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### Keywords

Multilingualism  
Child  
Mental Processes  
Language  
Reading  
Speech, Language and Hearing Sciences

### Descritores

Multilinguismo  
Criança  
Processos Mentais  
Linguagem  
Leitura  
Fonoaudiologia

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Received: 08/04/2014

Accepted: 11/03/2014

## Rapid naming, phonological memory and reading fluency in Brazilian bilingual students

### *Nomeação rápida, memória fonológica e fluência leitora em escolares brasileiros bilíngues*

### ABSTRACT

**Purpose:** To characterize the performance of Brazilian students exposed to two languages in reading fluency, phonological memory, and rapid naming, according to grade level, and to investigate correlations between these variables. **Methods:** Sixty students took part in this study (50% female), enrolled in the third to the fifth grades of two elementary schools of the city of São Paulo. They constituted two groups — bilingual group: 30 Brazilian children whose mother tongue and language spoken at home was Brazilian Portuguese and who were daily exposed to English at school for a period not shorter than three years; monolingual group: 30 students, from a monolingual Brazilian elementary school, who were paired by gender, age, and grade level with the bilingual students. Foreign children, children with complaint or indication of speech and language disorder, or who had been retained were excluded. A rapid automatized naming, pseudoword repetition, and oral reading tests were administered. The bilingual children were assessed in both languages and their performances were compared among themselves and with the monolingual group, which was only assessed in Brazilian Portuguese. **Results:** The bilingual group showed better performance in English, rapid naming, and pseudoword repetition tasks, whereas Brazilian Portuguese, in reading fluency. A higher number of correlations were found in Brazilian Portuguese. **Conclusion:** The results suggest that the acquisition of a second language may positively influence the abilities of rapid naming, reading rate, and accuracy. Brazilian bilingual students performed better in tasks of phonological memory in English and Brazilian Portuguese performed better in reading fluency. Different correlation patterns were found between the rapid naming, accuracy, and reading rate, in the bilingual group analysis, in both languages.

### RESUMO

**Objetivo:** Caracterizar o desempenho de escolares brasileiros expostos a dois idiomas, em fluência leitora, memória fonológica e nomeação rápida, segundo o ano escolar, e investigar correlações entre essas variáveis. **Métodos:** Participaram 60 escolares (50% meninas) do terceiro ao quinto ano do Ensino Fundamental de duas escolas de São Paulo. Constituíram-se: Grupo Bilíngue: 30 escolares brasileiros, cuja língua materna e falada em casa era o Português Brasileiro, expostos ao Inglês diariamente na escola, por período total não inferior a três anos; Grupo Monolíngue: 30 escolares de escola brasileira monolíngue, pareados por gênero e idade e por equivalência de ano escolar. Excluíram-se crianças: estrangeiras; com queixas ou indícios de alteração de linguagem e fala; com histórico de retenção. Aplicaram-se: testes de nomeação rápida, repetição de pseudopalavras e prova de leitura oral de texto. Avaliaram-se os bilíngues nos dois idiomas e seus desempenhos foram comparados entre si e com o Grupo Monolíngue, avaliado somente em Português Brasileiro. **Resultados:** O Grupo Bilíngue mostrou melhor desempenho, em Inglês, em nomeação rápida e repetição de pseudopalavras e, em Português Brasileiro, em taxa de leitura. Encontrou-se maior número de correlações nas avaliações em Português Brasileiro. **Conclusão:** Os resultados sugerem que a aquisição do segundo idioma pode influenciar positivamente essas habilidades. Escolares brasileiros bilíngues mostraram melhor desempenho em memória fonológica em Inglês e fluência leitora em Português Brasileiro. Encontraram-se diferentes padrões de correlação entre variáveis de nomeação rápida, taxa e acurácia de leitura de texto, na análise do Grupo Bilíngue nos dois idiomas.

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**Conflict of interests:** nothing to declare.

## INTRODUCTION

A fluent speaker in two languages can be recognized as bilingual. Bilingualism is common in some countries. The learning of two languages can be simultaneous or sequential, and when the later, early or late<sup>(1)</sup>. By convention, the language learned first is known as L1 and the second is called L2. The interest on the influence of a second language in language skills has become more and more common since the 1970s due to the increased need that formal education, especially in bilingual countries, where there is a massive presence of immigrants, must educate children who speak a language different from that used at school<sup>(2)</sup>. Studies investigating the effects of interference of other language observed that L1 interference becomes progressively stronger with its development, and therefore, the sooner L2 is acquired, the smaller are the effects of L1 on L2<sup>(3)</sup>. L2 learning not always occurs or begins early.

Historically, the literature has indicated that bilingual individuals have cognitive and linguistic advantages over monolingual individuals, probably because they have greater capacity to store information, to separate linguistic symbols of their referents, and even show better skills to target a word and, consequently, identify the phoneme<sup>(1,4)</sup>. Bilingual children have increased ability to play with words than the monolingual<sup>(1,4)</sup>. At a certain age, bilinguals were more efficient in tasks demanding the processing of phonological information.

In any way, at the beginning of language development, bilingual children seemed to work with a single set of rules and went through a period when they blended languages, until two sets of rules were distinguished, allowing for inferences on the structure of each of the languages<sup>(5)</sup>. A research performed with adults identified general advantage of the early or simultaneous bilingual in who developed L2 in learning a new word. The research concluded that the early acquisition of L2 increases the ability to learn new words in adulthood<sup>(6)</sup>. However, other studies with different approaches and which also tried to characterize language and metalinguistic skills of children and adults exposed to two languages have not observed performance differences between bilingual and monolingual people at these tasks<sup>(7,8)</sup>.

Studies have investigated the processing of linguistic information in bilingual children by administering picture-word interference tasks. According to these studies, children who are bilingual or exposed to a second language would have greater intervals attributed to an interruption in a stable grammatical structure of one of the languages to facilitate word recognition or recall<sup>(9,10)</sup>. These intervals would be closely linked to phonological processing, which is also of fundamental importance in the steps of oral language acquisition, as well as in learning the alphabetic principle. Processing of phonological information is also related to the acquisition of the second language.

Thus, as in the learning of the native language, phonological memory encodes new information to be kept temporarily in memory, so it can be later used in the new

language learned. Working memory plays a crucial role in learning a second language (L2). The ability to repeat words in an unknown language has been a successful predictor in this learning<sup>(11)</sup>. However, the working memory seems to be more efficient in L1 than in L2. This may be the reason for differences in problem-solving ability when using L1 or L2. In the literature, bilingual individuals have more complex brain activation patterns in L2 in working memory tasks, as these are considered to be more difficult<sup>(9)</sup>.

Another component of phonological processing, phonological lexical access, is measured by the efficient recall of phonological information from long-term or permanent memory, i.e., rapid automatized naming<sup>(12)</sup>. In a task of rapid naming of digits, Meuter and Allport<sup>(13)</sup> evaluated the time, in seconds, of language switching from L1 to L2 when naming things, and vice versa. They reported that bilingual individuals are efficient in selecting and maintaining two separate languages. Their results pointed to a longer time in the transition from L2 (weakest) to L1 (stronger). The reason would be that, for the production of enhanced L2, L1 suppression would be required, and the reverse does not occur, since L2 is not inhibited when L1 is used.

According to the literature, the metalinguistic ability of bilingual children would be different from that of monolingual children. The former would have a greater repertoire of phonemic discrimination, and the differences between the two languages would highlight these distinctions<sup>(14)</sup>, thus facilitating them. On the other hand, it is known that many bilingual children learn to read in their non-dominant language, which could cause a potential difficulty in achieving high levels of reading competence, which is not always observed.

It is believed that bilingual children have significant advantages in identifying relevant concepts and interpreting the symbolic function of the text<sup>(14)</sup>. Studies on the reading fluency of bilingual individuals indicated that small differences — usually a lower value in reading rate — are observed when reading in L1 and L2, even in individuals who apparently have the same proficiency in both languages<sup>(14)</sup>.

Bilingual schools have increased in number in Brazil. In addition, the migration process also has been intensified and this requires the rapid adaptation of Brazilian schools to receive foreign students. With regard to the study of bilingualism in Brazil, publications on the age at which children become fluent in both languages and the way the second language is acquired are still scarce. The influence of the second language on memory, metalinguistic, and other processes involved with literacy and learning has also not been studied, especially when it comes to the acquisition and development of Portuguese-English bilingualism. Verifying whether learning or exposure to two linguistic systems, that is, two languages, may influence positively or negatively — or not influence at all — the important processes of oral and written language development is the aim of this study. The hypothesis that exposure to two languages does not influence linguistic information processing guided this study.

This study aimed to characterize the performance of Brazilian schoolchildren exposed to two languages in reading fluency and phonological processing skills such as phonological memory and rapid naming according to grade level, and to identify correlations between these variables to establish whether bilingualism can influence these skills.

## METHODS

This study was approved by the Ethics Committee of Universidade Federal de São Paulo, Hospital São Paulo (n. 0709/06) and was only conducted after the schools' coordinators signed the informed consent form. From the observation and analysis of the curricula (of the grades participating in the study) at the American School, schools with matching curricula and content correspondence were sought. Among different monolingual Brazilian schools in São Paulo, one was identified with such characteristics. When schools were contacted, the objectives and procedures of the study were explained to the coordination and management staff, so they signed the informed consent. In a second visit, the concerns of parents and guardians were solved and, later on, after voluntary acquiescence and signing of the informed consent form, evaluations began.

### Sample selection

Sixty students (30 girls) aged between 8 and 10 years old, enrolled in two private school located in the southern area of São Paulo (SP), were selected and evaluated. At first, two groups were set as follows:

- Bilingual group (BG): 30 students (15 boys and 15 girls) enrolled in the American School, distributed proportionally in the following grades: third, fourth, and fifth, equivalent respectively to the 3<sup>rd</sup>, 4<sup>th</sup> and 5<sup>th</sup> of primary education (Cycle I) in Brazilian education system. Participants had Brazilian Portuguese (BP) as a native language, which is spoken in their home environment, and used English as language to communicate and learn at school. They would stay full-time at school (8 a.m. to 3 p.m.), period in which they would use only English language, except in BP class lasting for 40 minutes daily. They were all first literate in English, and only in the following year they received formal instruction for literacy in BP. Thus, these students were exposed to English language for a minimum of 30 hours weekly.
- Monolingual group (MG): 30 school children (15 girls and 15 boys) paired by gender and age and by equivalence to school year of children in BG. They were enrolled in the 3<sup>rd</sup> to 5<sup>th</sup> grades of a monolingual private school, studying in the afternoon.

For the establishment of both groups, teachers were asked to indicate students meeting the following general inclusion criteria, defined previously: no complaints or indicators of hearing difficulties; no complaints or indicators of vision difficulties (uncorrected); no complaints or indicators of

neurological, behavioral, or cognitive disorders; no complaints or indicators of speech and language disorders.

Some inclusion criteria were specifically defined to compose BG: Brazilian nationality, BP as first language (L1), use of BP at home, and minimal exposure for at least three years to the English language (minimum of 30 hours per week).

### Procedures

To assess school children, the following instruments were used:

- Rapid Automatized Naming (RAN), part of the Comprehensive Test of Phonological Processing (CTOPP)<sup>(12)</sup>, used to evaluate the efficiency of lexical recall of phonological information from long term or permanent memories. This test requires the release of phonological information from long-term memory. The rapid naming test of the CTOPP consists of four types of stimuli (visual): digits, letters, colors, and objects. These were used in the evaluation following the test recommendations. For this study, only the total time spent in naming items was computed;
- The Children's Test of Nonword Repetition (CNRep)<sup>(15)</sup>, consisting of a list of 40 nonwords distributed according to the number of syllables: ten nonwords of two, three, four, and five syllables. The phonemic sequences of each nonword are in accordance with English phonotactic rules, corresponding to the dominant syllabic pattern in that language to the extension of the item. CNRep was used to evaluate the BG. Results were presented as frequency of correct responses, and the maximum possible score to be achieved was 40 points. Each school child was asked to repeat the nonwords they heard the way they understood. The protocol application order was followed. Correct answers were words repeated clearly and correctly by the child, scoring one point each. Each child had their total score computed;
- Brazilian Children's Test of Pseudoword Repetition (BCPR)<sup>(16)</sup>, consisting of a list of 40 pseudowords according to relations of low (10 words), medium (20 words), and high (10 words) similarity to real words in BP. Results were presented as number of correct responses, and maximum score to be reached was 40 points. BCPR was used to assess MG. Procedures were identical to those used with CNRep.

To evaluate the oral reading fluency, texts from the QRI were used<sup>(17)</sup>. These texts are adapted and leveled to the school year. They were translated into BP for the assessment of MG. The total reading time for each student was kept for the calculations of reading rate and accuracy (words correct per minute, WCPM). Average rate and accuracy were calculated per school year and school.

All students were assessed in the same sequence of activities. Participants were instructed in the language that would be tested. Thus, the BG was instructed in English (for exams in English) and Portuguese (for those applied in

Portuguese). BG evaluations were performed individually in the school from March to June 2006 in a silent room, provided by the school. MG evaluations were held in the second semester to ensure the correspondence of contents. Each child in MG was evaluated in a session. Each child of BG was evaluated twice, with an interval of two weeks between evaluations: the first one was held in English and the second, in Portuguese. An evaluation session lasted 30 minutes on average.

For the descriptive analysis, the means and standard deviations of the children's responses were calculated, by year and by group. The inferential analysis was obtained through the analysis of variance (ANOVA), which is aimed to compare three or more groups of information to identify possible differences between groups as to performance. When we found statistical significance, multiple comparisons were made to assure significant differences. Spearman's correlation coefficient was also used to investigate association between different variables. Significance level in tests was set at 0.05.

## RESULTS

The performances of the groups of children were similar, regardless of the school and the school year, when time spent for rapid naming of letter, digits, objects and colors was compared. No effects of school interaction and of the school year were seen on naming time.

However, we found differences between the responses of the two groups of students when they were asked to repeat nonwords, with the highest number of correct answers in the third grade when analyzing the school year effect, and highest score of the BG as to group effect.

The analysis of oral reading performance in BP showed differences between groups in the comparison of rate and accuracy values. Thus, when the effect of school year was analyzed, we observed higher reading rate values as the school years progressed, the difference between the third and fifth grades. Higher reading rates were found in BG when the group effect was analyzed. The analysis of accuracy showed an effect of the school year on reading accuracy, with lower values presented by the third grade in both groups.

Comparison of performance in BG, both in English and BP, in rapid naming tasks with letters, digits, objects, and colors showed similar responses only in digit naming, regardless of the school year, the language used, or the interaction between these two variables. BG took less time to name letters, objects, and colors in English, when compared to Portuguese. However, results showed a difference between correct responses in nonword repetition by children in BG: they had more correct responses when the tests were performed in BP. Similarly, the analysis of languages and school year interaction showed that as school year progresses, the difference in correct responses at nonword repetition compared to performances in both languages decreases.

Analysis of the reading rate showed that the BG read faster in English than in BP. In accuracy values, there was an interaction between school year and language, and the third grade had a higher accuracy rate when reading in English than BP.

Correlations between variables, for school group, were also investigated.

At the BG analysis, negative correlations were found between reading rate and rapid naming of objects only in BP, and between reading rate and accuracy in English only. There was a positive correlation between rapid naming of letters and numbers. In this group, there was also positive correlation between rapid naming of objects and colors. Correlations ranged from moderate to strong.

In MG analysis, negative correlations were found between reading rate and all rapid naming variables. Positive correlations between rapid naming variables were also observed. No correlation, however, was found between the repetition of nonwords and any reading or naming variables.

## DISCUSSION

Studies on bilingualism are recent<sup>(2,4,5,9,10,13,14,18,19)</sup>. The interest in possible effect of learning a second language on cognitive development — or metacognitive<sup>(7,8,11)</sup> — follows the investigations about interference of native language (L1) in a second language learning (L2), especially when and why it happens during alphabetization.

In the first case, studies have investigated better cognitive development characteristics in bilingual individuals (when compared to monolinguals) and thus encourage enrollment in institutions that teach a second language from pre-school. However, in the second condition, where second language learning takes place during schooling, studies have focused on possible meta-cognitive deficits probably related to late learning or to unfavorable socio-cultural and economic conditions<sup>(2)</sup>.

This research aimed to evaluate the influence of the second language on some skills related to phonological processing in sequentially bilingual school children. Due to the educational level of the groups and to the phonemic method used in the bilingual literacy, phonological awareness tasks were not administered<sup>(20)</sup>. Only tasks that are independent of schooling, such as phonological memory and phonological access to mental lexicon, were assessed by means of nonword repetition and rapid naming (objects, colors, letters, and objects) ability. In a way, the reading decoding condition, linked to the phoneme-grapheme association, which is influenced by phonological awareness, was indirectly assessed by calculation of the rate and accuracy of oral reading.

This study evaluated school children of Brazilian nationality who had BP as their native language (language spoken at home) and minimal exposure of three years to the English language (minimum of 30 hours per week). Thus, the school sample was composed of children who were first exposed to the second language in preschool and others, exposed later. It can be said that, with the exception of the minimum of

three years, the variability in exposure time and hence early exposure to English were not controlled for.

Comparison between the two groups of students as to the rapid naming tasks showed (Table 1) similar results, in total time, of rapidly naming letters, numbers, objects, and colors in BP. That is, there was no difference in speed and accuracy of naming test items, when both groups were investigated in the same language. These data partially confirm the hypothesis raised and corroborate research findings<sup>(7,8)</sup> that did not notice differences in performance between bilingual and monolingual individuals in language proficiency tasks.

Furthermore, comparison of short-term phonological memory evaluated by repeating nonwords showed better performance of the BG compared to the MG, when evaluated in PB in all grade levels<sup>(17)</sup>. One might think that children from BG had good memory capacities and L2 learning did not affect this result. However, it is known that the working memory is fundamental in second language learning and is more efficient in first language<sup>(11)</sup>. Comparing both languages in the assessment of phonological memory, BG children showed better results in L1 compared to L2. That is, the storage capacity of nonwords was more apparent in L1 than in L2, showing the possibility of a positive influence of the second language on their short-term memory capacity<sup>(8,11)</sup>.

The comparison of reading fluency parameters showed better performance of BG when compared to MG in BP reading. Both the reading rate (WPM) and the accuracy (WCPM) rate were higher in BG. These results differ from the literature, as studies have reported lower values of reading rate

in bilingual schools, where many children learn to read in their non-dominant language<sup>(14)</sup>.

In addition, the observation of these parameters (Table 2) shows differences between rates and accuracy when comparing reading performances of the BG in both languages. These parameters in Table 2 show that BG children showed difference for the language effect. That is, they read the text faster in English than in BP, findings that invalidate those reported in literature<sup>(14)</sup>. For the accuracy parameter, there was effect of interaction between school year and language for the third grade, whose children read more accurately in the English language than in BP. These findings differ from the literature<sup>(12)</sup>, where studies have reported weaker performance in L2 than in L1. However, one should remember that BG children were alphabetized in English and read more in that language than in BP, which certainly made it easier for them to read, and increased their speed and accuracy when reading texts in English.

The comparison of the BG children rapid naming tasks, performed in both languages, showed differences between the time spent for the recall of letters, objects, and colors, with a shorter time observed in the English language. Importantly, the students from BG learned the names of the letters first in English, and the English words used to name colors and objects in the test are less extensive in terms of syllables (mostly monosyllables: “key”, “boat”, ... “red”, “blue”, ...) than in Portuguese (disyllables and trisyllables mostly: “chave”, “barco”, ... “vermelho”, “azul”, ...) which made the expression in English quite easier in both cases. Therefore, this study showed that there is interference of L1 in L2, as referred in the literature<sup>(3,13,18,19)</sup>.

**Table 1.** Time spent at fast naming task, number of hits in nonword repetition, and rate and reading accuracy values in Portuguese, according to group

			School year			Effect (p-value)		
			3 <sup>rd</sup> year Mean (SD)	4 <sup>rd</sup> year Mean (SD)	5 <sup>rd</sup> year Mean (SD)	Group	Year	Group x Year
FAST NAMING	Letters	MG	38.14 (3.72)	37.78 (8.18)	31.67 (2.58)	0.7398	0.0615	0.1695
		BG	38.14 (5.43)	33.25 (4.37)	34.57 (4.35)			
	Digits	MG	33.14 (6.12)	35.11 (7.79)	27.50 (5.05)	0.2052	0.2559	0.0778
		BG	30.14 (2.97)	29.00 (3.82)	30.43 (3.15)			
	Objects	MG	68.00 (15.48)	66.78 (12.15)	59.50 (10.77)	0.2846	0.1236	0.3011
		BG	75.57 (10.21)	63.13 (6.49)	66.86 (11.64)			
Colors	MG	69.57 (19.13)	65.67 (13.01)	63.17 (15.92)	0.4017	0.4651	0.9995	
	BG	66.00 (10.97)	62.38 (10.91)	59.86 (5.84)				
NWR	MG	36.43 (1.27)	34.67 (2.35)	34.33 (1.75)	<0.0001*	0.0416*	0.5143	
	BG	39.00 (1.15)	38.38 (0.92)	38.14 (1.35)				
READING	Rate	MG	93.43 (24.99)	104.89 (23.81)	128.17 (16.56)	0.0008*	0.0073*	0.6885
		BG	121.57 (15.49)	134.38 (15.90)	144.29 (31.65)			
	Acurácia	MG	98.14 (1.57)	99.11 (1.05)	99.00 (1.26)	0.5910	0.0155*	0.6521
		BG	97.71 (1.60)	99.38 (0.52)	98.57 (0.98)			

\*Significance level: p=0.05 – Test ANOVA

**Caption:** BG = bilingual group; MG = monolingual group; SD = standard deviation; NWR = nonwords repetition

**Table 2.** Time spent at fast naming task, number of hits in nonword repetition, and rate and reading accuracy values in Portuguese and English for bilingual group, according to language

			School year			Effect (p-value)		
			3 <sup>rd</sup> year	4 <sup>th</sup> year	5 <sup>th</sup> year	Year	Language	Year x Language
			Mean (SD)	Mean (SD)	Mean (SD)			
FAST NAMING	Letters	English	33.86 (3.89)	30.63 (3.66)	30.29 (2.36)	0.0533	0.0029*	0.7682
		Portuguese	38.14 (5.43)	33.25 (4.37)	34.57 (4.35)			
	Digits	English	29.57 (3.60)	28.63 (4.37)	29.14 (2.79)	0.7655	0.3157	0.8647
		Portuguese	30.14 (2.97)	29.00 (3.82)	30.43 (3.15)			
	Objects	English	60.29 (5.77)	56.00 (6.39)	52.71 (11.22)	0.0533	0.0001*	0.3353
		Portuguese	75.57 (10.21)	63.13 (6.49)	66.86 (11.64)			
Colors	English	61.71 (5.59)	59.50 (7.71)	54.29 (6.21)	0.2668	0.0076*	0.7383	
	Portuguese	66.00 (10.97)	62.38 (10.91)	59.86 (5.84)				
NWR	English	33.00 (1.91)	34.75 (2.66)	37.29 (3.35)	0.0821	<0.0001*	0.0209*	
	Portuguese	39.00 (1.15)	38.38 (0.92)	38.14 (1.35)				
READING	Rate	English	144.29 (16.00)	140.13 (19.19)	156.00 (19.49)	0.2125	0.0018*	0.1882
		Portuguese	121.57 (15.49)	134.38 (15.90)	144.29 (31.65)			
	Acurácia	English	99.29 (0.76)	98.38 (0.92)	99.14 (0.69)	0.5894	0.1397	0.0014*
		Portuguese	97.71 (1.60)	99.38 (0.52)	98.57 (0.98)			

\*Significance level:  $p=0.05$  – ANOVA test

**Caption:** SD = standard deviation; NWR = nonwords repetition

The study of correlations showed different patterns of association between variables related to phonological information processing and reading performance (Table 3) when results were analyzed by group and number of languages acquired.

A negative correlation was observed between the number of words read per minute in all tasks of rapid naming, both in MG and BG, only when it was performed in BP. In contrast, an association of this type was not found when the same group of children (BG) was assessed in English, except for the correlation (negative and moderate) between reading rate and rapid naming of numbers.

Another difference that can be pointed out from analyzing the correlation patterns found is the association between rate and accuracy of reading found only in the bilingual group, when the evaluation was conducted in L2, that is, in English. Thus, the faster the rate of reading, the better the accuracy. This was not correlated in tasks in BP (L1) in the BG or in the MG.

On the other hand, the rapid naming variables were positively correlated (moderate to strongly) in MG and with lower  $r$ -values in BG when measured in BP. Few correlations were found in English. Repetition of nonwords was not related to any rapid naming or reading fluency variables in any of the groups or situations assessed.

Therefore, it can be said that when the BG was assessed in Portuguese (L1), children had a pattern of correlation between variables that was more similar to that of MG children when assessed in English (L2). One can raise the hypothesis that language characteristics, including orthographic representation and conditions related to alphabetization

method, which was a non-controllable variable in this study (at the American School, the method is phonemic), have defined the different correlations, since the BG performance was more closely related to that of MG in L1<sup>(21)</sup>. The fact that students from BG have read the text faster in English than in BP seems to support this possibility, although limitations regarding the sample size and the number of schools participating in this study should be considered.

Therefore, one may infer that, although the study was limited to reading, rapid naming, and word repetition tasks, differences in associations between variables in both languages could be identified.

In addition, the group of bilingual Brazilian schoolchildren showed better performance in L1 in repeating nonwords, and higher rate values and reading accuracy values compared to the monolingual group. These results can contribute to the study of bilingualism as showing better performance of this group in L1, which suggests that, among Brazilian schoolchildren, the acquisition of the second language can positively influence skills involving the processing of phonological information and reading fluency.

## CONCLUSION

Bilingual Brazilian schoolchildren exposed concomitantly to two languages show better performance in phonological memory evaluations in English (L2) and oral reading in Portuguese (L1) when compared to the monolingual group. We have found different patterns of correlation between variables of rapid naming, reading rate and accuracy when the same bilingual group was evaluated in L1 and

**Table 3.** Correlation between results in the bilingual and the monolingual group in Portuguese

	Bilingual group				Monolingual group	
	English		Portuguese		Coefficient	p-value
	Coefficient	p-value	Coefficient	p-value		
<b>Rate/reading</b>						
FNL	-0.115	0.609	-0.267**	0.000	-0.804**	0.000
FNN	-0.426*	0.048	-0.347**	0.000	-0.650**	0.001
FNO	-0.010	0.963	-0.469**	0.004	-0.622**	0.002
FNC	-0.174	0.438	-0.224**	0.001	-0.601**	0.003
<b>Accuracy/reading</b>						
	0.506*	0.016	0.302	0.060	0.421	0.051
NWR	0.341	0.120	0	0.470	-0.163	0.470
<b>Accuracy/reading</b>						
FNL	0.303	0.170	0.213	0.063	-0.354	0.106
FNN	0.330	0.133	0.167	0.580	0.239	0.283
FNO	-0.119	0.599	0.687*	0.012	0.125	0.580
FNC	0.050	0.975	0.384	0.177	0.130	0.564
NWR	0.088	0.697	0	0.457	0.167	0.457
Rate/reading	0.506*	0.016	0.302	0.060	0.421	0.051
<b>FNL</b>						
FNN	0.396	0.068	0.426	0.000	0.872**	0.000
FNO	0.177	0.430	0.226	0.004	0.584**	0.004
FNC	0.361	0.099	0.064	0.016	0.562**	0.006
NWR	-0.271	0.223	0	0.787	0.061	0.787
Rate/reading	-0.115	0.609	0.267*	0.000	0.804**	0.000
Accuracy/reading	0.047	0.835	0.213	0.063	0.354	0.106
<b>FNN</b>						
FNL	0.396	0.068	0.426	0.000	0.872*	0.000
FNO	0.063	0.781	0.184	0.028	0.612**	0.002
FNC	-0.117	0.604	0.100	0.412	0.509*	0.016
NWR	0.130	0.238	0	0.850	0.043	0.787
Accuracy/reading	-0.075	0.741	0.167	0.580	0.239	0.283
Rate/reading	-0.426*	0.048	0.347*	0.000	0.650**	0.001
<b>FNO</b>						
FNL	-0.012	0.430	0.226**	0.004	0.584**	0.004
FNN	0.342	0.781	0.184*	0.028	0.612**	0.002
FNC	0.291**	0.006	0.526**	0.000	0.654**	0.001
NWR	0.105	0.642	0	0.786	0.065	0.774
Rate/reading	-0.010	0.963	0.469**	0.004	0.622**	0.002
Accuracy/reading	0.186	0.406	0.687*	0.012	0.125	0.580
<b>FNC</b>						
FNL	0.361	0.099	0.064	0.016	0.562**	0.006
FNN	-0.117	0.604	0.100	0.412	0.509*	0.016
FNO	0.571**	0.006	0.526**	0.000	0.654**	0.001
NWR	-0.380	0.081	0	0.494	-0.232	0.300
Rate/reading	-0.174	0.438	-0.469	0.001	-0.601**	0.003
Accuracy/reading	-0.007	0.975	0.687	0.177	0.130	0.564

\*Significance level:  $p=0.05$  – Spearman Correlation Coefficient test; \*\*Significance level:  $p=0.01$

**Caption:** FNL= fast naming of letters; FNN = fast naming of numbers; FNC = fast naming of colors; FNO = fast naming of objects; NWR = nonwords repetition

L2. When evaluated in L1, the pattern was the same found in the monolingual group. The results seem to indicate that the acquisition of the second language can influence these skills positively.

*\*FOF was responsible for research design and schedule, literature search, data collection and analysis, writing of the paper, article submission, and procedures; CRBA, mentor, was responsible for correction of the paper and final approval.*

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