

# EFFICACY OF PHONOLOGICAL INTERVENTION PROGRAM IN STUDENTS AT RISK FOR DYSLEXIA

## *Eficácia de um programa de intervenção fonológica em escolares de risco para a dislexia*

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### ABSTRACT

**Purpose:** to verify the efficacy of phonological intervention program in students at risk for dyslexia. **Methods:** participated these study 40 students of the 1<sup>st</sup> grade level of elementary school, of both genders, with aged between 5 years and 11 months to 6 years and 7 months. The students were divided into two groups: GI (20 students without risk for dyslexia); and GII (20 students with risk for dyslexia), both groups were subjected to phonological intervention program, composed by tasks of identifying of sounds and letters of the alphabet in sequence and random order, identification and production of rhyme, rhyme production with phrases, identification and manipulation of words, identification and production of syllables, syllabic segmentation and analysis, phonemic identification and segmentation, replacement, synthesis, analysis and phonemic discrimination. In situation of pre and post-testing, all subjects in this study were submitted to the Evaluation Cognitive Linguistic Skills Protocol – collective and individual version. **Results:** in comparison of the pre with post testing of the performance of students of GI and GII, was statistical difference for the subtests of the skills of reading, writing, phonological awareness, auditory processing and processing speed, indicating average of superior performance for GII in post testing compared to pre testing. **Conclusion:** the phonological intervention program was effective for students at risk for dyslexia because it made possible the development of phonological awareness through intervention, assisting in the acquisition of skills necessary for the learning of reading and writing.

**KEYWORDS:** Early Intervention; Dyslexia; Reading; Writing; Learning

### ■ INTRODUCTION

The early identification of students at risk for dyslexia is a subject discussed in the international literature since the decade of 80<sup>1,2</sup>. However, recent studies claim that the sooner the principal signs that characterize dyslexia is identified, the sooner these students will be placed in the context of the intervention to minimize the characteristics of the framework and its interference in learning of the reading and writing and actually confirm or not the framework of dyslexia<sup>3-6</sup>.

The dyslexia can be defined as a specific learning disorder of the reading that causes difficulties of processing of stimuli linguistic and non-linguistic brief, rapid and successive. However, when thinking about early identification of students at risk for dyslexia the principal manifestations found are phonological alterations, difficulty in recognizing letters, no association of relation letter/sound, alteration in the discrimination of sounds, difficulty in distinguishing letters with nearby sounds, recurring exchanges in speech and in the initial learning writing<sup>3,5,7-9</sup>.

The phonological disorder has been pointed out as one of the first signs of risk for dyslexia, since the phonological skills that should develop naturally and spontaneously were not acquired, which complicates the development of other skills such as analysis, synthesis, segmentation and phonemic

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manipulation<sup>9-11</sup>, which may influence the acquisition of the mechanism of phoneme-grapheme conversion for the learning of reading and writing<sup>(4,7)</sup>.

The phonological disorder characterized by disorganization of speech that impairs the language development owing to the presence of substitutions, distortions and omissions of sounds<sup>10</sup>. However, despite being considered the main sign of risk for dyslexia, should be taken into consideration, the other signs, mentioned above, which manifest themselves in the classroom, taking this school to a lower performance relative to their group-class in activities related to reading and writing<sup>12,13</sup>.

The thematic about early identification of students at risk for dyslexia and the practice of interventional work is still very recent and developed studies have as its primary focus, the intervention with phonological basis, and have shown good results through of the intervention using activities that involve phonological awareness, among them stand out the sound perception (rhyme and alliteration) and the manipulation of speech segments (segmentation, analysis and synthesis phonemic), beyond the letter/sound relationship<sup>4,10</sup>.

The early intervention proposes to provide insight to verify if, after the implementation of specific programs, involving the stimulation of cognitive-linguistic skills that have been altered or delayed, the students show or no improvement in learning of reading.

Those who, after submitted to an intervention program, remaining with gaps in skills of phonological awareness, processing speed, visual and auditory processing, and in the letter/sound relationship, suggest a disorder present in the processing, storage and/or access information, which impairs the acquisition and development of perceptive and linguistic skills, should submitted the interdisciplinary evaluation to confirm the manifestation of dyslexia and periodic monitoring order to minimize the deficiencies identified in the evaluation process<sup>3,14,15</sup>.

Thus, based on the specialized literature, as before phonological disorders in school phase is identified, the faster early intervention programs can be realized by decreasing the impact of this disorder on the reading and writing learning, especially at the beginning of the 1<sup>st</sup> year of elementary school<sup>3</sup>. However, in Brazil, are still few studies that use intervention programs directed for early identification of dyslexia and, therefore, for tracking of students at risk for dyslexia<sup>8,9</sup>.

In result of the above, this study aimed to verify the efficacy of phonological intervention program in students at risk for dyslexia.

## ■ METHODS

This study was submitted and approved for the Ethics Committee from the Faculty of Philosophy and Sciences of São Paulo State University – CEP/FFC/UNESP – Marília (SP), under protocol nº 686/2009.

Participated in these study 40 students from 1<sup>st</sup> year of elementary school, 17 (42,5%) female gender and 23 (57,5%) male gender, with aged between 5 years and 11 months and 6 years and 7 months, were divided into two groups:

**Group I (GI):** composed of 20 students without risk for dyslexia that were submitted to phonological intervention program, 10 students of the females and 10 of the males, with aged between 5 years and 11 months to 6 years and 7 months, regularly registered in the 1<sup>st</sup> year of elementary school.

We considered students without risk for dyslexia those that presented good academic performance, indicated by teachers following the criterion of satisfactory performance for two consecutive bimesters, compared to its class group and absence of phonological disorder.

**Group II (GII):** composed of 20 students at risk for dyslexia that were submitted to phonological intervention program, seven students of the females and 13 males, with aged between 5 years and 11 months to 6 years and 3 months, regularly registered in the 1<sup>st</sup> year of elementary school.

The students of group GII were identified among 70 students regularly registered in 1<sup>st</sup> year of elementary education at a public school in Marília-SP, through the application of Child Language Test in the areas of phonology, vocabulary, fluency and pragmatic – ABFW<sup>16</sup> for identification and confirmation of the diagnosis of phonological disorder. To determine the severity of phonological disorder was used the index of Percentage of Correct Consonants – PCC<sup>1</sup>, this index checks the number of correct consonants produced in a sample of speech according to the total number of consonants in the sample, which is considered as incorrect consonant, the omissions, substitutions and common and not common distortions.

Thus, the index of phonological disorder was calculated after classifying phonological processes, the quantity and productivity of each process observed in the speech sample obtained through naming and imitation proofs of the ABFW. This index was calculated with the division the correct consonants emitted by total consonants of the proof multiplied by 100%. That way, phonological disorder was considered mild if the PCC is 85% to 100%, lightly moderate from 65% to 85%, moderately severe in 50% to 65% and severe if lower than 50%.

**Table 1 – Comparison of the index of gravity of the phonological disorder – PCC in the naming and imitation task**

Appointment Degree of severity pre	Appointment Degree of severity post		Total
	1	2	
1	16 80,00%	0 0,00%	16 80,00%
2	3 15,00%	0 0,00%	3 15,00%
3	0 0,00%	1 5,00%	1 5,00%
Total	19 95,00%	1 5,00%	20 100,00%

  

Appointment Degree of severity pre	Appointment Degree of severity post		Total
	1	2	
1	17 85,00%	0 0,00%	17 85,00%
2	3 15,00%	0 0,00%	3 15,00%
Total	20 100,00%	0 0,00%	20 100,00%

Legend: 1: mild; 2: lightly moderate; 3: moderately severe

\* Significant values for the nomination ( $p=0,125$ ) – Signal Test

\* Significant values for the imitation ( $p=0,250$ ) – Signal Test

The data collection was realized at the Laboratory of Investigation of Deviations from Learning – LIDA/ UNESP-Marília-SP and started after signing of the Consent Term form by parents or those responsible for students.

All students in this study was submitted the same procedures in situation of pre and post-testing and intervention. The choice of procedures pre and post-testing followed the following criteria: instruments to verify the skill of reading words and pseudowords, phonological skills (rhyme and alliteration), writing skills and auditory processing skills, so they could be evaluated skills worked in the intervention process. Thus, in situation of pre and post-testing, the following procedures were used:

A) Cognitive-Linguistic Performance Test – collective version<sup>17</sup>. This version was composed of the following subtests: recognition of the alphabet in sequence, words dictated and pseudowords and dictation of digits. Besides the subtests cited were added the subtests of recognition of the alphabet in random order and mute dictation.

B) Cognitive-Linguistic Performance Test – individual version<sup>17</sup>. This version was composed of the following subtests: reading words and non-words, rhyme, alliteration, syllabic segmentation, auditory discrimination, repetition of words and non-words, numbers game inverted, rapid automatized naming pictures and rapid automatic naming of digits. This

version was added subtest rapid automatic naming of colors.

The evaluation tests used in pre and post-testing were applied in four sessions, with two sessions for pre-testing and two sessions for post-testing, lasting 50 minutes each.

The phonological intervention program was realized in 15 sessions cumulative, in each session was presented a new activity that was worked coupled with the task developed in the previous session, lasting 50 minutes each, twice a week. The stages of phonological intervention program were worked sequentially in the following order: identification of sounds and letters of the alphabet, identifying of sounds and letters of the alphabet in random order, identification and production of rhyme, rhyme production with phrases, identification and manipulation of words, identification and production of syllables, segmentation and analysis syllabic, identification and segmentation phonemic, substitution, synthesis, analysis and phonemic discrimination.

The results were statistically analyzed using the program SPSS (*Statistical Package for Social Sciences*), in its version 20.0, based on the number of correct answers submitted by GI and GII, to obtain the results. As a statistical test was used Mann-Whitney Test, in order to verify possible differences in comparing the groups studied. The level

of significance adopted was 5% (0,05) for the application statistical tests.

## ■ RESULTS

In comparison of the pre with post-testing of the performance of students of GI and GII for reading ability, we can verify that occurred statistical difference in subtests of alphabet recognition pre and post-testing, alphabet recognition in random order to pre-testing, words read correctly in one minute in the pre and post-testing.

The results show that GI and GII had mean scores on superior performance in tests of recognition of the alphabet that reflected in the number of words read correctly, even with no statistical difference in the subtests of reading words and not words, the data suggest the influence of the recognition of alphabet for reading.

For writing skills, in comparison of the pre with post-testing, we found that there was statistical difference in the writing subtest of the alphabet pre and post-testing, word dictation post-testing, no words dictation pre and post-testing, total dictation pre and post-testing and mute dictation pre and post-testing. The data suggest improvement in the performance of students presenting a reflection of the relation letter/sound for acquisition and increase of average of writing performance.

In phonological awareness skill we can verify that there was statistical difference for the subtests of alliteration, rhyme and syllabic segmentation in pre and post-test, suggesting that the interventive work with phonological skills resulted in increased average performance of phonological skills.

For auditory processing, in comparison of the pre with post-testing of GI and GII was found statistical difference in the subtests of discrimination of sounds, repetition of words and dictation of numbers for pre and post-testing, indicating an improvement in performance of students regarding sound perception, for storage and retrieval of information for words and digits.

For the ability of processing speeding, in the comparison of the pre with post-testing between the performance of GI and GII, was found statistical difference for the subtests of rapid naming of figures, first and second rapid naming of digits in pre and post-testing. The data suggest improvement in processing, access and retrieval of visual information quickly and successively, both for figures as for digits.

Concerning the performance of students of GII, after phonological intervention, for tests of naming and imitation, we can observe that the students had similar performance when comparing the situations of pre and post-testing.

**Table 2 – Distribution of the performance of students of the GI and GII, in pre and post-testing, in the skill of reading and writing**

Variable	Group	Mean	Standard-deviation	Minimum	Maximum	p-value
Alf Pré	GI	26,00	0,00	26,00	26,00	0,000*
	GII	23,15	4,60	7,00	26,00	
Alf Pós	GI	26,00	0,00	26,00	26,00	0,038*
	GII	25,60	1,00	22,00	26,00	
Alf AI Pré	GI	25,85	0,67	23,00	26,00	0,000*
	GII	21,40	5,55	6,00	26,00	
Alf AI Pós	GI	25,85	0,67	23,00	26,00	0,071
	GII	24,60	2,85	18,00	26,00	
LP Pré	GI	180,75	108,84	60,00	493,00	0,133
	GII	373,45	398,75	0,00	1453,00	
LP Pós	GI	160,80	95,19	54,00	467,00	0,304
	GII	260,35	239,22	0,00	866,00	
LNP Pré	GI	56,65	31,05	0,00	145,00	0,357
	GII	91,75	91,91	0,00	337,00	
LNP Pós	GI	56,70	44,23	13,00	217,00	0,935
	GII	73,35	79,72	0,00	294,00	
Cor1m Pré	GI	23,15	11,31	0,00	40,00	0,010*
	GII	13,00	11,48	0,00	37,00	
Cor1m Pós	GI	32,20	8,09	12,00	40,00	0,000*
	GII	18,95	10,69	0,00	40,00	
E Alf Pré	GI	25,85	0,49	24,00	26,00	0,000*
	GII	20,75	6,46	7,00	26,00	
E Alf Pós	GI	26,00	0,00	26,00	26,00	0,004*
	GII	24,20	3,58	12,00	26,00	
DitP Pré	GI	17,75	4,51	8,00	26,00	0,065
	GII	12,65	9,19	0,00	28,00	
DitP Pós	GI	27,50	3,76	16,00	30,00	0,000*
	GII	20,25	9,17	0,00	30,00	
DitNP Pré	GI	5,15	1,76	2,00	9,00	0,000*
	GII	2,30	2,39	0,00	7,00	
DitNP Pós	GI	7,55	1,23	5,00	9,00	0,000*
	GII	3,90	2,17	0,00	7,00	
DitT Pré	GI	30,70	5,12	23,00	39,00	0,000*
	GII	14,95	10,66	0,00	33,00	
DitT Pós	GI	35,05	4,63	21,00	39,00	0,000*
	GII	24,15	11,14	0,00	36,00	
DM Pré	GI	16,95	1,99	13,00	20,00	0,000*
	GII	5,90	4,90	0,00	14,00	
DM Pós	GI	18,50	1,64	15,00	20,00	0,000*
	GII	9,10	4,86	0,00	16,00	

Legend: Alf: alphabet, Alf AI: random alphabet, LP: words reading, LPN: no words reading, Cor1m: correct in 1(one) minute, E Alf: writing of the alphabet, DitP: words dictation, DitNP: no words dictation, DM: mute dictation

\* Significant values ( $p \leq 0,05$ ) – Statistical Mann-Whitney Test

**Table 3 – Distribution of the performance of students of the GI and GII, in pre and post-testing, in the skill of phonological awareness and auditory processement**

Variable	Group	Mean	Standard-deviation	Minimum	Maximum	p-value
Alit Pré	GI	18,20	1,61	15,00	20,00	0,000*
	GII	12,85	4,78	0,00	20,00	
Alit Pós	GI	19,90	0,45	18,00	20,00	0,000*
	GII	17,45	2,19	13,00	20,00	
Rima Pré	GI	17,25	2,29	12,00	20,00	0,000*
	GII	11,05	3,93	3,00	17,00	
Rima Pós	GI	19,85	0,49	18,00	20,00	0,000*
	GII	17,40	2,04	11,00	20,00	
SegS Pré	GI	8,70	1,49	4,00	10,00	0,876
	GII	8,45	1,93	3,00	10,00	
SegS Pós	GI	10,00	0,00	10,00	10,00	0,019*
	GII	9,65	0,67	8,00	10,00	
DS Pré	GI	17,40	3,78	5,00	20,00	0,000*
	GII	13,80	2,53	9,00	19,00	
DS Pós	GI	19,55	1,15	16,00	20,00	0,000*
	GII	17,65	2,56	11,00	20,00	
RepP Pré	GI	4,95	0,95	3,00	6,00	0,000*
	GII	3,20	1,20	2,00	6,00	
RepP Pós	GI	5,55	0,51	5,00	6,00	0,003*
	GII	4,75	0,91	3,00	6,00	
RepNP Pré	GI	2,30	0,73	1,00	4,00	0,592
	GII	2,40	0,68	2,00	4,00	
RepNP Pós	GI	2,45	0,61	2,00	4,00	0,065
	GII	2,80	0,62	2,00	4,00	
Núm Pré	GI	7,05	1,19	4,00	8,00	0,000*
	GII	4,45	1,96	0,00	8,00	
Núm Pós	GI	7,50	0,69	6,00	8,00	0,001*
	GII	6,35	1,09	4,00	8,00	
NInv Pré	GI	3,35	1,46	0,00	6,00	0,749
	GII	3,45	1,28	0,00	6,00	
NInv Pós	GI	4,05	1,23	2,00	6,00	0,375
	GII	4,40	1,00	2,00	6,00	

Legend: Alit: aliteration, SegS: syllabic segmentation, DS: sound discrimination, RepP: words repetition, RepNP: no words repetition, Núm: numbers, NInv: invert numbers

\* Significant values ( $p \leq 0,05$ ) – Statistical Mann-Whitney Test

**Table 4 – Distribution of the performance of students of the GI and GII, in pre and post-testing, in the skill of speed processement**

Variable	Group	Mean	Standard-deviation	Minimum	Maximum	p-value
NRF Pré	GI	43,30	7,28	32,00	58,00	0,007*
	GII	50,05	7,08	40,00	64,00	
NRF Pós	GI	38,10	5,97	23,00	49,00	0,000*
	GII	47,20	6,34	34,00	58,00	
NRN1 Pré	GI	43,30	8,26	32,00	63,00	0,002*
	GII	54,65	17,68	0,00	83,00	
NRN1 Pós	GI	39,05	6,00	29,00	49,00	0,000*
	GII	54,30	13,25	35,00	95,00	
NRN2 Pré	GI	43,45	7,63	31,00	64,00	0,005*
	GII	53,65	17,84	0,00	83,00	
NRN2 Pós	GI	38,30	3,91	34,00	47,00	0,000*
	GII	53,95	11,77	35,00	87,00	
NRC Pré	GI	73,25	19,30	44,00	116,00	0,155
	GII	83,75	22,30	49,00	117,00	
NRC Pós	GI	65,45	14,38	43,00	99,00	0,807
	GII	64,85	13,43	43,00	93,00	

Legend: NRF: rapid naming of figures, NRN1: rapid naming of numbers/first, NRN2: rapid naming of numbers/second, NRC: rapid naming of colors

\* Significant values ( $p \leq 0,05$ ) – Statistical Mann-Whitney Test

**Table 5 – Comparison of the index of gravity of the phonological disorder – PCC in the naming and imitation task after phonological intervention for students of the GII**

Appointment Degree of severity pre	Appointment Degree of severity post		Total
	1	2	
1	16	0	16
	80,00%	0,00%	80,00%
2	3	0	3
	15,00%	0,00%	15,00%
3	0	1	1
	0,00%	5,00%	5,00%
Total	19	1	20
	95,00%	5,00%	100,00%

  

Appointment Degree of severity pre	Appointment Degree of severity post		Total
	1		
1	17		17
	85,00%		85,00%
2	3		3
	15,00%		15,00%
Total	20		20
	100,00%		100,00%

Legend: 1: mild; 2: lightly moderate; 3: moderately severe

\* Significant values for the nomination ( $p=0,125$ ) – Signal Test

\* Significant values for the imitation ( $p=0,250$ ) – Signal Test

## ■ DISCUSSION

The performance comparison of GI and GII indicates that students of the group GII had superior performance in reading tests after work directed of the correspondence letter/sound, developed in subtests of Alphabet Recognition and Alphabet Recognition in random order associated with the sound. This result indicates that the work involving the letter/sound relationship, explicitly favors the performance of students with alterations in sound perception in skills necessary for the acquisition of reading, also directing, for a close relationship between the development of phonological sensitivity in early stages of the literacy process as a booster of reading<sup>15,18</sup>.

In comparison of the pre with post-testing of the groups for writing skill, the students of GI and GII showed mean of superior performance. The results refer to an influence of phonological skills, that helped in the coding process of words and not words. Thus, studies indicate that, phonological awareness when worked in the early grades literacy allows, with use of letter/sound association the access to phonological memory for word formation, which may be recovered during the writing, because students with deficit phonological, when inserted in interventional programs with instruction of phonological aspects tend to overcome errors until then imperceptible to this type of population, reflecting still, in the acquisition of writing<sup>11,19</sup>.

The increase in average of right answers for the subtests of Rhyme, Alliteration and Syllable Segmentation come from the work realized with the program of phonological intervention. It was found, also, that the increase in average right answers on the subtests of this ability, for students of the GII, did not reach the average performance of students of GI. The difficulty phonological of students at risk for dyslexia in realize this type of test suggests a deficit in the phonological representation, because a disorganization in access to phonological processing of information or the lack of ability to manipulate representations in cognitive level higher<sup>6,15,20</sup>.

Recent studies indicate that persistent difficulty in manipulate, processing, producing and reproducing phonological segments, over time, in the early grades literacy, may be indicative of a deficit in phonological memory and fast access of phonological information, leading to difficulties decoding in reading the subsequent series<sup>5,15,20,21</sup>. Thus, it is suggested to literacy teachers to dedicate extra time in the classroom for conducting activities involving phonological perception, seeking to encourage students with phonological deficits to better actuation the of mechanism of correspondence letter/sound

during the acquisition and development of reading and writing<sup>22</sup>.

In comparison of the pre with post-testing of GI and GII, for auditory processing skills, occurred performance statistically significant for the subtests of Discrimination of Sounds, Words Repeating and Sequence Numbers Inverted, indicating that the students have of the group GII suffered influence of stimuli offered in this skill.

Studies indicate that the work with phonological awareness exercises influence in skills that involve the discrimination of acoustic signals (phonemes), assisting in the retention of information in the phonological memory. Thus, activities that involve the repetition of words and pseudowords, and the repetition of sequences, either digits or figures, involve directly the processing of auditory information, the retention and recuperation of information stored for the reproduction stimulus requested<sup>4,6,20,23,24</sup>.

For students of the group GII, the ability of discriminate auditory stimuli and of processing auditory information is more compromised due to the frame of phonological disorder, however, when worked the sound discrimination in the early stages of literacy, the difficulty in distinguish and store information for hereafter use them in reading tasks, for example, becomes more effective because the phonological working memory is able to retain and manipulate information temporarily while participating in cognitive tasks such as reasoning, comprehension and learning<sup>25,26</sup>.

To Speed Processing Skill the results indicate statistical differences in comparison of GI and GII, for pre and post-testing, for subtests of Rapid Naming of Figures and Rapid Naming of Digits. The results point to the decrease of average performance, because it is tests evaluated by time necessary spent for its execution. Thus, we can verify that the group GII, also presented average of performance lower than group GI, suggesting a difficulty in prosecute and reproduce visual stimuli, since the tests that evaluate rapid naming seeking to verify the processing of stimuli of form quickly and successive<sup>27,28</sup>.

We know that access to phonological information of students with phonological disorder is altered, since these students have a disorder of phonological basic that characterizes the condition. The maintenance of the average performance for this population, suggests an overload of phonological memory generated by deficit in phonological processing of information, and that can be transferred to the reading because the reading process requires the processing of symbols (graphemes) at the moment of decoding and their respective



relationship to the phoneme to which reading occurs fluently<sup>21,29,30</sup>.

For tests of naming and imitation, students of the GII showed similar performance, evidenced by the indexes of the PCC, before and after application of phonological intervention program, suggesting that the strategies developed in the intervention did not help directly in the improvement of phonological disorder, however we must consider that the proposal of the intervention program is not working aspects of orality, and yes, demonstrate that students at risk for dyslexia have phonological disorders.

The program has showed itself effective because, after application of the phonological intervention for students at risk for dyslexia, it was verified that of 20 students with phonological disorder (100%), only three students (15%) continued to show phonological disorder together with the difficulties in the recognition of letters, no association of relation letter/sound, alteration in the discrimination of sounds and letters with base on the difficulty of distinguishing the contrastive traits.

Thus, we may consider that 15% of students who continued to show the difficulties presents in the pre-testing, at the moment of post-testing, present a possible manifestation of dyslexia, since the lack of response to intervention is one of the first criteria diagnoses of dyslexia for these students at risk<sup>3,5,7-9</sup>.

These findings point to the need for clinical and educational monitoring and follow-up of students with phonological disorder, because this may be the first sign of the presence of a condition particular genetic and neurologically, such as dyslexia, since the problems of perception and production of speech can cause a cascading effect, starting with the disruption of the normal development of the

phonological system and resulting in problems in learning of the reading and writing.

Furthermore, the use of model response to intervention can be used as a diagnostic criterion for the early identification of dyslexia, but can also assist with the understanding that the problems with learning to read and write can be a result of lack of education formal classroom, of the alphabetic principle of the writing system of the Portuguese language, which reinforces that, using this model can encourage real identifying which school has or not the manifestation of dyslexia.

## ■ CONCLUSION

The results of this study allow us to conclude that the Phonological Intervention Program was effective for students at risk for dyslexia, since, enabled the development of phonological awareness with interventive work, assisting in the acquisition of skills necessary for acquisition of the reading and writing.

Thus, the phonological intervention reflected positively on the performance of these students in phonological awareness tasks, itself, as well as auditory processing and processing speed, since the proposed activities aided in perception, identification, manipulation and segmentation of phonemes and syllables, and these predictive abilities to the literacy process.

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## RESUMO

**Objetivo:** verificar a eficácia de um programa de intervenção fonológica em escolares de risco para a dislexia. **Métodos:** participaram desse estudo 40 escolares do 1º ano do ensino fundamental, de ambos os gêneros, com idade entre 5 anos e 11 meses a 6 anos e 7 meses. Os escolares foram divididos em dois grupos: GI (20 escolares sem risco para dislexias) e GII (20 escolares com risco para dislexia), ambos os grupos foram submetidos ao programa de intervenção fonológica, composto por tarefas de identificação dos sons e das letras do alfabeto em sequência e em ordem aleatória, identificação e produção de rima, produção de rima com frases, identificação e manipulação de palavras, identificação e produção de sílabas, segmentação e análise silábica, identificação e segmentação fonêmica, substituição, síntese, análise e discriminação fonêmica. Em situação de pré e pós-testagem, todos os sujeitos desse estudo foram submetidos à aplicação do Protocolo de Avaliação das Habilidades Cognitivo-Linguísticas – versão coletiva e individual. **Resultados:** na comparação da pré com a pós-testagem do desempenho dos escolares de GI e GII, houve diferença estatística para os subtestes das habilidades de leitura, escrita, consciência fonológica, processamento auditivo e velocidade de processamento, indicando média de desempenho superior para GII na pós-testagem comparada a pré-testagem. **Conclusão:** o programa de intervenção fonológica foi eficaz para os escolares de risco para a dislexia, pois, possibilitou o desenvolvimento da consciência fonológica por meio do trabalho interventivo, auxiliando na aquisição das habilidades necessárias para o aprendizado da leitura e da escrita.

**DESCRIPTORIOS:** Intervenção Precoce; Dislexia; Leitura; Escrita; Aprendizagem

## ■ REFERENCES

1. Shriberg LD, Kwiatkowski J. Phonological disorders: I: A diagnostic classification system. *J. Speech Lang Hear Res.* 1982;47:226-41.
2. Broom YM, Doctor EA. Developmental phonological dyslexia: a case study of the efficacy of a remediation program. *Cognitive Neuropsychol.* 1995;12(7):725-66.
3. Fletcher J, Vaughn S. Response to intervention: Preventing and remediating academic difficulties. *Child Dev Perspectiv.* 2009;3(1):30-7.
4. Macoir J, Fossard M, Saint-Pierre MC, Auclair-Ouellet N. Phonological or procedural dyslexia: Specific deficit of complex grapheme-to-phoneme conversion. *J Neuroling.* 2012;25:163-77.
5. Lonigan CJ, Purpura DJ, Wilson SB, Walker PM, Clancy-Menchetti. Evaluating the components of an emergent literacy intervention for preschool children at risk for reading difficulties. *J Exp Child Psychol.* 2013;114:111- 30.
6. Toll AWM, van Luit JEW. Accelerating the early numeracy development of kindergartners with limited working memory skills through remedial education. *Res Dev Disabil.* 2013;34:745-55.
7. Piasta SB, Wagner RK. Learning letter names and sounds: Effects of instruction, letter type, and phonological processing skill. *J Exp Child Psychol.* 2010;105:324-44.
8. Silva C, Fukuda MTM, Capellini SA. Intervenção precoce em escolares de risco para a dislexia. In: Capellini SA, Silva C, Pinheiro FH, organizadores. *Tópicos em transtornos de aprendizagem.* São José dos Campos: Pulso, 2011. p. 90-102.
9. Fukuda MTM, Capellini SA. Programa de intervenção fonológica associado à correspondência grafema-fonema em escolares de risco para a dislexia. *Psicol Refl Crít.* 2012;25(4):783-90.
10. Savill NJ, Thierry G. Reading for sound with dyslexia: Evidence for early orthographic and late phonological integration deficits. *Dev Brain Res.* 2011;1385:192-205.
11. Wang LC, Yang HM, Tasi HJ, Chan SY. Learner-generated drawing for phonological and orthographic dyslexic readers. *Res Dev Disabil.* 2013;34:228-33.
12. Boets B, Wouters J, van Wieringen A, Ghesquiére P. Auditory processing, speech perception and phonological ability in pre-school children at high-risk for dyslexia: a longitudinal study of the auditory temporal processing theory. *Neuropsychol.* 2007;45(8):1608-20.
13. Raschle MN, Zuk J, Gaab N. Functional characteristics of developmental dyslexia in left-hemispheric posterior brain regions predate reading onset. *Proc Natl Academic.* 2012;1252(1):43-50.
14. Reynolds CR, Shaywitz SE. Response to intervention: Ready or not? Or, from wait-to-fail

- to watch-them-fail. *School Psychol Q.* 2009;24(2):130-49.
15. Cunningham A, Carroll J. Age and schooling effects on early and phoneme awareness. *J Exp Child Psychol.* 2011;109:248-55.
  16. Andrade CRF, Befi-Lopes DM, Fernandes FDM, Wertzner HF. Teste de linguagem infantil nas áreas de fonologia, vocabulário, fluência e pragmática – ABFW. Carapicuíba: Pró-Fono; 2002.
  17. Capellini SA, Smythe I. Protocolo de avaliação de habilidades cognitivo-linguísticas. Livro do profissional e do professor. Marília: Fundepe; 2008.
  18. Silva C, Capellini SA. Eficácia do programa de remediação fonológica e leitura no distúrbio de aprendizagem. *Pró-Fono Rev Atual Cient.* 2010;22(2):131-8.
  19. Machado AC, Capellini SA. Caracterização do desempenho de crianças com dislexia do desenvolvimento em tarefas de escrita. *Rev Bras Crescimento e Desenvolvimento Hum.* 2011;21(1):133-9.
  20. Sarver DE, Rapport MD, Kofler MJ, Scanlan SW, Raiker JS, Altro TA et al. Attention problems, phonological short-term memory, and visuospatial short-term memory: Differential effects on near-and long-term scholastic achievement. *Learn Individ Differ.* 2012;22:8-19.
  21. Jones MW, Branigan HP, Hatzidaki A, Obregón M. Is the naming deficit in dyslexia a misnomer? *Cognition.* 2010.
  22. Silva C. Programa de intervenção fonológica com escolares de risco para a dislexia: Elaboração e Avaliação [tese]. Marília: Faculdade de Filosofia e Ciência da Universidade Estadual Paulista; 2013.
  23. Swanson HL, Kehler P, Jerman O. Working memory, strategy knowledge, and strategy instruction in children with reading disabilities. *J Learn Disabil.* 2010;41(1):24-47.
  24. Romero-Díaz A, Penaloza-López Y, García-Pedroza F, Pérez SJ, Camacho WC. Central auditory processes evaluated with psychoacoustic test in normal children. *Acta Otorrinolaringol Esp.* 2011;62(6):418-24.
  25. Ferrante C, Borsel JV, Pereira MMB. Análise dos processos fonológicos em crianças com desenvolvimento fonológico normal. *Rev Soc Bras Fonoaudiol.* 2009;14(1):36-40.
  26. Brito CLR, Uzêda CPQ, Vieira JG, Cavalheiro LG. Habilidades de letramento após intervenção fonoaudiológica em crianças do 1º ano do ensino fundamental. *Rev Soc Bras Fonoaudiol.* 2010;15(1):88-95.
  27. Buján A, Lindín M, Díaz F. The effect of aging on movement related cortical potentials during a face naming task. *International J Psychoph.* 2010;78:169-78.
  28. Piai V, Roelofs A, Schriefers H. Semantic interference in immediate and delayed naming and reading: Attention and task decisions. *J Mem Lang.* 2011;64:404-23.
  29. Furnes B, Samuelsson S. Phonological awareness and rapid automatized naming predicting early development in reading and spelling: Results from a cross-linguistic longitudinal study. *Learn Individ Differ.* 2011;21:85-95.
  30. Tenório SMP, Ávila CRB. Processamento fonológico e desempenho escolar nas séries iniciais do ensino fundamental. *Rev CEFAC.* 2012;14(1):30-8.

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