Alterations of phonological processes and severity index between students with dyslexia and students with good academic performance

Alterações dos processos fonológicos e índice de gravidade entre escolares com dislexia e escolares com bom desempenho acadêmico

Monique Herrera Cardoso[1], Ana Carla Leite Romero[1], Simone Aparecida Capellini[2]

ABSTRACT

Purpose: To compare the occurrence of altered phonological processes and to use the severity index of phonological disorder to compare speech and writing samples from dyslexic students and students with good academic performance. **Methods:** Participants were 34 students of both genders from second to fifth grade, with ages between 8 years and 11 years and 11 months, divided into: G1 (17 students with interdisciplinary diagnosis of dyslexia) and G2 (17 students with good academic performance). Naming and imitation tasks (ABFW) comprising, respectively, 34 pictures and 39 words were used. Elaboration of a thematic writing was also requested, based on a logic sequence of pictures. **Results:** Dyslexic children in this study presented lower performance than the students with good academic performance regarding, in speech, the phonological process of consonant cluster simplification (imitation task), and, in the analysis of the writing production, the criteria: unaltered cursive trace, functional dysgraphia, hyposegmentation, and correct spelling. However, the severity of phonological disorders of speech and written samples was mild in both groups. **Conclusion:** Students with dyslexia presented alterations in phonological processes and in writing, with lower performance when compared to the students with good academic performance. As for the severity index PCC-R for speech and written samples, both dyslexic students and those with good academic performance were classified as mild.

Keywords: Learning; Educational status; Handwriting; Articulation disorders; Speech articulation tests

INTRODUCTION

Developmental dyslexia constitutes a specific learning disorder, with neurological origin, characterized by difficulty in the correct fluency in reading and by difficulty in the decoding and spelling abilities, resulting from a deficit in the phonological component of language[1].

Scholars with dyslexia present difficulty in correct reading fluency, difficulty in decoding ability, alteration on the discrimination of sounds, difficulty of phonological consciousness and limited short-term memory, and may also present problems concerning long-term verbal memory, due to the difficulty of forming lexical for storage. Thus, the reading performance of irregular words, non-frequent and pseudo-words; the enhancement of vocabulary and the comprehension of the read context becomes impaired[2,3].

According to the literature[4], scholars with dyslexia may present several learning problems, because for the development of reading and writing , it is necessary to give attention to the aspects of language on the following levels: phonological, morphological, syntactic and semantic. The meta-linguistic ability, in its phonological level, makes the child think about the language sound system, being aware about the phrases, words, syllables and phonemes, as smaller units, allowing the identification and the manipulation of those units, comprising the alphabetical principle. This comprehension is fundamental in a language, whose written system is alphabetical[5].

As the development of the written language constitutes

Study conducted at the School of Philosophy and Sciences, Universidade Estadual Paulista "Júlio de Mesquita Filho" – UNESP – Marília (SP), Brazil.
Conflict of interests: None
(1) Graduate Program (Masters degree) in Speech-Language Pathology and Audiology, School of Philosophy and Sciences, Universidade Estadual Paulista "Júlio de Mesquita Filho" – UNESP – Marília (SP), Brazil.
(2) Department of Speech-Language Pathology and Audiology and Graduate Programs in Education and Speech-Language Pathology and Audiology, School of Philosophy and Sciences, Universidade Estadual Paulista "Júlio de Mesquita Filho" – UNESP – Marília (SP), Brazil.
Correspondence address: Simone Aparecida Capellini. Av. Hygino Muzzy Filho, 737, Marília (SP), Brasil, CEP: 17017-336. E-mail: sacap@uol.com.br
Received: 5/17/2011; **Accepted:** 12/10/2011

and extension of the development of the oral language, in other words, and as the alphabet is the graphic representation of the phoneme[6], is becomes important that the alterations on the phonological system may influence writing in its codification process, as it refers to problems on the mechanism of letter-sound conversion, so required for reading and writing activities, in a writing system as Portuguese[7].

In the alphabetic writing system, the word codification process may be explained by the Double-Route process, that is, by the phonologic route (writing may be produced through a process involving the direct phonologic mediation) or by the lexical route (through a direct visual process, comprising the representation of the words known, stored in the visual input lexicon). Thus, words of different levels of alphabetic regularity can be written[8,9]. There are few studies which establish the relationship between the alterations of the phonological processes among school children with dyslexia and students with good academic performance, although there is a vast literature establishing the relationship between orality and writing[10,11]. Nonetheless, the present study also proposes to employ the phonological alterations severity analysis, already described in the national literature, concerning speech and also writing.

According to a previous study[12], there is an index description to determine the phonological disorder severity, the Percentage of Correct Consonants (PCC). This index verifies the amount of correct consonant produced during a speech sample, according to the total of correct consonants comprised in the sample, which considers as incorrect: the omissions, the substitutions, the common and uncommon distortions. However, there are variants of the PCC – the PCC-Adjusted (PCC-A), which does not analyze common distortions as mistakes; and the Revised-PCC (PCC-R), which does not score any type of distortion[13,14].

In Brazil, studies developed with Brazilian Portuguese, were realized employing these severity measurements, helping on the evaluation process, and on the therapy for children with phonological disorder[15,17]

Concerns about the contribution for future discussions, about the occurrence of altered phonological processes in speech and writing of scholars with dyslexia, this study aimed to: compare the occurrence of altered phonological processes and to employ the phonological disorder severity index, and compare a speech and writing sample of dyslexic students and good academic performance students.

The scientific relevance of such a study, relies on the possibility of verifying which phonological processes are altered in dyslexic children, as well as a measurement employment, capable to compare the severity of phonological alterations for speech, with the severity of phonological alterations for writing.

METHODS

This study was approved by the Research Ethics Committee of Universidade Estadual Paulista "Júlio de Mesquita Filho" (UNESP), Marília (SP), Brazil, under protocol number 0099/2010. The Free and Informed Consent was signed by the parents or tutors of all students.

Participants were 34 students of both genders, from second to fifth grade level, with ages ranging from 8 years to 11 years and 11 months. Subjects were divided into two groups:

- Group 1 (G1): comprised 17 students with dyslexia, selected on the waiting list for speech-language therapy at the Supervised Internship in Written Language of the Centro de Estudos da UNESP. The dyslexia diagnosis was conducted by the interdisciplinary team of the Learning Disorders Investigation Laboratory, in Marília, including speech-language, neurological and neuropsychological assessments.
- Group 2 (G2): comprised 17 students with good academic performance, indicated by teachers of a public school in Marília (SP), Brazil, based on satisfactory performance on the tests of Portuguese Language and Mathematics, during two consecutive quarters (grades above 5.0), matched to the subjects in G1 according to gender, age and grade level.

All the students of G1 and G2 were submitted to a Phonology test and were required to elaborate a thematic composition.

The Imitation and Naming tasks of the Phonology test of the Child Language Test ABFW[18] were employed, which are composed, respectively, by 39 words and 34 figures. The application of tasks was filmed using a Sony® DCR-SR 47, with the aim to facilitate the observation of articulatory production of students, in order to help the speech transcription. All the answers were phonetically transcribed on the specific register protocols of the test. The phonological processes were classified and the productivity of each one was quantified. Afterwards, the PCC-R[14] index was calculated, in order to determine the severity of the phonological disorder. This index is calculated by the division of the correct consonants emitted, by the total of consonants of the text, multiplied by 100. Thus, the phonological disorder is considered mild, if the PCC-R presents a result from 85% to 100%; slightly moderate, from 65% to 85%; moderately severe, from 50% to 65%; and severe, if below 50%.

For the elaboration of the thematic composition, the students were required to produce a text, based on a sequence of five figures, considering that on the first one, a boy was making a balloon; on the second, he was releasing the balloon; the third, the balloon fell on the roof of a house; the fourth, the house caught fire; the fifth had an interrogation mark, so that the scholar could create an end to the story[19].

The analysis of the composition theme was based on the analysis criteria of writing production[20], which included the verification and interpretation of the formal and conventional aspects of writing (as follows: differentiated use of capital letter/ cursive, tracing of cursive without alteration, functional dysgraphia, use of capital letter and regular, use of punctuation, hypo-segmentation, hyper-segmentation and correct orthography) and the aspects referring to the elaboration of a text (as follows: transposition of the oral language to the written language, theme, descriptive aspect, narrative aspect, coherence and textual coherence).

As well as for the speaking tasks, it was also calculated the PCC-R of the composition, in order to verify the errors index, concerning substitutions and omissions in writing. The calculation was realized by the division of the written correct consonants by the total of consonants which should

be correctly written, on the text elaborated by the scholar, multiplied by 100%. In order to determine the phonological disorder severity in writing, the same values employed for orality were employed.

The results were analyzed statistically with the tests: Fisher Exact test, Chi-square and Similarity Reasoning, adopting 5% (0.050) as significance level.

RESULTS

With the employment of the Chi-square test for proportions, it was verified that, from the 14 phonological processes analyzed in the Imitation test, G1 presented alterations in eight of them, while G2 did not present any alteration, and just on the simplification process of consonantal joints (SEC), it was observed difference, when compared to scholars from G1 and G2 (Table 1).

For the Naming test, G1 presented alterations in ten of the 14 types of phonological processes analyzed; G2 presented alterations in only one phonological process (SEC), and there was no difference in the comparison between the groups, that is, the performance of the students of G1 and G2 was similar (Table 2)

It was verified the occurrence frequency of formal and conventional aspects of writing (AFC1 to AFC8), and the aspects referring to text elaboration (AE1 to AE6), between G1 and G2 (Table 3). With the employment of Fisher Exact test, results indicated that most scholars of G1 presented, in relation the formal aspects and conventional of writing, differences in handwriting for printing and cursive alteration of cursive tracing, absence of functional dysgraphia, use of capital letter and regular, use of punctuation, absence of hypo-segmentation, presence of hyper-segmentation and orthographic mistakes. When compared to G2, differences were observed on the following criteria: cursive tracing without alteration, functional dysgraphia, hypo-segmentation and correct orthography (Table 3).

Concerning the aspects referring to the elaboration of text, most of G1 scholars presented transposition from the oral language to writing, followed the theme, realized a narrative text, not a descriptive one, presented coherence and did not present text cohesion. When comparing G1 and G2, it was possible to observe differences on the transposition from oral language to written language (Table 3).

With the employment of the Similarity Reasoning Test, it was possible to verify that most scholars from G1 and G2, presented light severity for tests of Imitation, Naming and writing sample. It was also observed that the groups did not present differences, when compared (Table 4).

DISCUSSION

When verifying the occurrence of the phonological processes altered in one speech sample of dyslexic students, it was possible to verify that the students with dyslexia of this study presented alterations on the tests of speech and writing phonology, difficulty in expressing their thoughts to the spoken or written language[21].

Children with dyslexia present alterations on the phonological consciousness – a necessary component, so that they can correlate the sound aspects of the speech with the written code, developing reading and writing properly[22]. According to the literature[23],if there are previous language problems, which affect the phonological and/or semantic and contextual levels, the orthographic processor will develop inefficiently and the correlation phoneme-grapheme does not guarantee the necessary stability for the optimal development of reading/writing.

Table 1. Frequency of altered phonological processes in the imitation task

Variable	Possibilities	G1		G2		p-value
		Frequency	%	Frequency	%	
RS	884	1	0.11	0	0.00	0.981
HC	884	0	0.00	0	0.00	>0.999
PF	374	0	0.00	0	0.00	>0.999
PV	221	0	0.00	0	0.00	>0.999
PP	119	0	0.00	0	0.00	>0.999
FV	289	0	0.00	0	0.00	>0.999
FP	102	12	11.6	0	0.00	0.386
SL	136	7	5.15	0	0.00	0.667
SEC	204	71	34.0	0	0.00	<0.001*
SCF	119	3	2.52	0	0.00	0.845
SP	493	0	0.00	0	0.00	>0.999
SF	221	2	0.90	0	0.00	0.924
EP	289	19	6.57	0	0.00	0.422
EF	153	11	7.19	0	0.00	0.522

* Significant values (p≤0.05) – Chi-square test for proportions

Note: G1 = students with dyslexia; G2 = students with good academic performance; RS = reduced syllable; HC = consonant harmony; PF = plosivation fricatives; PV = posteriorization to velar; PP = backing for palatal; FV = fronting of velars; FP = palatal fronting; SL = liquid simplification; SEC = simplification of consonantal encounter; SCF = simplification of final consonant; SP = voicing of plosives; SF = fricative voicing; EP = plosive devoicing; EF = fricative devoicing

Table 2. Frequency of altered phonological processes in the naming task

Variable	Possibilities	G1		G2		p-value
		Frequency	%	Frequency	%	
RS	765	1	0.13	0	0.00	0.980
HC	765	2	0.26	0	0.00	0.959
PF	391	2	0.51	0	0.00	0.943
PV	204	0	0.00	0	0.00	>0.999
PP	187	0	0.00	0	0.00	>0.999
FV	153	1	0.65	0	0.00	0.954
FP	85	8	9.41	0	0.00	0.530
SL	187	15	8.02	0	0.00	0.429
SEC	136	30	22.6	4	2.94	0.092
SCF	85	3	3.53	0	0.00	0.816
SP	357	0	0.00	0	0.00	>0.999
SF	238	0	0.00	0	0.00	>0.999
EP	238	12	5.04	0	0.00	0.577
EF	153	12	7.84	0	0.00	0.484

* Significant values (p≤0.05) – Chi-square test

Note: G1 = students with dyslexia; G2 = students with good academic performance; RS = reduced syllable; HC = consonantal harmony; PF = plosivation fricatives; PV = posteriorization to veil; PP = backing for palatal; FV = fronting of velar; FP = palatal fronting; SL = liquid simplification; SEC = consonant cluster simplification; SCF = simplification of final consonant; SP = plosive voicing; SF = fricative voicing; EP = plosive devoicing; EF = fricative devoicing

Table 3. Frequency of occurrence of conventional and formal aspects of writing and aspects related to text elaboration

Variable	G1 (n=17)				G2 (n=17)				p-value
	Occurrence		No occurrence		Occurrence		No Occurrence		
	Frequency	%	Frequency	%	Frequency	%	Frequency	%	
AFC1	17	100	0	0	17	100	0	0	>0.999
AFC2	1	5.88	16	94.12	10	58.82	7	41.18	<0.001*
AFC3	15	88.24	2	11.76	0	0	17	100	<0.001*
AFC4	12	70.59	5	29.41	11	64.71	6	35.29	0.977
AFC5	10	58.82	7	41.18	10	58.82	7	41.18	>0.999
AFC6	11	64.71	6	35.29	3	17.65	14	82.35	0.010*
AFC7	8	47.06	9	52.94	2	11.76	15	88.24	0.056
AFC8	0	0	17	100	5	29.41	12	70.59	0.019*
AE1	10	58.82	7	41.18	3	17.65	14	82.35	0.028*
AE2	17	100	0	0	16	94.12	1	5.88	0.787
AE3	0	0	17	100	0	0	17	100	>0.999
AE4	16	94.12	1	5.88	17	100	0	0	0.771
AE5	15	88.24	2	11.76	15	88.24	2	11.76	>0.999
AE6	5	29.41	12	70.59	7	41.18	10	58.82	0.809

* Significant values (p≤0.05) - Fisher's Exact test

Note: G1 = students with dyslexia; G2 = students with good academic performance; AFC1 = differentiated use of capital letters/cursive; AFC2 = cursive stroke without alteration; AFC3 = functional dysgraphia; AFC4 = use of upper and lowercase; AFC5 = use of punctuation; AFC6 = hypo-segmentation; AFC7 = hyper-segmentation; AFC8 = correct spelling; AE1 = transposition of oral language to writing; AE2 = subject; E3 = description; E4 = narrative; AE5 = consistency; AE6 = textual cohesion

On the comparison of phonological processes occurrence in a speech sample, between students with dyslexia and students with good academic performance, it was verified that students with dyslexia presented lower performance, when compared to students with good academic performance, just for the simplification process of consonant joints, in the Imitation test. This fact, highlights the difficulty of these students in identifying and manipulation complex syllables, due to the precariousness in recognizing that words are formed by smaller parts, and their difficulty in understanding the possibility of manipulating these units, denominated syllables and phonemes[24].

Concerning the results of the written test, comprising students with dyslexia, it was possible to observe alterations, at least in five criteria, highlighting the difficulty of dyslexic students, for decoding graphemes and also on the mechanism for converting grapheme-phoneme. This is one of the first manifestations of the difficulties found in this population, because dyslexic students need to understand and employ the association of the graphic signs with the phonological sequences of the words[22].

When comparing the altered phonological processes to the severity index PCC-R of speech and writing sample of

Table 4. Description of severity according to the PCC-R

PCC-R Imitation	G1	G2	Total	PCC-R Naming	G1	G2	Total	PCC-R Writing	G1	G2	Total
L	13	17	30	L	15	17	32	L	11	15	26
LM	4	0	4	LM	2	0	2	LM	2	2	4
MG	0	0	0	MG	0	0	0	MG	4	0	4
G	0	0	0	G	0	0	0	G	0	0	0
Total	17	17	34	Total	17	17	34	Total	17	17	34
p-value	0.209			p-value	0.547			p-value	0.202		

* Significant values (p≤0.05) – Similarity Reasoning test

Note: G1 = students with dyslexia; G2 = students with good academic performance; L = Light; LM = mild-moderate; MG = moderately severe, G = severe

the students from both groups of this study, it was possible to observe that both groups (G1 and G2), presented mild severity. Thus, for this study, the severity index PCC-R was not enough to differentiate the students with dyslexia, from the students with good academic performance, but it was important to evidence, at the moment of the written analysis, that the dyslexic scholars presented deaf-sound type orthographic errors. However, mild severity was found in other studies[25,26], which reported that it is more difficult to detect phonological processes for moderately severe and severe levels.

These results corroborate with the finding from other studies, because they highlight that the access to phonological information, stored in the long-term memory, is important for the acquisition of writing, as this ability form of the phonological processing constitutes an aspect to be integrated, for the recognition of words. Alterations concerning this ability, are generally identified in students with learning problems[27-30].

The results found in the present study, suggest that students with dyslexia present difficulties in codification and decodification of graphemes and in realizing grapheme-phoneme conversion mechanism, which impairs the development of the phonological and writing ability. Nevertheless, new studies should be realized, in order to better understand the analysis/discussion, in relation to the significant items of this study, as well the concerns about the severity of the phonological disorder, comprising a larger amount of dyslexic children, because they can corroborate on the identification and on the classification of the subtypes of dyslexia, and then help to establish a phonological disorder severity index, which is present in this population. Thus, it will certainly facilitate a better follow-up of the scholar, during the phonological intervention process[17].

CONCLUSION

Based on the results, it can be concluded that the students with dyslexia in this study presented alterations in phonological processes and in writing, and presented lower performance when compared to students with good academic performance.

With regards to the severity index PCC-R of speech and writing samples, both the dyslexic group and the scholars with good academic performance were classified as mild.

ACKNOWLEDGEMENTS

We would like to thank the São Paulo Research Foundation (*Fundação de Amparo à Pesquisa de São Paulo* – FAPESP), for supporting this research, process number 2009/18333-0.

RESUMO

Objetivo: Comparar a ocorrência de processos fonológicos alterados e utilizar o índice de gravidade do transtorno fonológico para comparar uma amostra de fala e de escrita de escolares disléxicos e de alunos com bom desempenho acadêmico. **Métodos:** Participaram 34 escolares, distribuídos entre o segundo e o quinto ano escolar, de ambos os gêneros, na faixa etária de 8 anos a 11 anos e 11 meses de idade, divididos em: G1 (17 escolares com diagnóstico interdisciplinar de dislexia) e G2 (17 escolares com bom desempenho acadêmico). Foram aplicadas tarefas de Imitação e de Nomeação (ABFW), compostas, respectivamente, por 39 vocábulos e 34 figuras. Foi solicitada também, a elaboração de uma redação temática, a partir de uma sequência lógica de figuras. **Resultados:** Os escolares disléxicos deste estudo apresentaram desempenho inferior, quando comparados aos escolares com bom desempenho acadêmico, em relação à fala, no processo fonológico de simplificação de encontro consonantal (prova de imitação) e em relação à análise de produção da escrita nos critérios: traçado da letra cursiva sem alteração, disgrafia funcional, hiposegmentação, e ortografia correta. Entretanto, a gravidade do transtorno fonológico da amostra da fala e da escrita, foi leve em ambos os grupos. **Conclusão:** Os escolares com dislexia apresentaram alterações nos processos fonológicos e na escrita, com rendimento inferior aos escolares com bom desempenho acadêmico. Quanto ao índice de gravidade PCC-R das amostras da fala e da escrita, tanto os disléxicos como os escolares com bom desempenho acadêmico, apresentaram classificação de grau leve.

Descritores: Aprendizagem; Escolaridade; Escrita manual; Transtornos da articulação; Testes de articulação da fala

REFERENCES

1. Lyon GR, Shaywitz SE, Shaywitz BA. Part I Defining dyslexia, comorbidity, teachers's knowledge of language and reading. A definition of dyslexia. Ann Dyslexia. 2003;53(1):1-14.
2. Germano GD, Capellini SA. Eficácia do programa de remediação auditivo-visual computadorizado em escolares com dislexia. Pró-Fono. 2008;20(4):237-42.
3. Pennala R, Eklund K, Hämäläinen J, Richardson U, Martin M, Leiwo M, et al. Perception of phonemic length and its relation to reading and spelling skills in children with family risk for dyslexia in the first three grades of school. J Speech Lang Hear Res. 2010;53(3):710-24.
4. Cunha VL, Capellini SA. Desempenho de escolares de 1ª a 4ª série do ensino fundamental nas provas de habilidades metafonológicas e de leitura - PROHMELE. Rev Soc Bras Fonoaudiol. 2009;14(1):56-68.
5. Pestun MS, Omote LC, Barreto DC, Matsuo T. Estimulação da consciência fonológica na educação infantil: prevenção de dificuldades na escrita. Psicol Esc Educ. 2010;14(1):95-104.
6. Camargo Z, Navas AL. Fonética e fonologia aplicadas à aprendizagem. In: Zorzi, JL, Capellini SA (Orgs). Dislexia e outros distúrbios da leitura-escrita: letras desafiando a aprendizagem. São José dos Campos: Pulso; 2008. p.127-57.
7. Salgado C, Capellini AS. Desempenho em leitura e escrita de escolares com transtorno fonológico. Psicol Esc Educ. 2004;8(2):179-88.
8. Kim YS, Petscher Y, Foorman BR, Zhou C. The contributions of phonological awareness and letter-name knowledge to letter sound acquisition - a cross classified multilevel model approach. J Educ Psychol. 2010;102(2):313-26.
9. Pinheiro FH, Capellini SA. Treinamento auditivo em escolares com distúrbio de aprendizagem. Pró-Fono. 2010;22(1):49-54.
10. Pattamadilok C, Perre L, Dufau S, Ziegler JC. On-line orthography influences on spoken language in a semantic task. J Cogn Neurosci. 2009;21(1):169-79.
11. Zorzi JL, Ciasca SM. Análise de erros ortográficos em diferentes problemas de aprendizagem. Rev CEFAC. 2009;11(3):406-16.
12. Shriberg LD, Kwiatkowski J. Phonological disorders I: a diagnostic classification system. J Speech Hear Disord. 1982;47(3):226-41.
13. Shriberg LD, Aram DM, Kwiatkowski J. Developmental apraxia of speech: II. Toward a diagnostic marker. J Speech Lang Hear Res. 1997;40(2):286-312.
14. Shriberg LD, Austin D, Lewis BA, McSweeny JL, Wilson DL. The percentage of consonants correct (PCC) metric: extensions and reability data. J Speech Lang Hear Res. 1997;40(4):708-22.
15. Pagliarin KC, Mota HB, Keske-Soares M. Análise da eficácia terapêutica em três modelos fonológicos de abordagem contrastiva. Pró-Fono. 2009;21(4):297-302.
16. Pagliarin KC, Brancalioni AR, Keske-Soares M, Souza AP. Relação entre gravidade do desvio fonológico e fatores familiares. Rev CEFAC. 2010. [citado 2011 mar 21]. Disponível em: http://www.scielo.br/pdf/rcefac/2010nahead/89-09.pdf
17. Wiethan FM, Melo RM, Mota HB. Consoantes líquidas: ocorrência de estratégias de reparo em diferentes faixas etárias e gravidades do desvio fonológico. Rev CEFAC. 2011. [citado 2011 mar 21]. Disponível em: http://www.scielo.br/pdf/rcefac/v13n4/44-10.pdf
18. Wertzner HF. Fonologia. In: Andrade CR, Andrade CR, Befi-Lopes DM, Fernandes FD, Wertzner HF(Orgs). ABFW: Teste de linguagem infantil nas áreas de fonologia, vocabulário, fluência e pragmática. Carapicuíba: Pró-Fono; 2000. p. 5-40.
19. Batista AO, Capellini SA. Desempenho ortográfico de escolares de 2º ao 5º ano do ensino privado do município de Londrina. Psicol Argum. 2011;29(67):411-25.
20. Abaurre MB. Linguística e psicopedagogia. In: Scoz RM. (Org.) Psicopedagogia, o caráter interdisciplinar na formação e atuação profissional. Porto Alegre: Artes Médicas; 1987. p. 25-40.
21. Silva SS. Conhecendo a dislexia e a importância da equipe interdisciplinar no processo de diagnóstico. Rev Psicopedag [online]. 2009;26(81):470-5.
22. Capellini SA, Conrado TL. Desempenho de escolares com e sem dificuldades de aprendizagem de ensino particular em habilidade fonológica, nomeação rápida, leitura e escrita. Rev CEFAC. 2009;11(Suppl 2):183-93.
23. Pavão V. Dislexia e disortografia: a importância do diagnóstico. IGT na Rede. 2005;2(3):1-6. [Citado 2011 mar 21]. Disponível em: <http://www.igt.psc.br/Artigos/dislexia_e_disortografia_a_importancia_do_diagnostico.htm>.
24. Dourado MB, Schmit E, Chiappetta AL. Consciência fonológica em disléxicos. Rev CEFAC. 2005;7(4):415-18.
25. Donicht G, Pagliarin KC, Keske-Soares M, Mota HB. Julgamento perceptivo da gravidade do desvio fonológico por três grupos distintos. Rev CEFAC. 2010;12(1):21-6.
26. Shriberg LD, Kwiatkowski J. Development phonological disorders. I: a clinical profile. J Speech Hear Res. 1994;37(5):1100-26.
27. Jiménez JE, Rodríguez C, Ramírez G. Spanish developmental dyslexia: prevalence, cognitive profile, and home literacy experiences. J Exp Child Psychol. 2009;103(2):167-85.
28. Piasta SB, Wagner RK. Learning letter names and sounds: effects of instruction, letter type, and phonological processing skill. J Exp Child Psychol. 2010;105(4):324-44.
29. Pinheiro FH, Germano GD, Capellini SA. A influência do treinamento auditivo para o desenvolvimento de habilidades fonológicas e silábicas em escolares com distúrbio de aprendizagem. Temas Desenv. 2010;17:79-84.
30. Aguilar Villagrán M, Navarro Guzmán JI, Menacho Jiménez I, Alcale Cuevas C, Marchena Consejero E, Ramiro Olivier P. Velocidad de nombrar y conciencia fonológica en el aprendizaje inicial de la lectura. Psicothema. 2010;22(3):436-42.