Original articles

Students' performance in letter identification and lexical process tests

Desempenho de escolares em provas de processo de identificação de letras e do processo léxico

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ABSTRACT

Purpose: to describe, compare and correlate the performance of Brazilian students from 2nd to 5th grade of Elementary Schools in public and private institutions for tests of letter identification and lexical process evaluation.

Methods: 262 students attending Elementary Schools (122 from public school and 140 from private school), in the interior of São Paulo State: Public School – G1 (2nd grade, n=24); G2 (3rd grade, n=33); G3 (4th grade, n=31); G4 (5th grade, n=34) and Private School – G5 (2nd grade, n=37); G6 (3rd grade, n=34); G7 (4th grade, n=34); G8 (5th grade, n=35. Tests of Letter Identification and the Lexical process from PROLEC were applied.

Results: the students from private school showed superior average performance, except for the same-different test between G1-G5 and G3-G7 groups. The differences were higher among the students up to de 4th grade, due to the frequent use of the phonological route. This suggests differences in teaching the Portuguese alphabetic principles in in private and public schools. For the 5th grade there was no evidence of difference for tests in which words could be read by the lexical route.

Conclusion: the students from private school showed superior performance, except for the tests in which the phonological route was not entirely required. However, in the beginning of literacy, the phonological route was more used than the lexical route, regardless of the type of school. This study shows the education system necessity for prioritizing in early literacy the letter-sound relationship, so the students from public institutions can present better decoding results, which can directly impact reading and comprehension.

Keywords: Reading; Evaluation; Learning; Education, Primary and Secondary

RESUMO

Objetivo: caracterizar, comparar e correlacionar o desempenho de escolares brasileiros do 2º ao 5º ano do Ensino Fundamental do ensino público e particular em provas de avaliação do processo de identificação de letras e do processo léxico.

Métodos: participaram 262 escolares do Ensino Fundamental (público= 122, particular= 140), do interior paulista: Ensino público - G1 (2º ano, n=24); G2 (3º ano, n=33); G3 (4º ano, n= 31); G4 (5º ano, n=34) e Ensino particular - G5 (2º ano, n=37); G6 (3º ano, n=34); G7 (4º ano, n=34); G8 (5º ano, n=35). Aplicadas Provas do processo de Identificação de Letras e Léxico do PROLEC.

Resultados: os escolares do ensino particular apresentaram desempenho médio superior, com exceção da prova Igual-Diferente entre os grupos G1-G5 e G3-G7. As diferenças foram maiores entre os escolares até o 4º ano devido ao uso frequente da rota fonológica, sugerindo diferença no ensino do princípio alfabético entre as escolas públicas e particulares. Para o 5º ano, não houve diferença nas provas em que as palavras podem ser lidas pela rota lexical.

Conclusão: os escolares do ensino particular apresentaram desempenho superior, com exceção das provas em que a rota fonológica não é a unicamente exigida. Contudo, no início da alfabetização, a rota fonológica foi mais utilizada do que a lexical, independente do tipo de ensino. Este estudo mostra a necessidade de o sistema de ensino priorizar na alfabetização a relação letra-som, de modo que os escolares de escola pública possam apresentar melhores resultados em decodificação que podem influenciar diretamente a compreensão e leitura.

Descritores: Leitura; Avaliação; Aprendizagem; Ensino Fundamental e Médio.

INTRODUCTION

Reading is composed by components for decoding and understanding. Decoding refers to written words recognition processes, while understanding is defined as the process, in which, words, sentences or texts are interpreted[1]. Learning how to read is a complex process and requires from scholars the use of phonological, syntactic and semantic components of the language. Understanding the relationship between letters and speech sounds is essential within the alphabetic system. This relationship is known as graphophonemic correspondence, in which each letter corresponds to a grapheme that is represented by a phoneme[2-7].

However, in Portuguese language, there are situations in which the same grapheme may correspond to different phonemes, generating difficulties during the reading process[2-7]. For example, the letter "s" is represented by the grapheme [s] and the phoneme / s / in the word "sapo". The word "asa" in turn, although it is represented by the same grapheme, present in the word sapo [s], it is represented by the phoneme /z/. This is due to the orthographic transparency and opacity which feature the alphabetical basis of the Brazilian Portuguese writing system, becoming more transparent towards decoding and more opaque towards coding. Nevertheless, Brazilian Portuguese contains more transparent conformation than other latin languages, such as Spanish and Italian. Orthographic transparency is characterized by the regularity in which a phoneme corresponds to a single grapheme, while orthographic opacity is characterized by the irregularity, with graphemes corresponding to more than one phoneme, and phonemes corresponding to several graphemes [3,8-11].

The phonological mediation process, also known as phonological route and the direct visual process (lexical route) make up the dual route process[12], widely described in literature to explain words recognition. Reading via the phonological route is performed by the grapheme and phoneme conversion mechanism to make the word pronunciation, creating a phonological code that will be identified by the auditory recognition of words system, accessing its meaning. Reading via phonological starts with the identification and location of the letters in the visual analysis system, which analyzes the graphic symbols written on the page, obtained through the sensory receptors (the eyes), thus constituting the skills to understand, organize and interpret visual stimuli. From this, a set of letters is formed, which is translated by the grapheme-phoneme conversion process into sequences of phonemes[13-17].

Decoding is, therefore, the ability related to graphic symbols recognition, represented by letters and words, having great interference influence on the reading comprehension process. From the analysis of what has been decoded, it becomes possible for the student to access the meaning and form the orthographic representation (representation of the grapheme sequence of an expression of speech and its organization into larger units) of a new word. It is the decoding ability will allow the student, subsequently, read via the lexical route, i.e., perform a meaninful reading[1,18-25].

In order to perform the lexical route when reading, it becomes necessary for the reader to know the word to be read, so that it can be visually recognized, having its meaning and pronunciation retrieved [3,13,16,24-28]. The visual lexicon, also denominated as orthographic *input* lexicon, is responsible for the visual recognition of words. That is a set of mental representations of the words from the language, in which written words are represented. From this, it becomes possible to have a representation for each words we are able to recognize visually[25]. In this case, the reader, before a written word, is able to identify the letters which compose it (visual analysis system), and converts the received information into a letter code. This code is sent to the input visual lexicon in order to activate the corresponding visual recognition unit, resulting into word identification, which in turn activates its meaning, stored in the semantic system, responsible for activating the speech production unit, stored in the output phonemic lexicon (set of mental representations of the phonological form)[13].

Thus, words of different levels of alphabetic regularity can be read without any problems. Reading via lexical route benefits from the frequency of words occurrence in the language, since the higher the frequency, the greater its lexical representation (mental representation of words without specifying the superficial or abstract form or of its content) and easiest the retrieval from the lexicon. When reading, the word recognition process requires fast processing [23-29].

The only necessary requirement for reading via visual route encompasses the word visualization often enough to form an internal representation of it, i.e., its orthographic representation (grapheme sequence representation of a speech expression and its organization into larger units). In phonological route, the main

requirement means learning how to use the grapheme-phoneme conversion rules[24-26].

For evaluation of the phonological and lexical routes performance, words and isolated pseudo words are read aloud in this task, so it becomes possible to assess which route is most used by the reader[12,24,25,30,31]. This task is recognized in several alphabetic languages as an effective method for reading assessment, being widely studied for its importance in the early learning process[13-15,32].

Among the tools available for reading assessment, the PROLEC[24] - Reading Process Assessment Tests, was adapted to the Brazilian reality in order to provide an assessment tool based on criteria and reading development standards. Through this instrument, it is possible to evaluate the different processes and sub-processes that interfere with reading, from letters identification process to the semantic process. In Letters identification process there are tests which evaluate the identification of letters and sounds isolated and words. In the lexicon process, there are lists of real words of different syllabic complexity, frequency and extention and pseudowords of different syllabic complexity, respecting the regular syllabic patterns used for the assessment of phonological and lexical routes, evaluating the recognition of words and their decoding. The syntactical process evaluates the ability to process different types of grammatical structures and the use of punctuation marks. Finally, the semantic process is evaluated, which identifies the meaning extraction process and the integration processes in memory and drawing inferences.

Given the importance of the process of identifying letters and words recognition (lexical process), this study aims to answer the following question: Is there any difference in the performance of Brazilian students from public and private Elementary Schools in tests concerning evaluation of letters identification process and lexicon process?.

This study aims to characterize, compare and correlate the performance of students from the 2nd to 5th grades of public and private Elementary Schools performing texts concerning evaluation of letters identification process and lexicon process.

METHODS

Cross-sectional study comprising a random sample, approved by the Ethics Research Committee of the Faculty of Philosophy and Sciences, Universidade Estadual Paulista "Júlio de Mesquita Filho" - FFC / UNESP / Marilia / SP / Brazil, Protocol no. 3240 / 2006.

Participants

A total of 262 students from Elementary School, Cycle I, 122 from municipal public school and 140 from private school, of a town in the interior of São Paulo state. The students were divided into the following groups:

- Group 1 (G1) - 24 students from the 2nd grade of Municipal Public Education.
- Group 2 (G2) - 33 students from the 3rd grade of Municipal Public Education.
- Group 3 (G3) - 31 students from the 4th grade of Municipal Public Education.
- Group 4 (G4) - 34 students from the 5th grade of Municipal Public Education.
- Group 5 (G5) - 37 students from the 2nd grade of Private Education.
- Group 6 (G5) - 34 students from the 3rd grade of Private Education.
- Group 7 (G5) - 34 students from the 4th grade of Private Education.
- Group 8 (G5) - 35 students from the 5th grade of Private Education.

As inclusion criteria, the following aspects were adopted: 1) signature of the Informed Consent by parents or guardians; 2) absence of impaired eyesight and hearing; 3) absence of learning complaint; 4) absence of failure history; 5) absence of intelectual depreciation. And as exclusion criteria: 1) students refusal to participate, although parents or guardians have signed the consent form; 2) students with inter-disciplinary diagnosis of learning disorder, dyslexia disorder and attention deficit hyperactivity disorder; 4) genetic or neurological syndromes diagnoses; 5) alteration of language or speech.

These data were registered in the school form and informed by the teachers of the students. Some students were excluded after collection, due to observation of language and speech alteration during the tests or after students reported being attending speech therapy.

Instruments

Evaluation tests of reading processes - PROLEC[24]. The tests were given individually in a room provided by the coordination of the participating

schools, opposite to the period of school class, lasting 20 minutes, on average. According to orientation on the procedure, the tests were applied following the sequence of difficulty. The students were evaluated by the same researcher, following the sequence order. Reading processes Evaluation tests – PROLEC applied, are described below:

- *1st Process: Identification of letters*. Composed of two tests to assess the ability of the students to identify the letters and their sounds.

1. *Name or sound of the letters*: aims to verify the ability of the student to name the letters and the sound that they represent. On a sheet of paper, isolated letters are shown, not following the alphabetical order, so that the student may name them or pronouce their corresponding sounds.

In this test, the name and the sound of the letter were evaluated separately. Firstly, the student was asked to name the letters and then say which sound corresponded to each letter. The evaluator wrote down on the answer sheet of the instrument; 0 for incorrect answer, and 1 for correct answer; however, as the name of letters and identification of sound were performed separately, the name of the letters was written down on the answer sheet, and the answers for identification of sounds, in the back of the sheet. There are 20 letters in total, so the score for this task ranges from 0 to 20.

2. *Equal and Different in words and pseudo words*: aims to prove whether the student is able to segment the words with their respective letters, using pairs of stimuli that differ in one letter. In half of the cases, these stimuli of the pairs of elements are equal; and on the other half, they differ only in one letter. In such cases, half of the stimuli are words, and the other half are not words or pseudowords.

Pairs of words or equal pseudowords (eg, city - city) or with a different letter (e.g. barrel - barel), so that the student should indicate whether they are equal or different. There are 20 pairs of stimuli and the score ranges from 0 to 20.

- *2nd. Process*: *Lexicon Process*. In this block, lists are included with isolated words, belonging to different categories, in order to check the performance of the words recognition routes and their sub-processes, i.e., the objective is to evaluate the ability to recognize words.

3. *Lexical Decision*: This test aims to measure the level of orthographic representations of the student, in order to check whether the subject is able to recognize the words, regardless of being able or not to read

them, according to the dual route reading model, that is, to measure the ability of the orthographic representation. Words and pseudo words were presented to the students, and they shouldl indicate whether the words were real or invented, in 30 displayed items. The score ranges from 0 to 30.

4. *Reading Words (RW):* In this test, the students had to read aloud a list of 30 words, formed by syllables of different complexities, five of each comprised the following structures: CCV, VC, CVC, CVV, CCVC and CVVC, aiming to measure the ability of the student to read real words. The student was asked to perform reading aloud and the evaluator wrote down, on the answer sheet; 1 for correct answers, 0 for incorrect, totalizing up to 30 points.

5. *Reading Pseudowords*: Along with test 4, Reading words, this test aims to compare the development of word recognition routes. The task consists of reading a list of 30 pseudowords formed by syllables of different complexity, as presented in test n° four. The score ranges from 0 to 30.

6. *Reading words and pseudo words*: This test also aims to analyze the degree of development the student has reached with the reading routes. For this, words and merged pseudo words, belonging to six categories are employed: frequent short words, frequent long words, non-frequent short words, non-frequent long words, short and long pseudowords. The list comprises a total of 60 stimuli, belonging to three categories: 20 high-frequency words, 20 low-frequency words and 20 pseudowords. In the three cases, half of the stimuli have short extension (monosyllables and disyllables) and the other half have long extension (trisyllables and polysyllables). The score ranges from 0 to 60 on the total sum; and from 0 to 20 for high frequency, low frequency and pseudowords.

Notes of the answers were written down on the answers notebook, as follows: if the answer given by the studentl was correct, a circle was made around number 1; if the answer was incorrect, a circle was made around number 0 and, in case of error, the answer given by the student was written in the space correspondent to the item. So it was awarded one point for each correct answer; decimal scores were not allowed.

Data analysis

To obtain the results, statistical analysis was performed using SPSS (*Statistical Package for Social Sciences*), version 13.0, based on the amount of

correct answers in each test presented by GI and GII. Significance level (α) of 5% (0.050) for statistical tests was employed.

Data descriptive analysis, to obtain mean, median, percentile 25 and 75, minimum and maximum values and standard deviation, was realized. In order to check the matching level between the tests, the *Spearman correlation* analysis was employed. To classify the degree of association, criteria of Zou et al.[33] were employed.

Mann-Whitney Test was used to compare the groups, aiming to verify possible differences between the performances of the students from municipal public schools and private schools.

RESULTS

Tables 1 and 2 show the employment of *Mann-Whitney Test* aiming to verify possible differences between the performances of students from the 2nd grade and 3rd grade of Elementary schools, public and private, respectively.

Table 1. Description and comparison of the performance of students from the 2nd grade of Municipal Public and Private Education, on tests of sound and letter identification processes and léxicon

Variable	Group	n	Mean	Percentile 25	Median	Percentile 75	Standard deviation	Minimum	Maximum	P value
Som	1	24	1,33	0	0	0	2,22	0	6	0,000*
	5	37	11,49	6	12	17	6,30	2	20	
Letra	1	24	19,25	19	19,5	20	0,90	17	20	0,001*
	5	37	19,86	20	20	20	0,35	19	20	
ID	1	24	19,00	19	19	20	1,25	15	20	0,161
	5	37	19,19	19,19	19	20	1,79	10	20	
DL	1	24	27,08	25	29	29	3,06	19	30	0,001*
	5	37	29,05	29	30	30	1,93	19	30	
LP	1	24	27,46	27	29	30	3,49	16	30	0,003*
	5	37	29,08	30	30	30	2,38	19	30	
LPP prov5	1	24	26,29	26	28	29	3,78	15	30	0,000*
	5	37	28,65	28	30	30	2,71	16	30	
LP_AF	1	24	18,54	18	19	20	2,36	9	20	0,000*
	5	37	19,92	20	20	20	0,36	18	20	
LP_BF	1	24	17,79	16,75	18	19	1,84	14	20	0,001*
	5	37	19,08	19	20	20	1,72	13	20	
LPP	1	24	17,21	17	17,5	19	2,62	8	20	0,006*
	5	37	18,51	18	19	20	1,89	12	20	

Mann-Whitney test (α) of 5% (0.050)
Legend: * statistically significant, ED: same-different, LD: lexical decision, RW: reading words (test 4), RPW: reading pseudowords (test 5), RW_HF: reading common words, RW_NF: reading non-frequent words, RPW: Reading pseudowords.

In Table 1, there is evidence of difference in all the tests evaluated, with exception of test Equal Different - ED (p = 0.161), that is, there is evidence that the groups present diferences on the evaluated tests, except for lexical decision (LD) test. Through average score obtained on the tests applied, there is superior performance of the students from private schools (G5) in relation to public education students (G1).

Table 2. Description and comparison of the performance of students from the 3rd grade of Municipal Public and Private Education, on tests of sound and letter identification processes and léxicon

Variable	Group	n	Mean	Percentile 25	Median	Percentile 75	Standard deviation	Minimum	Maximum	P value
Sound	2	33	1,18	0	0	2	2,31	0	9	0,000*
	6	34	13,29	5	20	20	7,35	5	20	
Letter	2	33	18,94	19	20	20	2,54	9	20	0,001*
	6	34	19,97	20	20	20	0,17	19	20	
ED	2	33	18,45	18	19	20	3,15	2	20	0,000*
	6	34	19,76	20	20	20	0,50	18	20	
LD	2	33	27,15	26	28	29	2,69	18	20	0,000*
	6	34	29,00	29	29	30	1,76	30	30	
RW	2	33	27,88	28	29	30	4,59	6	30	0,000*
	6	34	29,76	30	30	30	0,65	27	30	
RPW test 5	2	33	25,76	24	27	29	4,48	9	30	0,000*
	6	34	29,41	29	30	30	0,96	27	30	
RW_HF	2	33	18,97	19	20	20	2,66	5	20	0,000*
	6	34	20,00	20	20	20	0,00	20	20	
RW_NF	2	33	17,64	17	18	20	3,07	3	20	0,000*
	6	34	19,88	20	20	20	0,41	18	20	
RPW	2	33	16,73	16	18	19	3,56	6	20	0,000*
	6	34	19,85	20	20	20	0,44	18	20	

Mann-Whitney test (α) of 5% (0.050)
Legend: * statistically significant, ED: same-different, LD: lexical decision, RW: reading words (test 4), RPW: reading pseudowords (test 5), RW_HF: reading common words, RW_NF: reading non-frequent words, RPW: Reading pseudowords.

In Table 2, from the statistical test applied, there is evidence of difference between the groups (G2 and G6), that is, the groups differ in the tests evaluated. Through the average score in the applied tests, higher performance of private school students (G6) was observed, in relation to public education students (G2). Observing the standard deviation, G2 students show great variability for responses in relation to G6; this suggests inaccuracy for G2 responses. Except for sound identification, in which the inaccuracy was higher for G6 students.

Tables 3 and 4 show the application of *Mann-Whitney Test*, in order to verify possible differences between the performances of students from 4th grade and 5th grades of elementary schools, respectively.

Evidence of difference is observed between the students of the 4th grade (G3 and G7), ie, the groups differ in the tests evaluated, with exception of ED test – equal- different (Table 3). Through the average score in the applied tests, it was observed higher performance of private schools students (G7) in relation to public education students (G3), but for the ID test, this difference was not observed. When observing the standard deviation, G3 school show great variability in the responses, in relation to G7; this suggests imprecision in G3 responses. However, except for sound identification, inaccuracy was highest in G7.

Table 4 shows evidence of difference in sound identification (p =0.000), lexical decision (p = 0.000), reading words (p = 0.000), reading pseudowords (test 5) (p=0.000), reading non-frequent words (p=0.009) and reading pseudowords (p= 0.001), ie, there is evidence that groups G4 and G8 differ in the referred tests. By average score on tests, with evidence of differences between the groups, students from private schools (G8) present superior performance, in relation to public education students (G4). When observing the standard deviation, students from private schools maintain the heterogeneity standard for answers on identification sound test, but in the other tests, G4 students present imprecision in their answers.

Table 5 presents the employment of the *Spearman correlation analysis* to check the degree of relationship between the tests, name and sound of the letters of the letter identification process, and reading tests of words and pseudowords of the lexicon process, of students from the 2nd to 5th grades of public and private Elementary schools.

Table 3. Description and comparison of the performance of students from the 4th grade of Municipal Public and Private Education, on tests of sound and letter identification processes and lexicon

Variable	Group	n	Mean	Percentile 25	Median	Percentile 75	Standard deviation	Minimum	Maximum	P value
Sound	3	31	0,23	0	0	0	0,72	0	3	0,000*
	7	34	14,94	5,5	19,5	20	6,70	5	20	
Letter	3	31	19,84	20	20	20	0,37	19	20	0,016*
	7	34	20,00	20	20	20	0,00	20	20	
ED	3	31	19,55	19	20	20	0,68	18	20	0,078
	7	34	19,82	20	20	20	0,39	19	20	
LD	3	31	27,39	27	27	29	2,58	19	30	0,000*
	7	34	29,91	30	30	30	0,38	28	30	
RW	3	31	29,29	29	30	30	1,40	24	30	0,016*
	7	34	29,88	30	30	30	0,41	28	30	
RPW test 5	3	31	27,65	27	29	29	2,42	21	30	0,000*
	7	34	29,79	30	30	30	0,88	25	30	
RW_HF	3	31	19,81	20	20	20	0,48	18	20	0,016*
	7	34	20,00	20	20	20	0,00	20	20	
RW_NF	3	31	18,55	17	19	20	1,52	15	20	0,000*
	7	34	19,94	20	20	20	0,34	18	20	
RPW	3	31	18,16	18	19	19	2,00	10	20	0,000*
	7	34	19,94	20	20	20	0,24	19	20	

Mann-Whitney test (α) of 5% (0.050)
Legend: * statistically significant, ED: same-different, LD: lexical decision, RW: reading words (test 4), RPW: reading pseudowords (test 5), RW_HF: reading common words, RW_NF: reading non-frequent words, RPW: Reading pseudowords.

Table 4. Description and comparison of the performance of students from the 5th grade of Municipal Public and Private Education, on tests of sound and letter identification processes and léxicon

Variable	Group	n	Mean	Percentile 25	Median	Percentile 75	Standard deviation	Minimum	Maximum	P value
Sound	4	34	1,29	0	0	0	3,29	0	15	0,000*
	8	35	16,60	15,5	20	20	4,97	5	20	
Letter	4	34	19,94	20	20	20	0,24	19	20	0,148
	8	35	20,00	20	20	20	0,00	20	20	
ED	4	34	19,38	19	20	20	1,48	12	20	0,603
	8	35	19,23	19	20	20	1,48	13	20	
LD	4	34	28,06	27	28	30	1,72	24	30	0,000*
	8	35	29,63	29	30	30	0,65	28	30	
RW	4	34	29,26	29	30	30	1,05	26	30	0,000*
	8	35	29,94	30	30	30	0,34	28	30	
RPW test 5	4	34	27,18	26	28	29	2,47	20	30	0,000*
	8	35	29,57	29,57	28	29	0,85	20	30	
RW_HF	4	34	19,82	20	20	20	0,63	17	20	0,279
	8	35	19,97	20	20	20	0,17	19	20	
RW_NF	4	34	18,88	18	19	20	1,41	15	20	0,009*
	8	35	19,63	19,5	20	20	0,81	16	20	
RPW	4	34	18,76	18,25	19	20	1,48	15	20	0,001*
	8	35	19,71	20	20	20	0,62	20	20	

Mann-Whitney test (α) of 5% (0.050)
Legend: * statistically significant, ED: same-different, LD: lexical decision, RW: reading words (test 4), RPW: reading pseudowords (test 5), RW_HF: reading common words, RW_NF: reading non-frequent words, RPW: Reading pseudowords.

Table 5. Study of the Relationship between the tests name and sound of letters, reading words and pseudo words of PROLEC of students from the 2ⁿᵈ, 3ʳᵈ, 4ᵗʰ and 5ᵗʰ grades of Elementary School, Cycle I

	Variable	Statistics	S	RW	RPW
2ⁿᵈ grade	L	Correlation coefficient. (r)	0,363	0,346	0,536
		p value	0,004*	0,006*	0,000*
		n	61	61	61
	S	Correlation coefficient. (r)	-	0,368	0,330
		p value	-	0,004*	0,009*
		n	-	61	61
	RW	Correlation coefficient. (r)	_	-	0,659
		p value	_	-	0,000*
		n	_	-	61
3ʳᵈ grade	L	Correlation coefficient. (r)	0,374	0,442	0,587
		p value	0,002*	0,000*	0,000*
		n	67	67	67
	S	Correlation coefficient. (r)	-	0,290	0,303
		p value	-	0,017*	0,013*
		n	-	67	67
	RW	Correlation coefficient. (r)	_	-	0,651
		p value	_	-	0,000*
		n	_	-	67
4ᵗʰ	L	Correlation coefficient. (r)	0,300	0,383	0,641
		p value	0,15*	0,002*	0,000*
		n	65	65	65
	S	Correlation coefficient. (r)	-	0,417	0,98
		p value	-	0,001*	0,440
		n	-	65	65
	RW	Correlation coefficient. (r)	_	-	0,384
		Sig. (p)	_	-	0,002*
		n	_	-	65
5ᵗʰ	L	Correlation coefficient. (r)	0,193	0,485	0,508
		p value	0,112	0,000*	0,000*
		n	69	69	69
	S	Correlation coefficient. (r)	-	0,129	0,234
		p value	-	0,289	0,053
		n	-	69	69
	RW	Correlation coefficient. (r)	_	-	0,542
		p value	_	-	0,000*
		n	_	-	69

Spearman correlation analysis (α) of 5% (0.050)
Legend: * statistically significant, L: letter, S: sound, RW: reading words (test 4), RPW: reading pseudowords (test 5).

Among the students of 2ⁿᵈ and 3ʳᵈ grades, there is evidence of association between the tests, letter (L) and sound (S), letter (L) and reading words (RW), letter (L) and reading pseudoword (RPW), sound (S) and reading words (LP), sound (S) and reading pseudowords (RPW) and reading words (RW) and reading pseudowords (RPW). The better the performance of the students in test identification letters, the better their performance in sound identification tests, reading words and pseudowords. Similarly, the better the performance in test identification sound, the better the performance in word reading tests and pseudoword, and the better performance in reading words, the better performance in reading pseudowords.

The degree of association presented between the students of the 2ⁿᵈ grade is weakly positive for the tests L and S (0.363), L and RW (0.346), S and RW (0.368) and S and RPW (0.330) and moderate positive for tests

L and RPW (0.536) and RW and RPW (0.659). But the degree of association presented by the students of the 3rd grade is weakly positive for the tests L and S (0.374), L and RW (0.442), S and RW (0.290) and S and RPW (0.303) and moderate positive for tests L and RPW (0.587) and RW and RPW (0.651).

The students of the 4th grade presented evidence of association between tests L and S, L and RW, L and RPW, S and RW, RW and RPW, indicating the better the performance in a test, the better the performance in another test evaluated. The displayed degree of association is weak positive for L and S (0.300), L and RW (0.383), S and RW (0.417), RW and RPW (0.384) and moderate positive for the tests L and RPW (0.641).

In relation to the students from the 5th grade, there is evidence of association between tests L and RW, L and RPW and RW and RPW. The displayed degree of association is weak positive for L and RW (0.485) and moderate positive for L and RPW (0.508) and RW and RPW (0.542).

DISCUSSION

The results of this study indicate differences concerning the performance of Brazilian students from public and private education of Elementary School in tests which assess the letters identification process and the lexicon process. Superior performance was presented by students of Private Education in most of the evidence letters Identification Process and Lexicon Process PROLEC[24].

In Brazil, studies related to reading and writing assessment area also found differences between the performances of students from public and private schools [11,34-37]. These studies show superior performance of students from private schools in reading and writing assessment tests.

Among the students from 2nd to 5th grades of Public Education, imprecise responses were observed when compared to students of Private Education, demonstrating that responses of Private Education students are more homogeneous, i.e. maintain the same standard (more correct answers). In contrast, for identification of sound test, higher variability of responses was observed among the students of Private Education, although they presented a higher amount of correct answers. This was due to greater knowledge of the alphabetic principle (grapheme-phoneme conversion) by the students of Private Education. Authors explain that the difference between the types of school can also be related to educational practices employed, to

family support with better socio-cultural conditions, and social environment with more stimuli[34]. This fact, added to the pressure from parents, regarding the quality of education and school services focused on the market and to competitivity[38].

The differences in teaching the alphabetic principle between private and public schools are strengthened by the results found in students of the 4th and 5th grades. Among the students of private schools, the performance was higher compared to public school students, comprising tests in which the phonological route was most required. With these results, the use of grapheme-phoneme conversion mechanism is more effective among students of private schools. With these results, as observed, the use of grapheme-phoneme conversion mechanism is more effective among students of private schools. These findings are in agreement with the study of Cunha and Capellini[23], in which students of public education had difficulties in words that rely on phonological processing for decoding, but also had difficulty decoding words that require some knowledge on spelling rules, which, in turn, depend on a good phonological processing.

A good reader can use either the phonological route as the lexical while reading, depending on the stimulus presented, however, if the student has difficulty in letter-sound conversion mechanism, higher amount of phonological working memory and attention will be required, and the reading process will become slower and prone to errors, resulting into difficulties concerning phonological information, interfering on the formation of the orthographic lexicon of the words [13,23,24,39].

Tests in which there was no difference in the performance for public and private education students, the phonological route is not required, the words can be read by the lexical route. The main requirement for reading by the lexical route encompasses visualization of the word for sufficient time to form an internal representation of it, without having to change each letter in its respective sound, while on the phonological route, the main requirement encompasses learning the rules concerning grapheme-phoneme conversion[24].

The highest number of correct answers to frequent words, followed by non-frequent, occurs because the higher the frequency of the word, the more likely will be its internal representation, becoming easier and faster to read it. Reading by the lexical route, when faced with low frequency words, the reading process becomes slower because the pronunciation made by the phonological process can reach the articulatory memory

along with the lexical pronunciation, which will cause delay and possible error when reading the word [13,24,40].

When analyzed the direction and correlation strength between the tests L, S, reading words (test 4) and reading pseudowords (test 5), there is evidence of association between the tests for students from the 2nd and 3rd grades, ranging from weak to moderate positive. These findings clarify that learning to use the grapheme-phoneme conversion rules constitute a prerequisite for learning how to read and the main requirement for using the phonological route [13,23,24]. As students in early literacy tend to use more frequently the phonological route, for having less experience with reading, their performance on the reading tests is linked to the performance on letter and sound identification tasks. Students who know the phonemes, advance more easily and productively in early learning of reading and writing, which reflects positively towards the most advanced stages of this learning [24-26].

Among the students of the 4th grade, tests L and RW, S and RW, L and RPW and RW and RPW and of the 5th grade, the L tests and RW, L and RPW and RW and RPW showed evidence of association with strength and direction from weak positive to moderate, are the ones which show less dependence of these students on the phonological route, indicating greater use of the lexical route, corroborating the findings in the study of Pontes et al.[37], who suggest the lexical route use by students from the 4th and 5th grades, and, according to the authors, it indicates the beginning of the most advanced stage of reading acquisition, which guarantees speed and accuracy of this task.

Given the results, as observed, at the beginning of literacy the use of the phonological route overlaps the lexical, while from the 4th grade, due to better orthographic domain, the lexical route is most used, thus, with education and development, the student learns and stabilizes the orthographic connections, allowing automatic and proper word retrieval and less frequent use of the phonological route. Thus, with experience, the student starts to use the lexical route more frequently, as it benefits from the frequent occurrence of words in the language, since the higher this frequency, more established will be the lexical representation and easier the rescue from lexicon[14,23-27,40]. It is noteworthy for students that do not develop good phonological processing skills will findt more difficulty in recognizing individual words, leading to difficulty in forming orthographic representations of words in memory[23].

This study is important to help educators and other education and health professionals to identify the difficulties of the students in each school grade, and thus assist on the planning of the alphabetic principle teaching during early literacy, regardless of the type of education, public or private. If the education system prioritized teaching letter-sound relationship in the classroom during literacy, considering the alphabetical basis of the writing system of the Brazilian Portuguese, the results of the public school students would, possibly, be higher than those presented in this study, since the teaching of letter-sound relationship, besides accelerating reading acquisition, provides better automaticity for recognition of the word, and hence reading comprehension text.

CONCLUSION

The performance of the Brazilian students of Elementary Schools in tests for assessing the letter identification process and the lexicon process was different, according to the type of school (public or private). The students of private schools outperformed in most tests, except those in which the phonological route is not exclusively required.

Among the students in early literacy, the use of the phonological route has surpassed the lexical, both in public and in private education. From the 4th grade, the lexical route became the most used in both types of education.

This study shows the necessity of prioritizing, in literacy, the letter-sound relationship by the educational system, so that the public school students can present better results in decoding, which can directly influence reading comprehension.

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