Programa de remediação fonológica em escolares com dislexia do desenvolvimento***

Phonological remediation program in students with developmental dyslexia

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Abstract

Background: program for phonological remediation in developmental dyslexia. Aim: to verify the efficacy of a program for phonological remediation in students with developmental dyslexia. Specific goals of this study involved the comparison of the linguistic-cognitive performance of students with developmental dyslexia with that of students considered good readers; to compare the results obtained in pre and post-testing situations of students with dyslexia who were and were not submitted to the program; and to compare the results obtained with the phonological remediation program in students with developmental dyslexia to those obtained in good readers. Method: participants of this study were 24 students who were divided as follows: Group I (GI) was divided in two other groups - GIe with 6 students with developmental dyslexia who were submitted to the program; and GIc with 6 students with developmental dyslexia who were not submitted to the program; Group II (GII) was also divided in two other groups - GIIe with 6 good readers who were submitted to the program, and GIIc with 6 good readers who were not submitted to the program. The phonological remediation program (Gonzalez & Rosquete, 2002) was developed in three stages: pre-testing, training and post-testing. Results: results indicate that GI presented a lower performance in phonological skills, reading and writing when compared to GII in the pre-testing situation. However, GIe presented a similar performance to that of GII in the post-testing situation, indicating the effectiveness of the phonological remediation program in students with developmental dyslexia. Conclusion: this study made evident the effectiveness of the phonological remediation program in students with developmental dyslexia.

Key Words: Dyslexia; Intervention; Learning.

Resumo

Tema: programa de remediação fonológica na dislexia do desenvolvimento. Objetivos: verificar a eficácia do programa de remediação fonológica em escolares com dislexia do desenvolvimento. Dentre os objetivos específicos, o estudo visou comparar o desempenho cognitivo-lingüístico de escolares com dislexia do desenvolvimento com escolares bons leitores; comparar os achados dos procedimentos de avaliação utilizados na pré e pós-testagem em escolares com dislexia submetidos e não submetidos ao programa, e comparar os achados do programa de remediação fonológica em escolares com dislexia e escolares bons leitores submetidos ao programa de remediação. Método: participaram deste estudo 24 escolares, sendo o grupo I (GI) subdivido em: GIe composto por seis escolares com dislexia do desenvolvimento submetidos ao programa, e GIc, composto por seis escolares com dislexia do desenvolvimento não submetidos ao programa. O grupo II (GII), subdividido em GIIe, composto por seis escolares bons leitores submetidos à remediação e GIIc, composto por seis escolares bons leitores não submetidos à remediação. Foi realizado programa de remediação fonológica (Gonzalez e Rosquete, 2002) em três etapas: pré-testagem, treino, pós-testagem. Resultados: os resultados deste estudo revelaram que o GI apresentou desempenho inferior em habilidade fonológica, de leitura e escrita do que o GII em situação de pré-testagem. Entretanto, o GIe apresentou desempenho semelhante ao GII em situação de pós-testagem, evidenciando a eficácia do programa de remediação com habilidades fonológicas em escolares com dislexia do desenvolvimento. Conclusão: o estudo evidenciou a eficácia do treinamento com as habilidades fonológicas para os escolares com dislexia.

Palavras-Chave: Dislexia; Intervenção; Aprendizagem.

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Introduction

According to the American Psychiatric Association(1), dyslexia is characterized as a specific disability in reading skills, with student performance lower than expected in relation to the chronological age, the intellectual potential and the school level of the individual.

The first manifestations of dyslexia appear in the beginning of alphabetization, when the children present difficulties in phoneme-grapheme decoding, an essential skill to understand and to use the association of graphic signs and phonological sequences within words (2-3).

Recently studies show that phonological awareness direct instruction associated to phoneme-grapheme correspondence accelerates reading acquisition(4-6). If, on the one hand, the introduction of the alphabetic system helps the development of phonological awareness, on the other hand, the presence of difficulty in this development may impair reading and writing skills. So, the remediation program aims at maximizing specific phonological skills of children with learning disabilities.

In Brazil, the remediation program showed effectiveness in relation to phonological perception and reading development when used in children with developmental dyslexia(7-9).

Method

This study was conducted after its approval in the Committee of Ethics in Research of the Universidade Estadual de Campinas/UNICAMP, protocol number 029/2003.

A number of 24 students from primary education, from both genders, aged between 8 and 12 years participated in the study - six students attending 2nd, ten attending 3th and eight attending 4th grade. The students were subdivided into 2 groups: Group I (GI): 12 students with developmental dyslexia and Group II (GII): 12 good readers.

The students from group I were taken to the Ambulatory of Learning Disabilities - University Hospital - Universidade Estadual de Campinas - FCM/ UNICAMP - Campinas - São Paulo - Brazil - with complaints of learning disabilities. The diagnosis was confirmed after neurological, neuropsychological and speech and language evaluations. The results of neurological evaluation (evolutionary neurological examination) showed dynamic and static balance, appendicular coordination, torso-limb coordination, motor persistence and sensitivity alteration. Neuropsychological evaluation showed discrepancy between verbal intellectual quotient and performance intellectual quotient, memory, reading and writing alteration.

The students from group II were indicated by teachers, who used as selection criteria good performance in school in the two previous bimesters.

Group I and Group II were randomly divided into two subgroups (experimental and control).

Group I experimental (GIe): composed by 6 students with developmental dyslexia, five males, one female, submitted to phonological remediation program.

Group I control (GIc): composed by 6 students with developmental dyslexia, males, not submitted to the phonological remediation program.

Group II experimental (GIIe): composed by 6 good readers, five males, one female, submitted to the phonological remediation program.

Group II control (GIIc): composed by 6 good readers, males, not submitted to the phonological remediation program.

Pretest

1. Term of Post-Informed Consent: parents (or responsible) signed a Term of Post-Informed Consent, according to resolution of the National Health Council - CNS 196/96, to authorize the use of the procedures.
2. Phonological Awareness Test (10): The test consists of ten subtests, composed by four items to evaluate the skills of synthesis, segmentation, manipulation and syllabic and phonemic transposition, rhyme and alliteration
3. Rapid Automatized Naming - RAN(11): the test measures access and recovery of verbal activities in the continuous nomination of several visual stimuli (nomination of colors, digits, letters and objects).
4. Evaluation of the level and speed of oral reading(7-12): text "As travessuras de Afonsinho" (732 words), during 5 minutes. The reading is interrupted for the student to indicate until what word he/she has read, and then he/she continues until end of the text. At the end of the reading, it is necessary to verify the understanding of the text read.
5. Test of Reading and Writing(13): under dictation and oral reading of 48 real words (RW) and 48 invented (IW), in a total of 96 words. The words were divided into: regular, irregular and rule, and as well as for a frequency category: low and high.
6. Phonological Assessment of Child Speech(14): spontaneous nomination of five thematic illustrations. The list of words with sounds in different positions in the words is composed by 125 items.

Phonological remediation program(15)

The program was applied in the subgroups GIe and GIIe. The program was selected because it is based on grapheme-phoneme conversion, which is necessary for learning the Portuguese Writing System, with some adaptations for the Brazilian population, though.

The original program is composed by 7 stages, but in order to adapt it to the Brazilian population one more stage of grapheme-phoneme correspondence 1 was added.

A number of 20 sessions were done, and in each one 25 graphemes and 28 phonemes were presented, as well as syllables containing vowel-consonant, consonant-vowel, real and non-words words, by using visual aids (with cards) and audio (verbal order). The sessions were 40 minutes long, once a week; it was used 4 sessions for pre-testing and also for post-testing, totalizing 28 sessions. For ethical reasons, according to the resolution of the National Health Council CNS 196/96, the students from GIc and GIIc groups not submitted to the program were remediated after the end of the research.

Phonological remediation program stages

. grapheme-phoneme correspondence 1: to present the graphemes and to associate them to their respective sounds, using the mobile alphabet, after model offered by the researcher;
. phoneme discrimination in syllables: to present 8 different syllables orally only in the initial phoneme and 1 target syllable (example: pa, ta, la, sa, ta, ma, ca, va): to ask the children to lift their hand when they hear the syllable objective. To repeat 4 more times, using other syllables;
. word pair categorization: oral presentation of a sequence of 4 pairs of words with the same or different consonants, using the real and non-words: the child should be speak the words when they have or not the same sound;
. phoneme discrimination in words: to present orally 5 words being that only one is different. The children should lift their hand when they hear the different word and try to identify it. The instructor should say again the 2 chosen words so that the children repeat (to begin from the simplest to the most complex);
. grapheme-phoneme correspondence 2: to present 1 consonant and 1 vowel visually separately and later the combination in a board. To ask for the child to speak the sound corresponding to each grapheme and also of the formed syllable;
. phoneme identification: to present a grapheme visually and to request that the child mention a word that begins with this letter. Then, to present 7 words orally and to question the presence of the phoneme in that word;
. phoneme segmentation: to present 1 word orally and to ask the child to say all the phonemes in it. When the child dictates the phoneme, to present the visual feedback by placing the correspondent letter. In each session 7 words are supplied;
. phoneme suppression: To present 6 words so that the child removes the final phoneme; and soon after to present 7 words for the child to remove the initial phoneme. At the end, to give the visual feedback placing the word.

In the stage of the post-test program it was remade the pre-testing evaluation.

As for the statistical analysis the Mann-Whitney Test was applied adopting the significance level of 5% (0,05). The statistically relevant results are signaled with asterisk (*). It was used descriptive analysis to subjective data, such as thematic essay and phonologic evaluation.

Results

Following, the performance of students of the GI and GII in the phonological awareness test, rapid automatized naming, test of reading and writing are presented, according to Table 1.

In Table 2, the results of the evaluation of the level and speed of oral reading in the pretest and post-testing situation are observed.

In terms of Phonologic Assessment of Child Speech, it was evidenced that the phonologic processes of syllabic structure and substitution alteration in the GI, in the pretest and post-testing, were changed in the speaking and language development (Table 3). The GII showed adequate phonologic processes in speaking and language development.

Considering the syllabic structure, it was observed that 16% of the students showed an incidence higher than 25% of consonant cluster reduction. In the post-testing, the values stayed the same, without any improvement related to phonologic process of syllabic structure.

Considering the substitution process, we noted that 50% of the students presented equal or higher than 25% incidence of disorders in the phonological process of substitution (devoicing of plosive and fricative); 8% showed higher incidence than 25% in the sounds anteriorization fricative, 16% in the lateral liquid substitution. The same scenario happened in post-testing, in which there weren't any qualitative improvement in the substitution processes.

TABLE 1. Distribution of Average, Standard deviation and value of p from GI and GII, in Phonological Awareness Test , RAN, Test of Reading and Writing in the pretest and post-testing.

			Pretes			Post-testing		
	Skills	Groups	Average	Deviation	Valor of p	Average	Deviation	Valor of p
Phonological Awareness Test	SSy	I	0,17	0,58	0,317	0,00	0,00	>0,999
		II	0,00	0,00		0,00	0,00	
	PSy	I	3,00	0,60	<0,001*	1,75	1,36	0,083
		II	1,33	0,78		0,83	0,83	
	RHy	I	2,58	1,31	<0,001*	1,33	0,98	0,002*
		II	0,17	0,39		0,17	0,39	
	Alli	I	1,67	1,44	0,001*	1,58	1,62	0,017*
		II	8,33	0,29		0,17	0,39	
	SSe	I	0,25	0,87	0,317	8,33	0,29	0,317
		II	0,00	0,00		0,00	0,00	
	PSe	I	3,50	1,24	0,547	2,08	1,88	0,312
		II	3,75	0,87		2,92	1,44	
	SMan	I	1,25	0,87	<0,001*	1,17	1,03	0,003*
		II	8,33	0,29		8,33	0,29	
	PMan	I	3,08	1,08	0,001*	2,33	1,72	0,090
		II	1,17	0,94		1,17	0,83	
	STr	I	2,42	1,73	<0,001*	1,50	1,73	0,002*
		II	8,33	0,29		0,00	0,00	
	PTr	I	3,92	0,29	<0,001*	3,58	0,90	<0,001*
		II	1,58	1,31		1,58	1,00	
	TS	I	21,83	3,76	<0,001*	15,42	8,32	0,024*
		II	8,25	2,26		6,92	2,78	
RAN	COLORS	I	54,96	6,50	0,005*	55,89	10,83	<0,001*
		II	42,75	9,41		39,27	7,46	
	LETTERS	I	41,23	9,63	0,003*	38,93	9,37	0,004*
		II	29,18	6,95		27,15	5,57	
	DIGITS	I	49,97	15,09	<0,001*	45,73	10,64	<0,001*
		II	26,88	3,85		25,39	4,71	
	OBJECTS	I	74,73	12,67	<0,001*	71,79	11,11	<0,001*
		II	51,60	9,60		48,86	7,37	
Test of Oral Reading	RRWHF	I	8,67	5,61	<0,001*	6,83	5,72	<0,001*
		II	0,00	0,00		8,33	0,29	
	RRulWHF	I	9,83	5,75	<0,001*	7,92	5,85	<0,001*
		II	0,33	0,65		0,17	0,39	
	RIrWHF	I	9,58	6,30	<0,001*	7,83	5,83	<0,001*
		II	8,33	0,29		0,25	0,45	
	RRWLF	I	10,08	5,50	<0,001*	8,67	6,07	<0,001*
		II	0,75	0,75		0,58	0,79	
	RRulWLF	I	11,33	5,05	<0,001*	9,50	5,70	<0,001*
		II	1,17	1,11		1,17	0,83	
	RIrWLF	I	11,42	4,46	<0,001*	9,42	5,35	<0,001*
		II	1,17	1,47		0,50	0,90	
	IRW	I	22,75	9,40	<0,001*	18,83	11,78	0,001**
		II	2,50	2,47		2,58	2,91	
	IRulW	I	24,50	8,43	<0,001*	20,17	9,60	<0,001*
		II	2,42	2,02		2,17	2,12	
	IIrW	I	24,58	8,13	<0,001*	20,33	10,52	<0,001*
		II	2,75	2,83		2,17	1,90	
Test of Writing	RRWHF	I	10,42	4,68	<0,001*	8,33	5,38	<0,001*
		II	0,25	0,45		8,33	0,29	
	RRulWHF	I	12,67	3,75	<0,001*	10,17	5,02	<0,001*
		II	1,25	1,06		0,50	1,17	
	RIrWHF	I	13,50	3,09	<0,001*	11,50	4,54	<0,001*
		II	1,58	1,78		1,42	1,98	
	RRWLF	I	11,25	5,74	0,001*	9,25	5,38	<0,001*
		II	1,75	1,29		1,58	0,90	
	RRulWLF	I	13,33	4,03	<0,001*	11,50	4,30	<0,001*
		II	3,58	2,54		3,08	2,07	
	RIrWLF	I	15,25	1,36	<0,001*	12,25	4,11	0,001*
		II	6,75	2,63		5,00	2,17	
	IRW	I	24,75	11,70	<0,001*	19,83	11,08	<0,001*
		II	2,75	1,82		2,67	1,87	
	IRulW	I	26,67	8,79	<0,001*	23,00	9,33	<0,001*
		II	5,50	3,12		4,58	2,11	
	IIrW	I	26,58	9,61	<0,001*	24,00	7,79	<0,001*
		II	8,08	3,12		6,42	3,68	

Caption: SSy: Syllabic Synthesis; PSy: Phonemic Synthesis; Rhy: Rhyme; Alli: Alliteration; SSe: Sillabic Segmentation; PSe: Phonemic Segmentation; SMan: Syllabic Manipulation; PMan: Phonemic Manipulation; STr: Syllabic Transposition; PTr: Phonemic Transposition; TS: Total Score.RRWHF: Real regular words of high frequency; RRulWHF: Real rule words of high frequency; RIrWHF: Real irregular words of high frequency; RRWLF: Real regular words of low frequency; RRulWLF: Real rule words of low frequency; RIrWLF: Real irregular words of low frequency; IRW: Invented regular words; IRulW: Invented rule words; IIrW: Invented irregular words.

TABLE 2. Distribution of Average, Standard deviation and value of p from GI and GII, in evaluation of the level and speed of oral reading in the pretest and post-test

Variável	Group	N	Average	Deviation	Significance (p)
RLPretest	I	12	1,75	0,45	<0,001*
	II	12	3,00	0,00	
RLPost-testing	I	12	2,33	0,78	0,006*
	II	12	3,00	0,00	
RSPretest	I	12	21,5167	24,9276	<0,001*
	II	12	89,8167	32,0257	
RSPost-testing	I	12	32,6333	31,7314	0,001*
	II	12	97,5333	30,1797	

Caption: RL: reading level; RS: reading speed.

TABLE 3. Distribution in percentage of the performances of the students from GI and GII in situation pretest and post-testing in the Phonological Assessment of Child Speech.

		Incidence -GI ?25%	Incidence -GI < 25%	Incidence -GII ?25%	Incidence -GII < 25%
Syllabic Structure Processes	Consonant cluster reduction	16%		84%	
	Stressed syllable deletion	-		-	
	Fricative deletion (FSDP)	-		-	
	Non-lateral liquid deletion (FSDP)	-		-	
	Non-lateral liquid deletion (FSFP)	-		-	
	Intervowel lateral liquid deletion	-		-	
	Intervowel non-lateral liquid deletion	-		-	
	Lateral initial liquid deletion	-		-	
	Metathesis	-		-	
	Epenthesis	-		-	
Substitution Processes	Devoicing of obstruents (plosive, fricative or affricate)	50%		50%	
	Anteriorization	8%		92%	
	Lateral liquid substituition	16%		84%	
	Lateral liquid semivocalization	-		-	
	Plosivation	-		-	
	Fricative Posteriorization	-		-	
	Assimilation	-		-	

Discussion

The data concerning the level of reading of students with dyslexia in pretest and post-testing situation showed the importance of realizing work with phonological skills, because only GIe presented evolution in the reading stage. This results is in agreement with Capellini(7) and Snowling(16). In this research, we observed there is improvement in the phonological awareness and consequently better reading level after the intervention work that uses the phonological aspects.

In the oral reading test, we observed better relevant improvement in real words reading of high frequency rule and regular non-words in GIe; while in the GIIe significant improvement in reading of non-words rule ocurred, which confirms the phonological remediation program effectiveness in strategies for using the phonologic route. Therefore, when comparing the performance of GI and GII groups it was verified that differences significant in pretest and post-test confirmed other studies(5-6-7-8).

It is possible to verify that the dyslexics submitted to the program showed improvement in spelling too(8-17).

In the evaluation of phonologic aspects of GI, we verified that in some GI members the phonologic disorders is also present in orality, in the pretest and post-testing. This phonologic immaturity is directly related to development aspects of writing and reading, what is validated by the studies that mention the deficit of grapheme-phoneme relation in these

individuals (2-9-15-16-18).

The findings related to the phonologic awareness certify the effectiveness of the phonological remediation program, whose main objective is the improvement of phonologic processing. We verify that the work with phonologic skills increased the child performance in writing and reading activities (6-19).

In this study it was also verified the effectiveness of the program of oral reading speed, in which the remediated groups (GIe and GIIe) showed increase in performance in the post-testing situation. It was observed no linguistic skills improvement that involve reading amongst students that did not receive remediation.

The merit of this study with phonological remediation is the noticeable observation that students with problems in writing and reading acquisition improved in accuracy and reading speed compatible for their school level. This occurs because this type of remediation favors automating the access to lexicon, the mechanism of phoneme-grapheme conversion and the reading comprehension (2-7-8-15-20-21).

The relevance of these findings let us reflect about the importance of a diagnosis based on phonologic processing and lexical investigation for correct elaboration of programs that intend to guarantee the language processing skills development in students with specific learning disabilities.

Conclusion

. GI showed cognitive-linguistic skills lower than the expected to their age and school level when compared to the GII students.

. GIe presented higher performance in tests of reading speed, writing and reading activities, phonologic awareness and rapid automatized naming when compared to the GIc in post-testing situation.

. GIe presented better performance than GIIe in the phonological remediation program tasks, showing improvement in the phonological perception in activities related to reading and writing. The performance of GIIe was less expressive by the fact that they did not show accomplishment in the language phonologic processing, and so, alphabetization problems.

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