been pointed out as being more developed in bilinguals (Bialystok, 2015). Metalanguage refers to the explicit knowledge of the linguistic structure and the ability to intentionally access this knowledge (Barac & Bialystok, 2012). According to Bialystok (2015), the bilinguals' metalinguistic advantage would reside much more in their cognitive capacity than in the linguistic processing itself. This benefit, as already mentioned, would derive from the practice of managing two languages (Bialystok, 2007), as the exercise of controlling two languages would foster more efficient and faster cognitive processing.

Consequently, in metalinguistic tasks, which favor the recruitment of executive control processes in which it is difficult to isolate the form from its meaning, bilingual children would perform better than monolingual children. Furthermore, according to Eviatar, Taha, Cohen, and Schwartz (2018), the typological proximity between two languages (as is the case in our research, regarding Brazilian Portuguese and Spanish) might improve bilingual children's ability to understand the structure of the word on both the phonemic and morphemic levels, and provide an advantage over their monolingual peers.

Some metalinguistic studies of bilingual children's reflection upon language arbitrariness (Cohen, 2013; Mendonça, 2009; Piantá, 2011; Safinia, 2015) have shown divergent results. Safinia (2015) applied word-manipulation tasks, word exchange, the Wug task, and a grammatical judgment task. There was a significant difference between the linguistic groups only in the task of word manipulation, with an advantage for the bilingual group. Cohen (2013) administered four metalinguistic tasks (Word order repetition, Word renaming, Symbol substitution, and Grammar judgments) in a balanced bilingual group and a dominant bilingual group (French or English). There was a difference between groups only in the Word renaming task, showing better results for the balanced bilingual group.

Mendonça (2009) and Piantá (2011) administered a task of Language Arbitrariness and one of Symbol Substitution to Brazilian Portuguese-speaking children, learners of English as L2. In the first study, the results showed no difference between groups in the two metalinguistic tasks. In the second study, the results indicated higher development of metalanguage and inhibition abilities. Participants with higher L2 exposure obtained the higher scores in both tasks.

The divergent results reported above in bilingual children's metalinguistic performance might be a consequence of variables related to individual, linguistic, and contextual factors. An example of individual aspects is the stage of literacy process that the children are in when metalinguistic data are collected. Yet contextual factors, such as an unbalanced SES level between children's groups, could also reflect on their performance; conversely, cultural and socio-demographic aspects, including parents' schooling and socio-economical levels, the frequency of storytelling to their children, and their own reading and writing habits, may reflect on children's metalinguistic and literacy development. Finally, language typology could influence the results, as similarities or differences between languages could influence the level of ease or difficulty in transferring or suppressing metalinguistic and literacy mastery in each language (Bialystok, 2007).

Taken together, the studies analyzed above reflect the lack of consensus on the impact of bilingualism on EF and metalinguistic knowledge. Mismatching results may be related to: 1) the differences in tasks of executive functions that predominantly evaluate one or another specific component (Valian, 2016), in general using either verbal or non-verbal tasks; 2) the variability of factors that influence executive functioning and that have not always been controlled for or matched between bilingual and monolingual groups, including socioeconomic level and personality variables (Valian, 2016), reading and writing habits, and educational level (Bialystok et al., 2009); and 3) the observance of language typology (whether or not belonging to the same family) and language context of use (as in the case of border languages, in which switching and mixing phenomena may take place much more heavily and frequently).

Thus, this study aimed to verify whether there are differences between bilingual and monolingual children in learning achievement (reading, writing, and arithmetic), verbal and nonverbal EF (planning, inhibitory control, working memory, cognitive flexibility, and cognitive efficiency), and metalinguistic abilities. Investigations with this profile of participants may be useful, for example, for further studies with immigrant populations. To verify the hypothesis that bilingualism increases children's performance in reading and writing ability, EF, and metalinguistic processing, a monolingual group and a bilingual group of school children from 1st to 3rd years were compared. The next sections report on the study, its results, and a discussion of them.

Method

Participants

Fifty children aged 6 to 8 years were initially recruited to participate in this study. Four children did not meet one or more of the selection criteria and were not included. Thus, the final sample was composed of 46 children recruited from public schools in two cities in the south of Brazil. The participants were classified according to language experience as follows: one group was composed of Brazilian Portuguese (BP) – Spanish (S) bilingual students (n 23) who lived in a border area between Brazil and Uruguay and had learned both languages before the age of five, but were literate in Portuguese at school. The bilingual group lived in a family and social bilingual immersion context, they had daily exposure to both languages, because both Brazilian Portuguese and Spanish were freely and constantly practiced at home, work, school, commerce, and services, mainly in the oral modality. Their parents were also bilinguals and were native speakers of either one or the other language (BP or S). For purposes of avoiding the effect of daily exposure to an additional language, a second group included monolingual (Brazilian Portuguese) students (n 23) who did not live in a border area. Children were recruited within the first three years of elementary school, when literacy was being developed in Brazilian schools, and the groups were matched for age and school year.

Among the inclusion criteria were daily exposure to both languages, with one of the parents being a native Spanish speaker (specifically for the bilingual group), with no auditory or visual uncorrected problems, presenting typical language processing. All participants' present IQ was equal to or higher than 80 (WASI – Yates et al., 2006).

Instruments

Important methodological decisions were taken to ensure that the two groups were under the same conditions, so that sociodemographic, cognitive, school, and health issues directly related to cognitive performance were observed to form the groups. All instruments were administered in their versions adapted to Brazilian Portuguese.

* *Three questionnaires related to the identification of participants' bilingual profile, health issues, and socioeconomic status*

1) Data Survey for Children's Bilingualism Research. This questionnaire was developed by the researchers and administered to the bilingual children's parents. It includes questions related to the parents' place of birth, language used at home and in the community, the language in which they feel most comfortable talking, and whether or not they consider themselves bilingual, as well as their child's age of language acquisition, years and amount of exposure, and proficiency in both languages. Although a subjective measure, the bilingual parents' statements confirming that their children used both languages in their daily lives is a valid and reliable tool for assessing the children's bilingual condition (Marian, Blumenfeld & Kaushanskaya, 2007; Paap & Sawi, 2014).
2) Questionnaire on health, sociodemographic, and cultural factors for children's neuropsychological assessment (Fonseca, Jacobsen & Pureza, 2015). The questionnaire was developed to examine the child's clinical, educational, and socio-cultural history. More specifically, this instrument investigates diseases, hospitalizations, school difficulties, writing and reading habits, socioeconomic level, and parental education.
3) Brazilian Economic Classification Criterion (Associação Brasileira de Empresas de Pesquisa, 2016). This survey assesses the participants' socioeconomic level, considering movable property, the education level of the head of the family, and access to public services. The classification is organized into seven social classes (A, B1, B2, C1, C2, D, and E).

This study aimed at assessing EF components and metalanguage abilities through the administration of multiple verbal and nonverbal tasks to groups of bilingual and monolingual children at different ages in their literacy development process, as already mentioned. The adopting of various typologies of tasks measuring the same constructs has been suggested by Paap and Sawi (2014) and Valian (2016), who state that different tasks and measures are very rarely used in the same study to check for bilingual advantage. In this way, more consistent evidence can be reached.

Tasks assessing school performance

a) School Performance Test II - TDE-II (Stein, Giacomoni & Fonseca, 2019). This instrument evaluates the fundamental abilities for school performance, such as reading, arithmetic, and writing. Each competence corresponds to a subtest. The maximum score in each subtest is as follows: a) written - 40 points; b) arithmetic - 37 points; and c) reading - 36 points.
b) Reading and Writing Scale - teacher version - RWS (Morais, 2016). This scale investigates possible difficulties in reading and writing learning that may lead a child/adolescent to perform poorly. The score ranges from 0 to 64 points. A score equal to or greater than 62 points indicates that the child has a degree of difficulty in reading and writing and should receive monitoring.

Tasks assessing EF components

a) Child Hayling Test - HCT (Siqueira, Gonçalves, Hübner & Fonseca, 2016). This is a verbal task to assess the executive components of initiation, verbal inhibition, cognitive flexibility, and processing speed. The test consists of two parts (A and B), with a score of correct answers ranging from 0 to 10. The evaluated measures are execution time and errors.

b) Digits Span Test - DST, a subtest of the Infant Brief Neuropsychological Assessment Instrument - NEUPSILIN-INF (Salles, Fonseca, Parente, Cruz-Rodrigues, Mello, Barbosa & Miranda, 2016). This is a verbal task less dependent on language, to examine verbal/phonological working memory. The test consists of two parts (forward and backward), with scores ranging from 02 to 09 in each part. The span is indicated by the number of items in the last sequence repeated correctly.

c) Corsi's Blocks Test - CBT, subtests of the Infant Brief Neuropsychological Assessment Instrument - NEUPSILIN-INF (Salles et al., 2016). This is a non-verbal task to evaluate the visuospatial component of working memory. The test consists of eight square sequences varying in length, between two and five stimulis. The sequence score ranges from 02 to 05 points. Participants' performance in the task is measured by the longest sequence answered correctly and by the total score.

d) Five Digits Test - FDT (Sedó, De Paula & Malloy-Diniz, 2015). This is a non-verbal task to evaluate the speed of cognitive processing, attention, inhibition, and cognitive flexibility. The test consists of four parts (reading, counting, choosing, and shifting), ranging from 0 to 50 points each. Performance is measured through execution time and errors for each part.

e) Trail Making Test for children- TMT (Trevisan & Seabra, 2012). This is a non-verbal task to assess the development of cognitive flexibility in children. This task consists of two parts (A and B). In the first, there are five sequences and four connections of stimuli, while in the second there are 10 sequences and nine connections. Performance is measured according to the number of correct sequences and connections, in addition to the execution time of each part.

f) Pseudowords Span - PS, a subtest of the Infant Brief Neuropsychological Assessment Instrument - NEUPSILIN-INF (Salles et al., 2016). This is a verbal task to examine verbal/phonological working memory. The total score is 20 points, with one point per word correctly repeated. In addition, the task is scored by the longest sequence repeated correctly.

g) Bells Test for children (Fonseca, Jacobsen & Pureza, 2015). This is a non-verbal task to evaluate focused and selective attention, visual perception, and processing speed. The maximum score of the task is 35 points. Performance is assessed by the number of errors and omissions and the execution time of the task.

Tasks assessing metalinguistic knowledge at the word level

a) Language Arbitrariness Test- LAT (Mendonça, 2009; Piantá, 2011). This assesses awareness of the arbitrary nature of the word-referent relationship. The test consists of two parts (A and B), with a score of up to 10 points in each part. The score for each part and the total score are the measures of that task.

b) Symbol Substitution Test- SST (Mendonça, 2009; Piantá, 2011). This assesses the understanding of the arbitrary nature of the word-referent relationship.The test consists of two parts (A and B), with a score of up to 10 points in each part. The score for each part and the total score are the measures of that task.

This research was approved by the Ethics Committee at the Pontifical Catholic University of Rio Grande do Sul (PUCRS) under protocol number 1.686.833. The children who participated in the study were read the terms of informed consent to participate in the study and signed it. Additionally, their parents or legal representatives gave their formal consent.

Procedures for data collection

At first, the Reading and Writing Scale was administered to the teacher (teacher assessment of the student), while the TDE-II was administered to each child. Afterward, the other tests were administered, in the following order: Child Hayling Test, Digits Span Test, Corsi's Blocks Test, Language Arbitrariness Test, Symbol Substitution Test, Five Digits Test, Trail Making Test for children, Pseudowords Span, and Bell Canceling Test for children. Each participant was individually administered all the tests in his/her respective school in a quiet environment, in a single session lasting approximately one and a half hours. Standardized instructions were used for each test.

Data analyses

The normality test (Shapiro-Wilk) showed that the data did not present normal distribution. Thus, the non-parametric Mann-Whitney test was chosen. Alpha <0.05 was considered. The analyses were performed using statistical software SPSS version 17.0. Beyond the level of significance, the effect size of the differences between groups was considered (Hedges' g) using the computer calculator available at https://www.socscistatistics.com/effectsize/default3.aspx. Groups' performances were compared in all tasks. The magnitude of effect sizes was defined by Cohen's (1988) criteria as small (0.2), medium (0.5), and large (0.8). Effect size analyses complement the significance analyses, as they indicate the magnitude of the difference between groups (APA, 2010). This type of analysis has been pointed out as being very appropriate and reliable in experimental studies (Schuele & Justice, 2006) and in a small sample; in our study, the analyses of effect size are relevant to show how strong the effect can be (Halsey, 2019).

Results

The groups did not differ in relation to age, intelligence quotient (IQ), socioeconomic status (SES), mother's education, and mother's reading and writing habits (Table 1).

Table 1 presents the groups' socio-demographic profile in terms of means and standard deviations. As indicated in the table, the children came from medium-low SES. Considering the average of the SES variable, the participants in both groups belong to an economic class with few financial resources (C2), though they do not belong to the least favored classes (D-E). According to the Brazilian Market Research Association (Associação Brasileira de Empresas de Pesquisa, 2016), class C2 represents 25.60% of the Brazilian population, who do not have access to public utility services or the highest levels of formal education. The average household income for families in this group is US$338.28/month.

Regarding school learning assessment, comparisons between groups on reading, writing, and arithmetic abilities (TDE-II) showed a significant advantage of the performance of the bilingual group over the monolingual one, with low to high effect sizes. More specifically, the statistical advantage and effect sizes

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Table 1. Participants' socio-demographic characteristics and IQ measures

	Bilingual (n = 23)	Monolingual (n = 23)	P	g
AGE	7.13 (0.79)	7.16 (0.79)	0.82	0.03
IQ	102.21 (3.70)	100.39 (5.40)	0.15	0.39
SES	19.30 (1.92)	18.82 (1.60)	0.35	0.27
Mother's Education	8.30 (1.98)	8.86 (2.13)	0.20	0.27
Mothers' reading habits	1.91 (1.08)	1.82 (1.83)	1.00	0.05
Mothers' writing habits	1.52 (1.23)	2.08 (1.34)	0.18	0.43
Female (%)	30,44%	47,83%		
Male (%)	69,56%	52,17%		

Notes: SD – standard deviation; SES - socioeconomic status as calculated according to the Brazilian Economic Classification Criteria (Brazilian Association of Research Companies, 2015): Class A = 45–100 points, B1 = 38–44 points, B2 = 29–37 points, C1 = 23–28 points, C2 = 17–22 points, D-E = 0–16 points; IQ - Intellectual quotient as measured by the Wechsler Abbreviated Scale of Intelligence (WASI).Mothers' reading habits and Mothers' writing habits measured the time in hours dedicated to reading and writing by the participants' mother.

Table 2. Language groups' school learning differences

	Bilingual	Monolingual	*P*	*G Advantage*
TDE				
Reading – total	21.87 (15.89)	8.09 (14.06)	0.00	0.85 B***
Reading – time	106.54 (111.32)	88.61 (51.38)	0.54	0.17
Reading – cognitive efficiency	28.41 (13.51)	26.84 (12.81)	0.64	0.15
Writing – total	13.57 (5.79)	5.57 (10.44)	0.00	0.94B***
Writing – time	221.77 (158.38)	300.80 (197.23)	0.25	0.46B*
Writing – cognitive efficiency	5.79 (2.07)	5.03 (1.61)	0.47	0.38 B*
Arithmetic– total	13.17 (11.10)	10.57 (10.44)	0.07	0.32B*
RWS				
Total	32.43 (12.80)	43.91 (10.70)	0.00	0.97B***

Note: TDE II - School Performance Test II; **RWS** - Reading and Writing Score. The time and cognitive efficiency scores of the reading and writing subtests were performed based on the scores of 17 bilingual and 6 monolingual children in the process of literacy.* Low effect size; ** Moderate effect size; ***High effect size

were found in the total reading score and total writing score (high effect size), the total writing time (moderate effect size), writing – cognitive efficiency, and total arithmetic ability (low effect size). Conversely, the results of the Reading and Writing Scale (RWS), answered by the teacher, corroborate the findings of TDE-II, reporting a bilingual advantage. The bilingual group showed higher reading and writing performance as compared to the monolingual group ($p <0.001$) (Table 2).

There were no significant differences in the scores of metalanguage measures but moderate and small effect sizes were found in the three subtasks of Symbol Substitution favoring bilinguals, while a moderate effect favoring monolinguals was found in Part A of the Language Arbitrariness Test. Yet, from the 30 scores generated by the seven tasks measuring EF, there was a monolingual advantage in three of them and an advantage for bilinguals in 10 of them. The analyses of effect size showed a much higher bilingual advantage as compared to a monolingual one, with a low and mainly moderate and high effect size in 12 out of 30 subtasks, while monolingual advantage was observed in six (Table 3).

Discussion

The bilingual group in this study outperformed the monolingual one in reading, writing, and arithmetic abilities, which are measures of school performance, in consonance with the study conducted by Van der Vel de Kremin et al. (2019). A large effect size was observed in total reading, total writing, and total reading and writing score (RWS), small effect size in two writing subtasks. There was a small effect size on arithmetic ability. It may be the case that, in this study, the performance of the bilingual group in the reading and writing skills developed during literacy in Portuguese has been favored by the oral linguistic knowledge acquired in Spanish. As reported by Proctor, August, Snow, and Barr (2010), literacy skills acquired in a language can be transferred to another language, especially when they share similar properties, such as is the case with the two languages in this study.

Data collected for this study indicated significant differences between monolingual and bilingual children concerning EF components – namely, inhibition, working memory, and cognitive flexibility – as well as in reading and writing performance. However, regarding metalinguistic processing, no differences were found in the comparisons between groups. Thus, these results corroborate the hypothesis that bilingualism seems to improve some components of EF and impacts the literacy process in bilingual children.

Our data are in accordance with those of Kroll and Bialystok (2013) and Hartanto et al. (2019), showing a bilingual advantage in inhibition, though they are in only partial accordance with the

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Table 3. Means, standard deviations, significant differences and effect size between language groups in EF components

Measure	Bilingual (n = 23)	Monolingual (n = 23)	*P*	*g*	Advantage	Stimuli's Task
Child Hayling Test						V
Time A	27.8 (12.7)	32.5 (13.05)	0.16	0.36	B*	
Error A	1.26 (1.35)	1.87 (1.25)	0.08	0.46	B*	
Time B	43.8 (26.01)	57.1 (24.47)	0.05	0.52	B**	
Error B	5.35 (2.12)	6.22 (1.88)	0.10	0.43	B*	
Error/30	0.42(0.23)	0.48(0.19)	0.11	0.28	B*	
Digits span						V
Forward	6.09 (2.15)	4.83 (1.02)	0.00	0.74	B**	
LDSF	4.04 (1.22)	3.57 (0.66)	0.02	0.47	B*	
Backward	3.17 (1.92)	2.09 (1.31)	0.03	0.65	B**	
LDSB	2.48 (1.23)	2 (1.04)	0.03	0.42	B*	
Pseudowords Span – PS						V
Total	7.30 (4.65)	6.43 (2.19)	0.92	0.23	B*	
Span	2.09 (0.94)	1.96 (0.47)	0.48	0.17		
TMT						N-V
Sequence Trail A	81.83 (43.16)	74.5 (36.76)	0.63	0.18		
Score A	88 (24.10)	62.5 (31.49)	0.37	0.90	B***	
Time A	18.8 (12.9)	25.1(7.9)	1	0.58	B**	
Sequence Trail B	44.33 (48.69)	101. 50 (19.11)	0.04	1.54	M***	
Score B	35.83(39.34)	83.83 (22.82)	0.09	1.49	B***	
Time B	37.1 (16.4)	37.81 (42.7)	0.25	0.02		
Bells Test						N-V
Time	171.2 (103.2)	177.2(73.4)	0.44	0.06		
Error Bells	3.3 (7.2)	8.95 (6.72)	0.00	0.81	B***	
Omission Bells	9.39 (4.52)	6.39 (5.38)	0.04	0.60	M**	
CBT						N-V
Score	21. 35 (9.44)	14.74 (8.65)	0.01	0.73	B**	
Span	4.04 (1.46)	3.7 (1.18)	0.19	0.25	B*	
FDT						N-V
Reading – Error	1.05 (2.16)	0.31 (0.77)	0.12	0.45	M*	
Reading Time	45.0 (18.56)	61.7 (19.10)	0.00	0.88	B***	
Counting Error	1.9 (2.63)	0.22 (0.52)	0.00	0.88	M***	
Counting – Time	55.6 (17.25)	86.9 (40.88)	0.00	0.99	B***	
Choosing–Error	2.9 (2.80)	2.1 (2.76)	0.15	0.28	M*	
Choosing Time	90.5 (36.54)	127.7 (34.27)	0.00	1.05	B***	
Shifting–Error	4.45 (4.99)	2.4 (2.61)	0.29	0.51	M**	
Shifting Time	105.7 (56.39)	157.6 (66.6)	0.00	0.84	B***	
Language Arbitrariness Test						N-V
Part A	3.74 (1.93)	4.61 (1.11)	0.08	0.55	M**	
Part B	6.65 (3.95)	6.13 (1.74)	0. 10	0.17		
Total	10.39 (5.88)	10.74 (2.85)	0.12	0.07		
Symbol Substitution Test						V
Part A	2.82 (1.73)	2.04 (1.79)	0.06	0.44	B*	

(*Continued*)

Table 3. (*Continued.*)

Measure	Bilingual (n = 23)	Monolingual (n = 23)	*P*	*g*	Advantage	Stimuli's Task
Part B	1.77 (1.82)	1.31 (1.71)	0.28	0.26	B*	
Total	4.59 (3.55)	3.35 (2.79)	0.11	0.38	B*	

Notes: **DST –** Digit Span test; **LDSF** - Longest Digit Span Forward**; LDSB -** Longest Digit Span Backward; **CBT –**Corsi's Blocks Task; **FDT-** Five Digits Test; **TMT** – Trail Making Test; **SD** – standard deviation. **B** – Bilingual; **M** – Monolingual; * Low effect size; ** Moderate effect size; ***High effect size**; V** – verbal; **N-V** – Non-verbal.

results presented by Antón, Duñabeitia, Estévez, Hernández, Castillo, Fuentes, and Carreiras (2014), Duñabeitia, Hernández-Cabrera, Antón, Macizo, Estévez, Fuentes, and Carreiras (2013) and Gathercole, Thomas, Kennedy, Prys, Young, Viñas Guasch, and N.Jones (2014), who did not use the Stroop task and did not find evidence of significant differences in the comparison between groups. Also, the conclusion drawn by Hilchey and Klein's (2011) study – that the evidence for an advantage in inhibition in bilingual children would be rare and inconsistent – does not fit this study, as five out of six measures pointed to an advantage for bilingual children in inhibitory control as compared to monolingual children's control.

Regarding the speed of processing, bilinguals outperformed monolinguals in response times for tasks requiring sustained and focused or executive attention, working memory, and inhibition, in consonance with the study of Valian (2015). In Valian's study, and in ours, bilingual children presented lower average means of response time than did monolinguals in the tasks that generated conflict of response. Conversely, Hartanto et al. (2019) showed better results obtained by bilingual children as compared to monolinguals in inhibition tasks, regardless of socioeconomic status.

The bilingual children presented superior results in all the measures of the Digits Span and the Corsi's Blocks Task of NEUPSILIN-INF (Salles et al., 2016). The bilingual experience may have favored the visual and verbal working memory, because, in these tasks, the bilingual participants manipulated a quantity of visual and verbal information, in direct order, with greater accuracy than the monolingual group. These results are consistent with those reported by Morales, Calvo, and Bialystok (2013) and Blom, Kuntay, Messer, Verhagen, and Leseman (2014), who also found a higher performance of bilingual children in tasks evaluating WM as compared to monolinguals. Meanwhile, they differed from the results of Engel de Abreu (2011) and Hartanto et al. (2019), which did not indicate a difference between language groups.

Differences between language groups were found in two tasks measuring time and cognitive flexibility (TMT and FDT). The bilingual group obtained better results in the time score of the Shifting measure (FDT) ($p = 0.00$, high effect size). Monolinguals, in turn, made fewer errors (moderate effect size, but without statistical significance). This shows the advantage of bilingual children in this task, as they demonstrated better skills regarding alternate thinking and answering tasks with verbal output. On the other hand, they had worse results in Sequence Trail Part B of TMT ($p = 0.04$, high effect size), indicating that the monolingual group performed better when they had to alternate their thinking to answer tasks with motor output. Some studies show that bilingual children obtain better results in tasks that depend on the alternation of attention (Carlson & Meltzoff, 2008; Martin-Rhee & Bialystok, 2008). Thus, it is hypothesized that bilingualism stimulates cognitive flexibility skills, especially when they involve linguistic stimuli, but has no influence on the speed of processing and visuospatial perception. This hypothesis is reinforced by the better performance of monolinguals in the Counting measure (FDT), which demands processing speed for the estimation of numerical magnitudes, without involving linguistic processing.

In general, the tasks that evaluate the components of the EF with non-verbal stimuli – Corsi's Blocks Test, FDT, Bells Test – showed significant differences between the linguistic groups, with higher effect sizes than verbal tasks. Evidence found by Luo, Luk, and Bialystok (2010) shows that the performance of bilingual children in verbal tasks would be influenced by their two or more languages (slower lexical access), unlike performance on non-verbal tasks, in which bilingual groups seem to have a better response time. The results of this investigation show that bilingual participants performed better in both non-verbal and verbal tasks, which allows for an inference about the impact of bilingualism on general cognitive development.

Concerning metalanguage processing, no differences were found between the language groups, which is unlike the results presented by Bialystok, McBride-Chang, and Luk (2005), Davidson and Raschke (2008), Davidson, Rainey Raschke, and Pervez (2010), Francis (2002), Kang (2012), Laurent and Martinot (2010), and Serratrice, Sorace, Filiaci, and Baldo (2009), who indicated some metalinguistic advantage for bilingual children over their monolingual peers. However, our data, considering effect size,are partially in consonance with those of the studies of Cohen (2013) and Safinia (2015), whose data revealed differences in just one of the evaluated tasks (Word renaming).

The performance of children of both language groups in the tasks that evaluated metalanguage may have been affected by age because the youngest children had difficulty segmenting and manipulating words with semantic function (nouns and adjectives) and with syntactic-sentence function (pronouns). It is considered that the ability to segment oral language into words occurs systematically around 7 years of age (Barrera & Maluf, 2003). Our participants are in the age group of 6 to 8 years old and, therefore, may still be developing this metalinguistic ability. It is noteworthy that the older children had better scores on metalinguistic tasks as compared to the younger children, which reflects a growing metalinguistic development over school years, which is also associated with literacy development in one or more languages (Bialystok, 2007).

Another consideration to be taken into account when one is analyzing the metalinguistic data relies on the similarity of vocabulary and sound structure of spoken language between Brazilian Portuguese and Spanish – both Latin-based languages – spoken in northern Uruguay and their frequent use in the oral mode. These two facts may reduce the ability of border children to differentiate between coexisting languages. These languages share 60% of their vocabulary (Carvalho, 2002). As languages show great vocabulary and phonological similarity, these children may have a metalinguistic development similar to that of the tested monolingual children, because they do not need to consciously control and reflect upon the use of languages in their speech contexts, as mixing vocabulary is common in everyday conversations.

Conclusion

This cross-sectional study showed differences in performance between language groups by analyzing the context of the use of two Latin-based languages in contact, spoken in a border region. Taken together, our data pointed to significant differences in the performance of bilingual and monolingual children in EF measures, among whom the great majority indicated a bilingual advantage, while no differences were found between groups in the metalanguage measures. Also, the bilingual group surpassed the monolingual group in school performance tasks (TDE-II and RWS).

These findings have implications for educational and neuropsychological assessment and intervention programs, especially regarding the needs of specific preventive stimulation for monolingual children and for different programs considering the bilingualism factor. Literacy improvement and access to reading and writing material (especially in two or more languages) seems to have the potential to increase linguistic and cognitive abilities. A longitudinal study could shed more light on the impact of bilingualism on literacy development by testing children's overall school performance in linguistic and arithmetic tasks and, therefore, provide important evidence of linguistic and cognitive maturation in children during the literacy process. Moreover, regarding the neuropsychological assessment of bilingual children, verbal and nonverbal EF tasks should be administered, as children's performance can be influenced by task typology and the specific EF subcomponents measured. Preventive neuropsychological intervention should stimulate EF development in bilingual children, focusing mainly on the use of nonverbal tasks.

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References

American Psychological Association (APA) (2010) *Publication Manual of the American Psychological Association* (6.ª ed.). Washington, DC: APA.

Antón E, Carreiras M and Duñabeitia JA (2019) The impact of bilingualism on executive functions and working memory in young adults. *PLoS ONE* **14**, e0206770. https://doi.org/10.1371/journal.pone.0206770

Antón E, Duñabeitia JA, Estévez A, Hernández JA, Castillo A, Fuentes LJ and Carreiras M (2014) Is there a bilingual advantage in the ANT task: Evidence from children. *Frontiers in psychology* **5**, 398. doi:10.3389/fpsyg.2014.00398.

Associação Brasileira de Empresas de Pesquisa. (2016) Brazilian Criteria 2015 and social class distribution update for 2016. Acesso em: 03/05/2017. Disponível em: http://www.abep.org/criterio-brasil

Barac R and Bialystok E (2012) Bilingual effects on cognitive and linguistic development: role of language, cultural background, and education. *Child development* **83**, 413–422. doi:10.1111/j.1467-8624.2011.01707.x

Barrera SD and Maluf MR (2003) Consciência metalingüística e alfabetização: um estudo com crianças da primeira série do ensino fundamental. *Psicologia: Reflexão e Crítica* **16**, 491–502. https://doi.org/10.1590/S0102-79722003000300008

Bialystok E (2015) Bilingualism and the Development of Executive Function: The Role of Attention. *Child development perspectives* **9**, 117–121. doi:10.1111/cdep.12116

Bialystok E (2010) Global-local and trail-making tasks by monolingual and bilingual children: beyond inhibition. *Developmental psychology* **46**, 93–105.doi:10.1037/a0015466

Bialystok E (2007) *Bilingualism in Development: Language, Literacy, and Cognition*. Cambridge: Cambridge University Press. doi:10.1017/CBO9780511605963

Bialystok E, Craik FIM, Green DW and Gollan TH (2009) Bilingual Minds. *Psychological Science in the Public Interest* **10**, 89–129. https://doi.org/10.1177/1529100610387084

Bialystok E and Viswanathan M (2009) Components of executive control with advantages for bilingual children in two cultures. *Cognition* **112**, 494–500. doi:10.1016/j.cognition.2009.06.014

Bialystok E, McBride-Chang C and Luk G (2005) Bilingualism, Language Proficiency, and Learning to Read in Two Writing Systems. *Journal of Educational Psycholo*gy **97**, 580–590.

Blom E, Kuntay AC, Messer M, Verhagen J and Leseman P. (Org.). (2014) The benefits of being bilingual: Working memory in bilingual Turkish-Dutch children. *Journal of Experimental Child Psychology* **128**, 105–119.

Carlson SM and Meltzoff AN (2008) Bilingual experience and executive functioning in young children. *Developmental Science* **11**, 282–298. doi:10.1111/j.1467-7687.2008.00675.x

Carvalho AM (2002) Português para falantes de espanhol: Perspectivas de um campo de pesquisa. *Hispania* **85**, p. 597–608.

Chung-Fat-Yim A, Himel C and Bialystok E (2019) The impact of bilingualism on executive function in adolescents. *International Journal of Bilingualism* **23**, 1278–1290. https://doi.org/10.1177/1367006918781059

Cohen C (2013) Effect of degree of bilingualism on metalinguistic awareness in English-French bilingual children. *The International Workshop for Bilingualism and Cognitive Control*, May 2013, Krakow, Poland. hal-01079079

Cohen J (1988) *Statistical Power Analysis for the Behavioral Sciences* (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum Associates, Publishers.

Davidson D, Raschke VR and Pervez J (2010) Syntactic awareness in young monolingual and bilingual (Urdu–English) children. *Cognitive Development* **25**, 166–182. doi:10.1016/j.cogdev.2009.07.003

Davidson D and Raschke VR (2008) *Metalinguistic awareness in monolingual and bilingual children and its relationship to receptive vocabulary scores and performance on a reading readiness test.* Poster presented at the Boston University Conference on Language Development, Boston, MA.

Diamond A (2013) Executive functions. *Annual review of psychology* **64**, 135–168. doi:10.1146/annurev-psych-113011-143750

Duñabeitia JA, Hernández-Cabrera J, Antón E, Macizo P, Estévez A, Fuentes L and Carreiras M (2013) The Inhibitory Advantage in Bilingual Children Revisited: Myth or Reality? *Experimental psychology.* **61**, 1–18. 10.1027/1618-3169/a000243.

Engel de Abreu PM (2011) Working memory in multilingual children: Is there a bilingual effect?. *Memory* **19**, 529–537.

Eviatar Z, Taha H, Cohen V and Schwartz M (2018) Word learning by young sequential bilinguals: Fast mapping in Arabic and Hebrew. *Applied Psycholinguistics* **39**, 649–674. doi:10.1017/S0142716417000613

Fonseca RP, Jacobsen GM and Pureza JR (2015) O que um bom teste neuropsicológico deve ter? Em Salles JF, Haase VG and Malloy-Diniz LF *Neuropsicologia do desenvolvimento: Infância e adolescência*. Porto Alegre: Artmed.

Francis N (2002) Literacy, second language learning, and the development of metalinguistic awareness: A study of bilingual children's perceptions of focus on form. *Linguistics and Education* **13**, 373–404. https://doi.org/10.1016/S0898-5898(01)00077-8

Gathercole VC, Thomas EM, Kennedy I, Prys C, Young N, Viñas Guasch N and Jones L (2014) Does language dominance affect cognitive performance in bilinguals? Lifespan evidence from preschoolers through older adults on card sorting, Simon, and metalinguistic tasks. *Frontiers in psychology* **5**, 11. doi:10.3389/fpsyg.2014.00011

Goldin-Meadow S, Levine SC, Hedges LV, Huttenlocher J, Raudenbush SW and Small SL (2014) New evidence about language and cognitive development based on a longitudinal study: hypotheses for intervention. *The American psychologist* **69**, 588–599. doi:10.1037/a0036886

Green DW and Abutalebi J (2013) Language control in bilinguals: The adaptive control hypothesis. *Journal of cognitive psychology* **25**, 515–530. doi:10.1080/20445911.2013.796377

Grosjean F (2010) *Bilingual: Life and Reality*. Cambridge, Mass.: Harvard University Press.

Halsey LG (2019) The reign of the p-value is over: what alternative analyses could we employ to fill the power vacuum? *Biology Letters*. http://doi.org/10.1098/rsbl.2019.0174

Hartanto A, Toh WX and Yang H (2019) Bilingualism Narrows Socioeconomic Disparities in Executive Functions and Self-Regulatory Behaviors During Early Childhood: Evidence From the Early Childhood Longitudinal Study. *Child Development* **90**, 1215–1235. https://doi.org/10.1111/cdev.13032

Hilchey MD and Klein RM (2011) Are there bilingual advantages on nonlinguistic interference tasks? Implications for the plasticity of executive control processes, *Psychonomic Bulletin & Review* **18**, 625–658. https://doi.org/10.3758/s13423-011-0116-7

Hubner LC (2016) Brasil, Brazil, Brésil: um país mono, bi ou multilingue?. CONECTA: revista da Rede Nacional da Ciência para a Educação, São Paulo, p. 1–3, 16 jun.

Jaekel N, Jaekel J, Willard J and Leyendecker B (2019) No evidence for effects of Turkish immigrant children's bilingualism on executive functions. *PLoS ONE* **14**, 1–14. https://doi.org/10.1371/journal.pone.0209981

Kang J (2012) Do bilingual children possess better phonological awareness?: Investigation of Korean monolingual and Korean-English bilingual children. *Reading and Writing* **25**, 411–431.

Kroll JF and Bialystok E (2013) Understanding the Consequences of Bilingualism for Language Processing and Cognition. *Journal of cognitive psychology* **25**, 10.1080/20445911.2013.799170. doi:10.1080/20445911.2013.799170

Kroll JF, Bobb SC and Hoshino N (2014) Two languages in mind: Bilingualism as a tool to investigate language, cognition, and the brain. *Current directions in psychological science* **23**, 159–163. doi:10.1177/0963721414528511

Laurent A and Martinot C (2010) Bilingualism and phonological awareness: the case of bilingual (French – Occitan) children. *Reading Writing*. **23**, 435–452.

Luo L, Luk G and Bialystok E. (Org.). (2010) Effect of language proficiency and executive control on verbal fluency performance in bilinguals. *Cognition* **114**, 29–41.

Marian V, Blumenfeld HK and Kaushanskaya M (2007) The Language Experience and Proficiency Questionnaire (LEAP-Q): Assessing language profiles in bilinguals and multilinguals. *Journal of Speech, Language, and Hearing Research* **50**, 940–967. DOI: 10.1044/1092-4388(2007/067

Martin-Rhee M and Bialystok E (2008) The development of two types of inhibitory control in monolingual and bilingual children. *Bilingualism: Language and Cognition* **11**, 81–93. doi:10.1017/S1366728907003227

Mendonça SM (2009) *Os efeitos metalinguísticos e cognitivos de uma experiência de exposição à L2 em contexto formal de ensino de crianças*. 61 f. Trabalho de conclusão de curso de Graduação em Letras – Universidade Federal do Rio Grande do Sul, Porto Alegre, RS

Morais AB (2016) *Construção e evidências de fidedignidade e validade de uma escala de leitura e escrita (ELE) para o rastreio de crianças com dificuldades escolares*. Dissertation, Pontifícia Universidade Católica do Rio Grande do Sul.

Morales J, Calvo A and Bialystok E. (Org.). (2013) Working memory development in monolingual and bilingual children. *Journal of Experimental Child Psychology* **114**, 187–202.

Morello R and Seiffert AP (2019) Multilinguismo e ensino nas fronteiras. *Línguas e Instrumentos Linguísticos* **43**, Jan-Jun, 217–236.

Paap KR, Johnson HA and Sawi O. (Org.). (2015) Bilingual advantages in executive functioning either do not exist or are restricted to very specific and undetermined circumstances. *Cortex* **69**, 265–278.

Paap KR and Sawi O (2014) Bilingual advantages in executive functioning: problems in convergent validity, discriminant validity, and the identification of the theoretical constructs. *Frontiers in psychology* **5**, 962. doi:10.3389/fpsyg.2014.00962

Piantá P (2011) *O desenvolvimento da Consciência Metalinguística analisado em diferentes contextos bilíngues no Brasil. 102 f.* Dissertação de Mestrado em Letras - Programa de Pós Graduação em Letras UFRGS, Porto Alegre

Poarch GJ and Bialystok E (2015) Bilingualism as a Model for Multitasking. *Developmental Review* **35**, 113–124. https://doi.org/10.1016/j. dr.2014.12.003

Proctor C. P, August D, Snow C and Barr CD (2010) The Interdependence Continuum: A Perspective on the Nature of Spanish–English Bilingual Reading Comprehension. *Bilingual Research Journal*., **33**:5–20.

Safinia L (2015) *Metalinguistic Awareness In Bilingual Children*. Retrieved from the University of Minnesota Digital Conservancy, http://hdl.handle.net/11299/171786.

Salles JF, Fonseca RP, Parente MA, Cruz-Rodrigues C, Mello CB, Barbosa T and Miranda MC (2016) *Instrumento de Avaliação Neuropsicológica Breve Infantil: NEUPSILIN-Inf – Manual*. São Paulo: Editora Vetor.

Sánchez-Azanza V.A., López-Penadés R, Buil-Legaz L, Aguilar-Mediavilla E and Adrover-Roig D (2017) Is Bilingualism Losing its advantage? A bibliometric approach. *PLoS ONE* **12**: e0176151. https://doi.org/10.1371/journal.pone.0176151

Schuele CM and Justice LM (2006) The importance of effect sizes in the interpretation of research. *The ASHA Leader* **11**, 14–27. https://doi.org/10.1044/leader. FTR4.11102006.14

Sedó M, de Paula J and Malloy-Diniz L (2015) *O Teste dos Cinco Dígitos*, São Paulo: Hogrefe.

Serratrice L, Sorace A, Filiaci F and Baldo M. (Org.). (2009) Bilingual children's sensitivity to specificity and genericity: evidence from metalinguistic awareness. *Bilingualism: Language and Cognition* **12**, 239–257.

Siqueira LS, Gonçalves HA, Hübner LC and Fonseca RP (2016) Development of the Brazilian version of the Child Hayling Test. *Trends in Psychiatry and Psychotherapy*. **38**, 164–174. doi:10.1590/2237-6089-2016-0019

Stein LM, Giacomoni CH and Fonseca RP (2019) Teste de Desempenho Escolar - TDE II. 1. ed. São Paulo: Vetor, 1. 180 p.

Trevisan BT and Seabra AG (2012) Teste de Trilhas para Pré-escolares. In: Seabra AG and Dias NM (eds), *Avaliação neuropsicológica cognitiva: atenção e Funções Executivas*. 1. São Paulo: Memnon, 92–100.

Valian V (2015) Bilingualism and cognition. *Bilingualism: Language and Cognition* **18**, 3–24. 10.1017/S1366728914000522.

Valian V (2016) Putting together bilingualism and executive function. *Linguistic Approaches to Bilingualism* **6**, 565–574. https://doi.org/10.1075/lab.15044.val

Van der Vel de Kremin L, Arredondo MM, Hsu L, Satterfield T and Kovelman I (2019)The effects of Spanish heritage language literacy on English reading for Spanish–English bilingual children in the US. *International Journal of bilingual education and bilingualism* **22**, 192–206. https://doi.org/10.1080/13670050.2016.1239692

Yates DB, Trentini CM, Tosi SD, Corrêa SK, Poggere LC and Valli F (2006) Apresentação da Escala de Inteligência Wechsler abreviada: (WASI). *Avaliação Psicológica* **5**, 227–233. Recuperado em 31 de mar de 2019, de http://pepsic.bvsalud.org/scielo.php?script=sci_arttext&pid=S1677-04712006000200012&lng=pt&tlng=pt.