

Original articles

The performance of elementary public and private school students pre and post phonological intervention

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ABSTRACT

Purpose: this study aims to compare the performance, pre and post phonological intervention, of 2nd year students in public and private education, with and without learning disabilities.

Methods: 30 students from the 2nd year of elementary education, public and private participated in these study, distributed in: GI, GII and GIII, composed of 15 public school students, submitted to pre and post testing and phonological intervention; and GIV, GV and GVI, comprising 15 private school students, submitted to pre and post testing and phonological intervention. In the pre and post testing moment, the Linguistic Cognitive Skills Assessment Protocol Adaptive was performed. For the intervention, the phonological tasks of letter/sound relationship, analysis, synthesis and manipulation of phonemes and syllables were conducted.

Results: there was a statistically significant performance for the students submitted to the phonological intervention program of the public and private education, in all skills analyzed.

Conclusion: the intervention was effective in both scopes, public and private, however, private school students did better in a greater number of skills analyzed as compared to public school ones, suggesting the influence of the intervention associated with the stimuli offered in the process of schooling.

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INTRODUCTION

Learning is a continuous process that lasts throughout the life of an individual and can be divided basically into formal and informal learning. Among these processes can be mentioned the literacy, which is understood as a formal learning, obtained in most cases, in the educational field¹.

The distinction between public and private education in national territory has raised some questions, such as on the form and content offered to students, quality of education, capacity and pedagogical professionalism. As well, the maneuvers and paths followed by educators to deal with students who cannot keep up with the literacy process, whether for sociocultural and/or neurological issues².

In fact, during the literacy process, some students may have learning difficulties that prevent them from following the performance of their peers, making it necessary to identify what may be delaying this process. This demand has been identified as growing in recent years, both in public and private schools³.

Individuals with learning difficulties tend to respond appropriately, when the causative factors of the same are worked, so that they can be adapted to meet the specific needs of each school. Getting success often in conclusion of the literacy process without the need for long periods of intervention^{4,6}.

Learning disabilities are characterized by changes of more comprehensive, being present in changes of one or more skills, such as auditory processing, visual processing, logical reasoning, processing speed, and metalinguistic skills. It may or may not be associated with previous phonological alterations, as well as other comorbidities, becoming of fundamental importance to the early identification of the symptoms to obtain efficacy in the treatment^{6,7}.

In this way, the main objective of the intervention is to maximize the process of reading and writing learning, with the aim of reducing the damages caused by these deficits during literacy. In addition to encouraging students with learning difficulties, favoring the overcoming of mishaps through activities that can be developed in the educational field, also allows the early identification of those who need a targeted clinical intervention or, even, a multidisciplinary evaluation for the closing of future diagnosis^{8,9}.

The intervention in the initial years of literacy, based on the stimulation of predictive abilities for learning, provides better performance in this process, aiming the development of phonological awareness. These skills

include letter/sound, rhyme, alliteration and syllabic segmentation, as well as auditory and visual discrimination of sounds, processing speed for stimuli, letter sequence naming and fluent reading¹⁰⁻¹³.

Students with learning difficulties can be identified in the initial literacy process, which is completed only in the third year of elementary school. The implementation of early intervention in education setting can provide an evolution or overcoming the frame of learning difficulties, since it makes it possible to identify among students with below-expected performance, in relation to their class-group, those who have learning difficulties and those who are at risk for some specific learning disorder^{7,14}.

In view of the above, this study aimed to compare pre and post phonological intervention performance of students from the 2nd year of public and private education, with and without learning difficulties.

METHODS

This research project was approved by the Research Ethics Committee of the Federal Fluminense University – CEP/ Polo of Nova Friburgo-RJ under protocol number 1.800.368. The Informed Consent Term was signed by those responsible for the children, according to resolution of the National Health Council CNS 466/12, and the Informed Agreement Term, signed by the participants of the research.

This study included 30 students from the 2nd year of elementary school attending public and private education, of both genders, aged 7 to 8 years, distributed in the following groups:

- Group I (GI): five students without learning difficulties, regularly enrolled in public education, submitted to pre and post testing;
- Group II (GII): five students without learning difficulties, regularly enrolled in public education, submitted to pre-testing, phonological intervention and post testing;
- Group III (GIII): five students with learning difficulties, regularly enrolled in public education, submitted to pre-testing, phonological intervention and post testing;
- Group IV (GIV): five students without learning difficulties, regularly enrolled in private education, submitted to pre and post testing;
- Group V (GV): five students without learning difficulties, regularly enrolled in private education, submitted to pre-testing, phonological intervention and post testing;

- Group VI (GVI): five students with learning difficulties, regularly enrolled in private education, submitted to pre-testing, phonological intervention and post testing

All groups were matched according to schooling. The inclusion criteria were absence of related complaints or indicators of hearing, vision or neurological disorders, behavioral or cognitive. The exclusion criteria were the non-signing of informed consent term by parents or guardians, presence of complaints of auditory and/or visual alterations, and presence of neurological, behavioral or cognitive disorders. The information regarding the criteria was taken from school records.

The students were submitted to pre-testing, phonological intervention and post testing, according to the division of the groups previously described. All data collection was carried out in the educational setting, at regular school hours, with the authorization of the principal and teachers.

The collection was made in the second semester, allowing the students to have prior knowledge of the school contents proposed in literacy. The pre and post tests were conducted in four sessions, two for the pre and two for post testing, the phonological intervention done in 10 sessions, twice a week, for two months. Both the evaluation and the intervention were performed, individually, by the researcher, with intervention activities directed to assessment items.

In the pre-testing moment, the Cognitive-Linguistic Skills Assessment Protocol was used, in its collective and individual version¹⁵, adapted for this population. The collective version of the instrument is composed by the subtests of Writing the name; Writing the alphabet in sequence; Copying of forms; Dictation of words and pseudo words; Dictation of figures and Dictation of numbers.

The individual version¹⁵ of the Assessment Protocol is composed of subtests Alphabet Recognition in sequence; Alphabet Recognition in random order; Reading of words; Non-word reading; Rhyme; Alliteration; Syllabic segmentation; Hearing discrimination; Repetition of words; Repetition of nonwords; Inverted numbers; Speed Naming of Figures and Speed Naming of Numbers.

The results of the subtests of the collective and individual version were obtained by assigning one (1) point to each correct answer of the student, and the application of the procedures that comprehend the

evaluation protocol was performed in two sessions, with duration of 50 minutes each.

The phonological intervention involved the following tasks: Alphabet recognition and identification of the sound of letters in sequence; Alphabet recognition and identification of the sound of letters, in a random order; Identification and production of rhyme using words and phrases; Identification and manipulation of words; Identification and manipulation of syllables; Segmentation and Analysis of syllables; Identification of phonemes; Segmentation of phonemes; Replacement and Analysis of phonemes; Identification and Discrimination of phonemes with texts and phrases.

Ten sessions of cumulative character were performed, with an average duration of 40 minutes each, for the development of phonological intervention. The results of the activities were obtained by means of point for correct answers, that is, score achieved by correct answers.

The results of this study were submitted to statistical analysis for greater reliability. The quantitative variables were presented by mean and standard deviation. The test used for normality of the data was the *Shapiro-Wilk test*. For comparison of pre and post testing between the groups, the *Wilcoxon test* was used, by adopting a $p < 0,05$ significance level, and using the Stata version 11.0 as the statistical program.

RESULTS

The data were grouped by abilities, such as reading, writing, phonological awareness, auditory processing, visual processing and processing speed, aiming at facilitating the analysis of the results and the comparison between the groups studied.

The results of the reading ability (Table 1) show a statistically significant difference for word reading for the GIV, GV and GVI groups, when reading pseudo words for the GV group and in words read correctly in 1 (one) minute for the GIII group.

In Table 2, regarding the writing ability, there was a statistically significant difference for writing the alphabet in the GIV, GV and GVI groups, dictation of pseudo words for GIV and total dictation for GIII and GIV.

In the phonological awareness ability, a statistically significant difference was found in the comparison of GI, GII, GIII, GIV, GV and GVI, at the moment of pre and post testing, for the alliteration variable for GVI, and rhyme, for GII.

In Table 4, for auditory processing ability, there was a statistically significant difference for GVI in auditory

discrimination, GI in word repetition, GII in repetition of nonwords and GIII in inverted numbers.

The performance of students in visual processing ability (Table 5) show a statistically significant difference for visual memory of forms, for GIV. For the speed processing ability, there was a significance for GI, GIII and GV in speed naming of figures, GIII in speed naming of numbers in first naming and GIV and GV in speed naming of numbers in the second naming.

DISCUSSION

The results of this study allowed the comparison of the performance of students in public and private education, in relation to the cognitive-linguistic performance test, in order to verify the performance in pre and post testing, after exposure to a phonological intervention program.

Thus, it can be seen, in Table 1, that there was a decrease in the means of performance of the GIV, GV and GVI students, attending the private education, for the words reading test (LP). For the GV group

there was a decrease in the mean performance of the pseudo word reading test (LPs). The decrease of the means of performance for the analysis of the LP and LPs variables is favorable, since this variable is analyzed by the time spent reading words and pseudo words, thus, the decrease of the means of performance indicates that the students demanded less time for the decoding, performing the test more quickly and effectively. The results suggest that GV and GVI students were influenced by the intervention program with phonological abilities, since the students were exposed to intervention with predictive abilities to acquire reading. However, the performance of GIV suggests an improvement in its performance due to the influence of schooling, because it was not submitted to the intervention, but because it is part of the private educational context that develops skills to acquire writing from early grades^{3,14}.

The performance of students who undergo phonological intervention reflects the expansion of lexical memory, which favors the correct decoding of words in a shorter time. Being that the best performance for

Table 1. Comparison of the pre and post testing of students of GI. GII. GIII. GIV. GV and GVI in the reading ability

Abilities	Variables	Groups	Mean	Standard deviation	p-value
Reading	Alf Pre	GI	25.40	1.34	0.317
	Alf Post		26.00	0.00	
	Alf Pre	GI	19.40	9.88	0.055
	Alf Post		21.60	8.26	
	Alf Pre	GIII	24.00	2.91	0.088
	Alf Post		24.80	2.68	
	Alf Pre	GIV	25.20	1.09	0.317
	Alf Post		25.60	0.89	
	Alf Pre	GV	25.20	1.09	0.157
	Alf Post		26.00	0.00	
	Alf Pre	GVI	25.00	1.22	0.088
	Alf Post		26.00	0.00	
	AlfAl Pre	GI	25.60	0.89	0.317
	AlfAl Post		26.00	0.00	
	AlfAl Pre	GI	23.40	2.40	0.171
	AlfAl Post		25.00	1.00	
	AlfAl Pre	GIII	25.20	0.83	0.875
	AlfAl Post		25.40	0.54	
	AlfAl Pre	GIV	25.60	0.54	0.317
	AlfAl Post		25.80	0.44	
	AlfAl Pre	GV	26.00	0.00	-----
	AlfAl Post		26.00	0.00	
	AlfAl Pre	GVI	24.40	0.54	0.052
	AlfAl Post		25.40	0.54	
	LP Pre	GI	60.40	2.88	0.777
	LP Post		60.00	4.24	
	LP Pre	GI	57.20	6.26	0.396
	LP Post		59.80	2.68	
	LP Pre	GIII	186.40	185.16	0.056
	LP Post		103.20	115.77	
	LP Pre	GIV	43.20	14.75	0.043*
	LP Post		34.40	9.78	
	LP Pre	GV	46.80	9.33	0.042*
	LP Post		33.40	9.42	
	LP Pre	GVI	69.00	22.32	0.043*
	LP Post		50.40	12.25	
	LPs Pre	GI	39.20	13.93	0.500
	LPs Post		35.40	10.01	
	LPs Pre	GI	64.20	65.22	0.173
	LPs Post		51.80	47.76	
	LPs Pre	GIII	31.20	3.63	0.412
	LPs Post		30.00	3.60	
	LPs Pre	GIV	28.40	8.64	0.056
	LPs Post		22.40	5.85	
	LPs Pre	GV	32.00	8.09	0.042*
	LPs Post		23.00	6.74	
	LPs Pre	GVI	32.00	10.77	0.079
	LPs Post		25.20	6.87	
	Cor1m Pre	GI	30.40	8.84	0.586
	Cor1m Post		32.20	4.54	
	Cor1m Pre	GI	7.40	9.07	0.056
	Cor1m Post		15.80	12.37	
	Cor1m Pre	GIII	25.00	7.38	0.042*
	Cor1m Post		32.20	9.31	
	Cor1m Pre	GIV	39.40	0.89	0.317
	Cor1m Post		39.80	0.44	
	Cor1m Pre	GV	40.00	0.00	-----
	Cor1m Post		40.00	0.00	
	Cor1m Pre	GVI	32.00	6.89	0.055
	Cor1m Post		39.40	0.89	

* Wilcoxon test Significance adopted $p < 0.05$ **Legend:** Alf: Alphabet. AlfAl: Random alphabet. LP: Words reading. LPs: Pseudo words reading. Cor1m: Words reading correct in 1(one) minute

Table 2. Comparison of the pre and post testing of students of GI. GII. GIII. GIV. GV and GVI in the writing ability

Abilities	Variables	Groups	Mean	Standard deviation	p-value
Writing	EAlf Pre	GI	25.40	0.89	0.875
	EAlf Post		25.60	0.54	
	EAlf Pre	GII	25.40	1.34	0.875
	EAlf Post		25.80	0.44	
	EAlf Pre	GIII	25.40	0.89	0.563
	EAlf Post		25.60	0.54	
	EAlf Pre	GIV	24.60	0.54	0.038*
	EAlf Post		26.00	0.00	
	EAlf Pre	GV	24.80	0.44	0.025*
	EAlf Post		25.80	0.44	
	EAlf Pre	GVI	14.60	5.94	0.043*
	EAlf Post		21.00	5.04	
	DitP Pre	GI	27.40	0.89	0.157
	DitP Post		26.00	2.23	
	DitP Pre	GII	16.40	11.39	0.218
	DitP Post		19.20	11.51	
	DitP Pre	GIII	25.80	3.63	0.052
	DitP Post		27.00	3.53	
	DitP Pre	GIV	29.40	0.54	0.317
	DitP Post		29.80	0.44	
	DitP Pre	GV	29.40	0.89	0.159
	DitP Post		30.00	0.00	
	DitP Pre	GVI	23.80	5.16	0.056
	DitP Post		28.20	0.83	
	DitPP Pre	GI	7.40	1.14	0.159
	DitPP Post		6.60	1.81	
	DitPP Pre	GII	4.00	2.54	0.102
	DitPP Post		6.20	3.56	
	DitPP Pre	GIII	5.40	1.94	0.052
	DitPP Post		7.20	1.64	
	DitPP Pre	GIV	6.40	1.34	0.042*
	DitPP Post		9.60	0.54	
	DitPP Pre	GV	7.80	1.30	0.089
	DitPP Post		9.40	0.89	
	DitPP Pre	GVI	5.20	1.48	0.276
	DitPP Post		6.00	1.22	
	DitT Pre	GI	34.80	1.30	0.104
	DitT Post		32.60	3.36	
	DitT Pre	GII	20.40	13.88	0.173
	DitT Post		25.00	15.62	
	DitT Pre	GIII	31.20	5.15	0.042*
	DitT Post		34.00	5.29	
	DitT Pre	GIV	35.80	1.30	0.042*
	DitT Post		39.40	0.54	
	DitT Pre	GV	37.20	1.64	0.089
	DitT Post		39.40	0.89	
	DitT Pre	GVI	29.00	6.55	0.078
	DitT Post		34.20	1.64	
	DFig Pre	GI	19.00	1.00	0.781
	DFig Post		18.80	1.09	
	DFig Pre	GII	12.00	7.68	0.267
	DFig Post		13.60	6.84	
	DFig Pre	GIII	15.80	3.27	0.078
	DFig Post		18.60	2.60	
	DFig Pre	GIV	19.60	0.54	0.317
	DFig Post		19.20	1.30	
	DFig Pre	GV	19.60	0.54	-----
	DFig Post		19.60	0.54	
	DFig Pre	GVI	17.40	2.07	0.159
	DFig Post		18.40	1.94	

* Wilcoxon test Significance adopted $p < 0.05$ **Legend:** EAlf: Alphabet writing. DitP: Words dictation. Dit PP: Pseudo word dictation. Dit T: Total dictation. DitFig: Figures dictation

Table 3. Comparison of the pre and post testing of students of GI. GII. GIII. GIV. GV and GVI in the phonological awareness skills

Abilities	Variables	Groups	Mean	Standard deviation	p-value
Phonological Awareness	Alit Pre	GI	17.80	2.86	0.786
	Alit Post		18.00	2.82	
	Alit Pre	GII	13.20	2.48	0.056
	Alit Post		16.80	2.58	
	Alit Pre	GIII	18.40	1.86	0.317
	Alit Post		19.00	1.73	
	Alit Pre	GIV	18.80	1.30	0.477
	Alit Post		18.40	2.07	
	Alit Pre	GV	19.60	0.89	0.875
	Alit Post		18.80	2.68	
	Alit Pre	GVI	14.80	2.28	0.042*
	Alit Post		19.60	0.89	
	Rima Pre	GI	17.80	0.83	0.891
	Rima Post		18.00	1.41	
	Rima Pre	GII	10.40	4.15	0.042*
	Rima Post		15.80	4.08	
	Rima Pre	GIII	19.20	0.83	0.875
	Rima Post		19.40	0.89	
	Rima Pre	GIV	17.60	1.34	0.492
	Rima Post		18.00	2.12	
	Rima Pre	GV	18.20	1.09	0.083
	Rima Post		19.40	1.34	
	Rima Pre	GVI	15.00	2.54	0.055
	Rima Post		18.40	1.51	
	SegS Pre	GI	8.60	1.14	0.875
	SegS Post		8.00	2.12	
	SegS Pre	GII	8.40	1.14	0.216
	SegS Post		9.20	1.30	
	SegS Pre	GIII	8.80	2.16	0.159
	SegS Post		10.00	0.00	
	SegS Pre	GIV	9.80	0.44	0.317
	SegS Post		10.00	0.00	
	SegS Pre	GV	10.00	0.00	-----
	SegS Post		10.00	0.00	
	SegS Pre	GVI	7.40	2.07	0.173
	SegS Post		9.60	0.89	

* Wilcoxon test Significance adopted $p < 0.05$ **Legend:** Alit: Alliteration. SegS: Syllabic segmentation

Table 4. Comparison of the pre and post testing of students of GI. GII. GIII. GIV. GV and GVI in the auditory processing ability

Abilities	Variables	Groups	Mean	Standard deviation	p-value
Auditory Processing	DS Pre	GI	18.60	1.94	0.875
	DS Post		18.40	3.04	
	DS Pre	GI	16.00	5.33	0.571
	DS Post		17.80	4.91	
	DS Pre	GIII	17.00	3.46	0.088
	DS Post		19.40	1.34	
	DS Pre	GIV	19.00	1.22	0.088
	DS Post		20.00	0.00	
	DS Pre	GV	19.60	0.54	0.157
	DS Post		20.00	0.00	
	DS Pre	GVI	12.80	7.19	0.043*
	DS Post		20.00	0.00	
	RepP Pre	GI	3.40	0.89	0.033*
	RepP Post		6.00	0.00	
	RepP Pre	GI	5.20	1.30	0.317
	RepP Post		5.60	0.54	
	RepP Pre	GIII	3.80	1.30	0.055
	RepP Post		5.40	0.89	
	RepP Pre	GIV	4.80	1.09	0.267
	RepP Post		5.40	0.54	
	RepP Pre	GV	5.20	0.83	0.317
	RepP Post		5.40	0.89	
	RepP Pre	GVI	3.80	0.83	0.563
	RepP Post		4.00	1.22	
	RepNP Pre	GI	3.00	1.00	0.088
	RepNP Post		3.80	0.44	
	RepNP Pre	GI	2.60	0.54	0.041*
	RepNP Post		4.60	1.34	
	RepNP Pre	GIII	1.60	0.89	0.052
	RepNP Post		3.00	1.00	
	RepNP Pre	GIV	2.20	0.44	0.317
	RepNP Post		2.40	0.54	
	RepNP Pre	GV	3.00	1.00	0.088
	RepNP Post		2.20	0.44	
	RepNP Pre	GVI	2.00	1.41	0.875
	RepNP Post		2.20	0.44	
	Num Pre	GI	7.20	0.83	1.000
	Num Post		7.20	0.44	
	Num Pre	GI	6.00	1.00	0.477
	Num Post		6.40	0.54	
	Num Pre	GIII	6.80	1.09	0.393
	Num Post		7.40	0.89	
	Num Pre	GIV	7.20	1.92	0.083
	Num Post		8.40	1.51	
	Num Pre	GV	8.20	1.30	0.052
	Num Post		9.20	0.83	
	Num Pre	GVI	6.00	0.70	0.875
	Num Post		6.20	0.83	
	NInv Pre	GI	3.40	0.89	0.875
	NInv Post		3.60	2.07	
	NInv Pre	GI	1.40	1.34	0.055
	NInv Post		3.20	0.83	
	NInv Pre	GIII	3.40	0.89	0.033*
	NInv Post		5.20	0.83	
	NInv Pre	GIV	2.60	1.34	0.052
	NInv Post		3.60	0.89	
	NInv Pre	GV	4.20	1.30	0.776
	NInv Post		4.20	1.78	
	NInv Pre	GVI	3.80	0.44	0.579
	NInv Post		4.00	1.22	

* Wilcoxon test Significance adopted $p < 0.05$ **Legend:** DS: Sound discrimination. RepP: Words repetition. RepNP: No words repetition. Num: Numbers dictation. NInv: Invert numbers

Table 5. Comparison of the pre and post testing performance of students of GI, GII, GIII, GIV, GV and GVI in the visual processing and processing speed abilities

Abilities	Variables	Groups	Mean	Standard deviation	p-value
Visual Processing	MVF Pre	GI	2.60	1.14	0.055
	MVF Post		4.20	1.30	
	MVF Pre	GII	3.80	3.80	0.171
	MVF Post		5.60	0.54	
	MVF Pre	GIII	4.60	0.89	0.054
	MVF Post		5.80	0.44	
	MVF Pre	GIV	2.40	0.89	0.042*
	MVF Post		5.00	0.70	
	MVF Pre	GV	2.80	1.30	0.055
	MVF Post		5.00	0.70	
	MVF Pre	GVI	4.00	1.22	0.055
	MVF Post		5.60	0.54	
Speed Processing	NRF Pre	GI	46.60	9.04	0.042*
	NRF Post		39.80	6.49	
	NRF Pre	GII	43.00	1.41	0.345
	NRF Post		46.40	9.07	
	NRF Pre	GIII	45.40	5.45	0.043*
	NRF Post		37.40	6.50	
	NRF Pre	GIV	39.60	1.14	0.078
	NRF Post		36.40	3.50	
	NRF Pre	GV	38.20	5.76	0.042*
	NRF Post		32.00	4.06	
	NRF Pre	GVI	41.20	4.91	0.684
	NRF Post		41.20	6.97	
	NRN1 Pre	GI	48.00	8.15	0.224
	NRN1 Post		42.40	8.29	
	NRN1 Pre	GII	44.80	25.37	0.089
	NRN1 Post		40.60	23.38	
	NRN1 Pre	GIII	45.60	4.77	0.042*
	NRN1 Post		34.00	4.18	
	NRN1 Pre	GIV	36.80	9.03	0.056
	NRN1 Post		33.80	9.75	
	NRN1 Pre	GV	39.40	11.08	0.680
	NRN1 Post		38.40	11.28	
	NRN1 Pre	GVI	41.00	5.95	0.685
	NRN1 Post		40.00	9.56	
	NRN2 Pre	GI	54.40	10.01	0.138
	NRN2 Post		48.40	7.76	
	NRN2 Pre	GII	45.00	28.93	0.089
	NRN2 Post		37.20	23.04	
	NRN2 Pre	GIII	46.00	9.30	0.079
	NRN2 Post		36.60	5.12	
	NRN2 Pre	GIV	40.80	9.80	0.041*
	NRN2 Post		33.60	6.65	
	NRN2 Pre	GV	42.80	9.17	0.042*
	NRN2 Post		38.80	9.83	
	NRN2 Pre	GVI	49.20	5.26	0.222
	NRN2 Post		42.60	8.96	

* Wilcoxon test Significance adopted $p < 0.05$ **Legend:** MVF: Visual memory for forms, NRF: Rapid naming of figures, NRN1: Rapid naming of numbers 1, NRN2: Rapid naming of numbers 2

the reading of pseudo words can be supported directly in the development of the phonological awareness, allowing the access and use of the phonological route by these students^{9,16}.

In relation to the students of the GIII group, belonging to the public school, there was an increase in the average performance in the test of words read correctly in one minute (Cor1m), indicating that the initial difficulty in the decoding of symbols was supplied for the execution of this activity. Indicating the influence of the intervention of phonological basis, which allowed the students with learning difficulties to improve their performance in decoding real words^{5,17}.

The improvement in performance in reading ability tests is also reflected in the tests proposed by the processing speed ability, presented in Table 5. Since, the students in the public education, the GI and GIII groups showed a decrease in performance averages, depending on the execution time, for the rapid naming of figure test (NRF); as well as, GIII decreases its performance in rapid naming of numbers in the first naming (NRN1). Indicating that the students demanded less time to access the information requested, performing the test faster and more accurately.

For students with learning difficulties it is suggested that the best performance was the result of the ability to decode the presented information quickly and accurately, an ability developed along with improved access to lexical memory for visual *input* and image recognition, and immediate to numbers. In relation to students of public education who were not submitted to intervention, we suggest the development of the ability to decode stimuli resulting from the learning process provided by teaching school, due to exposure to new concepts and stimuli, in addition to maturational cognitive development¹⁸.

However, for GIV and GV students in private education, the improvement in performance was characterized by a decrease of the means in the rapid naming of numbers test in second naming (NRN2), suggesting that exposure to continuous stimuli did not generate overload memory. Data that this indicates that the capacity of processing, storage and recovery of students without learning difficulties develops together with school learning, regardless of whether or not submitted to intervention¹⁹.

In the ability of phonological awareness, belonging to Table 3, students of GVI presented superior performance in the alliteration test (Alit) and the students of GII for the rhyme test. The results suggest that

the students with learning difficulties of the private education suffered the joint influence of the phonological intervention, associated to the literacy process offered in educational scope. As for students of public education, is also verified the influence of phonological intervention on the perception of sonorous segments worked directly with the task of letter/sound relationship, identification and production of rhymes, and belonging to the literacy process, identified in the speed of processing continuous stimuli^{4,20}.

In relation to auditory processing ability (Table 4), there was an increase in the mean performance of GVI students, for the sound discrimination test (DS). For students in public education, there was an increase in the means for the repetition of words test (RepP) for GI, repetition of non-words (RepNP) for GII and inverted numbers (NInv) for GIII¹⁶.

The systematic learning of phonological skills through phonological intervention has potentiated such abilities, allowing the development of auditory discrimination, that is, the development of these abilities occurred in parallel and joint. Thus, the improvement in the sound discrimination reflects in the phonological awareness, generating a reciprocal performance between the involved abilities, causing an increase of the means of performance of the GVI students^{13,19}.

For the words repetition test (RepP) there was an increase in the mean performance for the students of the GI, and this group did not undergo intervention. Based on the results, it is possible to deduce that the improvement in performance was due to the fact that the students did not present difficulties and did not require the direct access of the phonological route to perform the proposed test. This fact makes it possible to storage, retrieval and access the information through lexical memory, preserved in this specific population^{16,21}.

In relation to the non-words repetition test (RepNP), there was an increase in the mean for GII students, indicating that there was an effective access to the phonological route, which allowed to process, store and retrieve the requested information. Such performance may come from the explicit learning of phonological awareness, provided by the intervention program. In the inverted numbers test (NInv) the GIII students had averages higher performance, comparing the pre and post testing, suggesting the expansion of the mechanisms of retention of information by the immediate memory of work²⁰⁻²³.

In the writing ability, presented in Table 2, there was an increase in the mean of the performance in

the comparison of the GIV, GV and GVI students, belonging to the private education, in the alphabet writing test (EAlf). This result can be justified by the improvement in the retention of information related to long term memory, reflecting the phonological intervention and the maturational development generated by literacy, both for students with learning difficulties and for students with academic performance expected. As well, the superior performance of GIV students in the pseudo words dictation test (DitPP) also signals the learning of phonological awareness, directly interfering in the use of the phonological route in a systematic form^{22,24}.

The students of the public education in the GIII group, with learning difficulties, obtained a superior performance in the comparison of the means of pre and post testing in relation to the total dictation test (DitT). This result indicates that the development of phonological awareness provides support for the development of reading, such as for coding. Since the writing process derives from the effective performance of decoding, that is, the formation and access to lexical memory act as a positive factor for writing^{11,23-25}.

The results of this study aim to identify the benefits of phonological intervention in both the public and private educational environments, as well as to identify gains for students with learning difficulties in both educational contexts. However, it is necessary to expand the sample of interest, as well as the verification of the real educational influence on the performance of the students who were not submitted to the intervention, in public and private education, to verify if there is a consistency in the increase of averages for specific skills.

CONCLUSION

The results of the comparison of the students' performance of the analyzed groups allowed us to conclude that private school students presented a superior performance after intervention in Reading, Writing, Phonological Awareness, Visual Processing and Processing Speed skills, acquiring a significant performance in the integrality of the analyzed subtests. In relation to public school students, a superior performance in specific tests of phonological awareness, reading of correct words in one minute, total dictation, auditory processing and processing speed, was observed. These findings allow the conclusion that both student groups presented advances in distinct metalinguistic aspects, when stimulated with phonological based teaching associated to the schooling process.

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