Desempenho de escolares em consciência fonológica, nomeação rápida, leitura e escrita***

Students' performance in phonological awareness, rapid naming, reading, and writing

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Abstract

Background: phonological awareness, rapid naming, reading and writing in students with learning difficulties of a municipal public school. Aim: to characterize and compare the performance of students from public schools with and without learning difficulties in phonological awareness, rapid naming, reading and writing. Method: participants were 60 students from the 2nd to the 4th grades of municipal public schools divided into 6 groups. Each group was composed by 10 students, being 3 groups of students without learning difficulties and 3 groups with students with learning difficulties. As testing procedure phonological awareness, rapid automatized naming, oral reading and writing under dictation assessments were used. Results: the results highlighted the better performance of students with no learning difficulties. Students with learning difficulties presented a higher ratios considering time/speed in rapid naming tasks and, consequently, lower production in activities of phonological awareness and reading and writing, when compared to students without learning difficulties. Conclusion: students with learning difficulties presented deficits when considering the relationship between naming and automatization skills, and among lexical access, visual discrimination, stimulus frequency use and competition in using less time for code naming, i.e. necessary for the phoneme-grapheme conversion process required in the reading and writing alphabetic system like the Portuguese language.

Key Words: Reading; Writing; Learning.

Resumo

Tema: consciência fonológica, nomeação rápida, leitura e escrita em escolares de ensino público com dificuldades de aprendizagem. Objetivo: caracterizar e comparar o desempenho de escolares com e sem dificuldades de aprendizagem do ensino público municipal em consciência fonológica, nomeação rápida, leitura e escrita. Método: participaram deste estudo 60 escolares de 2ª a 4ª séries de escola de ensino público municipal, distribuídos em 6 grupos, sendo cada grupo composto por 10 escolares, divididos em 3 subgrupos de escolares sem dificuldades de aprendizagem e 3 subgrupos de escolares com dificuldades de aprendizagem. Como procedimentos, foram realizadas provas de: nomeação automática rápida, consciência fonológica e leitura oral e escrita sob ditado. Resultados: os resultados deste estudo evidenciaram desempenho superior dos escolares sem dificuldades de aprendizagem em relação àqueles com dificuldades. Os escolares com dificuldades de aprendizagem apresentaram maior relação velocidade/tempo em tarefas de nomeação e, consequentemente, desempenho inferior em tarefas de consciência fonológica e leitura e escrita de palavras isoladas quando comparados aos sem dificuldades de aprendizagem. Conclusão: os escolares com dificuldades de aprendizagem apresentaram comprometimento na relação entre as capacidades de nomeação e automatização dos estímulos apresentados com a capacidade de acesso lexical, discriminação visual, frequência de uso dos estímulos e competição para a apresentação do menor tempo possível na nomeação dos códigos necessários para o estabelecimento do mecanismo de conversão fonema-grafema, exigido para a realização da leitura e escrita em um sistema alfabético como o Português.

Palavras-Chave: Leitura; Escrita; Aprendizagem.

Introduction

Recent studies show that students with learning difficulties may show changes in phonological awareness and access to mental lexicon due to modifications at different levels of information processing 1-7.

The students with reading disabilities have reading fluency changed and problems with reading comprehension as a result of changes in phonological awareness and low capacity for storing information in working memory 8-10.

The component mechanisms of language processing underlie the development of phonological awareness. These components, ie, phonological working memory and access to mental lexicon enable the processing and organization of language. Likewise, they are requested by the central executive component in carrying out any task, including phonological awareness and phoneme-grapheme association 11-13.

Based on the above, this study aimed to characterize and compare the performance of students with and without learning difficulties in public municipal education in phonological awareness, rapid naming, reading and writing.

Method

This study was approved by the Ethics Committee in Research of the Faculty of Sciences - FFC / UNESP - Marília, under protocol number 2812/2003.

A total of 60 students from second to fourth grades of public school programs in Marília-SP participated in this study, 32 (53%) students were males and 28 (47%) were females, aged 8 years and 3 months to 10 years and four months old, divided into Group I (GI), Group II (GII) and Group III (GIII), each consisting of 10 students without learning difficulties, respectively in the 2nd, 3rd and 4th grades, Group IV (GIV) , Group V (GV) and Group VI (GVI): each composed of 10 students with learning difficulties, respectively in the 2nd, 3rd and 4th grades.

The students were selected based on academic performance in two consecutive marking periods and the schoolchildren who had poor performances are considered to present learning difficulties and those who had sufficient performance evaluations in Portuguese Language and Mathematics are considered students without learning difficulties.

For this study, we used the following procedures:

- Automatic Rapid Naming (RAN)14,15: RAN was applied, consisting of the subtests of naming colors, digits, letters and objects.
- Phonological Awareness Test (PAT)16: PAT was applied, consisting of syllabic and phonemic skills of synthesis, segmentation, manipulation and transportation and supra-phonemic, such as rhyme and alliteration.
- Proof Reading and Writing17: It was applied to oral reading and writing under dictation of 96 items, two sub-lists of 48 real words and 48 non-word words were used for the tasks of oral reading and writing through dictation.

For inter-group statistical analysis, we used the Mann-Whitney test and, for the intra-group statistical analysis, we used the Wilcoxon Test and Friedman Test. In order to perform the statistical analysis and obtain the results, we used the SPSS (Statistical Package for Social Sciences), version 10.0.

Results

Table 1 presents the average performance of groups in the RAN, the PAT and the Test of Oral Reading and Writing in Dictation.

When comparing the performance of groups with and without learning difficulties, using the Mann-Whitney, it appears in Table 2 that GI had lower performance in time for naming letters than GIV, the same occurring between GII and GIV in naming colors and letters and GIII and GVI in naming colors, letters, numbers and objects. As for phonological awareness, it is observed that GIV showed higher error average in rhyme, syllabic manipulation, phonemic manipulation and transportation and total score than GI, GII and GIII. It can also be observed statistically significant differences when comparing the performances of GI and GIV, GII and GIII, GV and GVI in oral reading of real words of high and low frequency.

On the test of writing under dictation, it can be verified that GII had lower error average compared to GV in all categories of words. GI and GIII and GIV and GVI were statistically different in all categories.

In table 3, with the application of the Wilcoxon Test, we verified the occurrence of significant differences, indicating that GI, GII and GIII presented lower time for naming than GIV, GV and GVI. As for phonological awareness, it was found that all groups had superior performance in phonemic skills.

GIII and GIV showed superior performance in reading high-frequency regular words compared to low frequency. GI, GIII and GIV showed superior performance for reading real words irregular high frequency, while GI and GVI had superior performance for reading real words rule of high frequency. In the reading of non-word words, GI and GIV showed superior performance in reading regular words than irregular words in rule than non-word.

GI, GII, GIII, GIV and GV were superior in writing high-frequency words than low frequency ones, regular non-word words than irregular ones, while GI, GII, GIII, GV and GVI had superior performance in writing regular word than rule word, and irregular words than the rule.

TABLE 1. Distribution of the average performance of students in the subtests of RAN, PAT, oral reading and writing under dictation.

	Skills	GI	GII	GIII	GIV	GV	GVI
RAN	Colors	60,9	44,7	43,5	75,7	56,3	66,9
	Letters	36,9	24,6	25,3	54,5	37,7	35,5
	Digits	37,2	28,0	25,6	51,6	33,7	34,8
	Objects	74,9	59,4	50,8	88,6	70,4	74,0
PAT	SSy	0	0	0	0	0	0,5
	PSy	2,7	2,0	1,7	2,6	1,9	3,4
	Rhy	1,0	0,2	0	2,3	2,3	1,2
	Allit	1,1	0	0,1	1,8	1,4	0,8
	SSe	0	0,1	0	0	0	0
	PSe	3,4	2,7	2,1	4,0	3,6	3,0
	SMan	0,2	0,1	0	1,1	1,7	1,3
	PMan	1,3	0,1	0	2,6	2,4	1,1
	STr	0,9	0,6	0	1,7	1,1	0,6
	PTr	3,5	2,6	1,5	4,0	3,5	3,9
	TS	14,1	8,8	5,4	20,1	18,2	15,8
Oral Reading	RRWHF	3,0	0,5	1,3	8,7	5,7	3,3
	RRUWHF	2,1	0,4	0,4	6,3	5,2	2,0
	RIWHF	5,5	1,5	3,3	10,7	9,0	7,0
	RRWLF	2,1	0,5	0,6	8,7	7,3	2,8
	RRUWLF	5,3	1,0	1,2	10,8	8,5	5,4
	RIWLF	1,8	1,0	0,4	9,2	6,8	2,4
	RNW	9,3	4,1	9,2	20,8	17,1	13,8
	RUNW	14,1	5,6	9,6	24,4	19,4	15,3
	INW	11,5	5,2	10,0	23,4	17,4	13,0
Writing under Dictation	RRWHF	4,1	2,0	1,5	9,8	9,0	3,0
	RRUWHF	4,0	2,0	1,0	9,6	7,1	2,4
	RIWHF	12,1	6,5	6,4	14,1	13,9	9,9
	RRWLF	8,1	1,8	1,7	13,1	10,8	4,3
	RRUWLF	9,1	3,9	3,5	12,8	12,7	7,8
	RIWLF	5,3	2,3	2,1	11,3	9,6	3,4
	RNW	13,0	8,1	6,0	25,4	21,8	13,4
	RUNW	26,0	19,3	17,1	28,9	24,4	24,2
	INW	20,0	12,9	10,9	28,3	22,0	19,3

Caption: SSy: Syllabic Synthesis; PSy: Phonemic Synthesis; Rhy: Rhyme; Allit: Alliteration; SSe: Syllabic Segmentation; PSe: Phonemic Segmentation; SMan: Syllabic Manipulation; PMan: Phonemic Manipulation; STr: Syllabic Transposition; PTr: Phonemic Transposition; TS: Total Score; RRWHF: Real Regular Words High Frequency; RRUWHF: Real Rule Words High Frequency; RIWHF: Real Irregular Words of High Frequency; RRWLF: Real Regular Words Low Frequency; RRUWLF: Real Rule Words Low Frequency; RIWLF: Real Irregular Words Low Frequency; RNW: Regular Non-Words; RUNW: Rule Non-Words; INW: Irregular Non-Words.

TABLE 2. Distribution of p-value of the performance of students in the RAN, the PAT, oral reading and writing under dictation.

	Skills	GI X GIV	GII X GV	GIII X GVI
RAN	Colors	0,069	0,023*	0,007*
	Letters	0,017*	0,006*	0,003*
	Digits	0,112	0,172	0,012*
	Objects	0,325	0,131	0,005*
PAT	SSy	> 0,999	> 0,999	0,147
	PSy	0,555	0,634	0,002*
	Rhy	0,040*	< 0,001*	0,001*
	Allit	0,212	0,005*	0,049*
	SSe	> 0,999	0,317	> 0,999
	PSe	0,147	0,179	0,112
	SMan	0,014*	0,005*	0,005*
	PMan	0,020*	0,001*	0,005*
	STr	0,282	0,478	0,068
	PTr	0,030*	0,022*	< 0,001*
	TS	0,025*	0,001*	< 0,001*
Oral Reading	RRWLF	0,007*	< 0,001*	0,035*
	RRWHF	0,032*	< 0,001*	0,004*
	RIWLF	0,003*	< 0,001*	0,011*
	RIWHF	0,003*	< 0,001*	0,004*
	RRUWLF	0,012*	< 0,001*	0,004*
	RRUWHF	0,022*	0,002*	0,020*
	RNW	0,011*	< 0,001*	0,048*
	INW	0,004*	< 0,001*	0,044*
	RUNW	0,001*	< 0,001*	0,363
Writing under Dictation	RRWLF	0,012*	< 0,001*	0,030*
	RRWHF	0,002*	< 0,001*	0,091
	RIWLF	0,054	0,001*	0,022*
	RIWHF	0,009*	0,001*	0,009*
	RRUWLF	0,025*	< 0,001*	0,017*
	RRUWHF	0,004*	< 0,001*	0,070
	RNW	0,001*	< 0,001*	0,002*
	INW	0,268	< 0,001*	0,002*
	RUNW	0,001*	< 0,001*	< 0,001*

Legend: SSy: Syllabic Synthesis; PSy: Phonemic Synthesis; Rhy: Rhyme; Allit: Alliteration; SSe: Syllabic Segmentation; PSe: Phonemic Segmentation; SMan: Syllabic Manipulation; PMan: Phonemic Manipulation; STr: Syllabic Transposition; PTr: Phonemic Transposition; TS: Total Score; RRWHF: Real Regular Words High Frequency; RRUWHF: Real Rule Words High Frequency; RIWHF: Real Irregular Words of High Frequency; RRWLF: Real Regular Words Low Frequency; RRUWLF: Real Rule Words Low Frequency; RIWLF: Real Irregular Words Low Frequency; RNW: Regular Non-Words; RUNW: Rule Non-Words; INW: Irregular Non-Words.

TABLE 3. Distribution of p-value (p) for the performance of students in the subtests of the RAN, the PCF, oral reading and writing under dictation.

	Subtests	Groups					
		I	II	III	IV	V	VI
RAN	Colors X Letters	0,005*	0,005*	0,005*	0,005*	0,005*	0,005*
	Colors X Digits	0,005*	0,005*	0,005*	0,005*	0,005*	0,037*
	Colors X Objects	0,009*	0,005*	0,005*	0,114	0,024*	0,008*
	Letters X Digits	0,714	0,201	0,015*	0,610	0,165	0,028*
	Letters X Objects	0,005*	0,005*	0,005*	0,005*	0,005*	0,005*
	Digits X Objects	0,005*	0,005*	0,005*	0,005*	0,005*	0,014*
PAT	SSy x PSy	0,007*	0,006*	0,020*	0,010*	0,014*	0,026*
	Rhy x Allit	0,023*	0,024*	0,180	> 0,999	> 0,999	> 0,999
	SSe x PSe	0,004*	0,007*	0,005*	0,026*	0,011*	0,004*
	SMan x PMan	0,414	0,317	0,317	0,317	> 0,999	> 0,999
	STr x PTr	0,026*	0,037*	0,024*	0,102	0,317	0,039*
Oral Reading	RRWHF – RRWLF	0,157	> 0,999	0,010*	0,317	> 0,999	0,157
	RIWHF – RIWLF	0,039*	0,058	0,582	0,066	0,059	0,180
	RRUWHF – RRUWLF	0,132	0,268	> 0,999	0,083	0,102	> 0,999
	RNW x INW	0,396	—	0,009*	—	0,017*	0,726
	RNW x RUNW	0,007*	—	0,441	—	0,340	0,107
	INW x RUNW	0,015*	—	0,005*	—	0,041*	0,041*
Writing under Dictation	RRWHF – RRWLF	0,732	0,141	0,020*	0,380	0,020*	0,763
	RIWHF – RIWLF	0,008*	0,005*	0,004*	0,005*	0,029*	0,161*
	RRUWHF – RRUWLF	0,011*	0,011*	0,005*	0,009*	> 0,999	0,234
	RNW x INW	0,005*	0,005*	0,015*	0,005*	0,005*	0,005*
	RNW x RUNW	0,009*	0,004*	0,063	0,008*	0,018*	0,011*
	INW x RUNW	0,005*	0,005*	0,066	0,008*	0,005*	0,034*

Legend: SSy: Syllabic Synthesis; PSy: Phonemic Synthesis; Rhy: Rhyme; Allit: Alliteration; SSe: Syllabic Segmentation; PSe: Phonemic Segmentation; SMan: Syllabic Manipulation; PMan: Phonemic Manipulation; STr: Syllabic Transposition; PTr: Phonemic Transposition; RRWHF: Real Regular Words High Frequency; RRUWHF: Real Rule Words High Frequency; RIWHF: Real Irregular Words of High Frequency; RRWLF: Real Regular Words Low Frequency; RRUWLF: Real Rule Words Low Frequency; RIWLF: Real Irregular Words Low Frequency; RNW: Regular Non-Words; RUNW: Rule Non-Words; INW: Irregular Non-Words.

Discussion

Regarding the performance of students in the RAN, it was found that students without learning difficulties were superior in naming colors, letters, numbers and objects than students with learning difficulties, however, students with learning difficulties were faster naming letters and numbers than color, corroborating studies 14,15,18,19 discussing the requirement of the use of attentional, perceptual and visual processes for lexicon recovery of greater extent in students with good academic performance. Regarding the performance of students in phonological awareness, it was found that all students were better in syllabic skills than in phonemic skills 7,20.

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In rhyme and alliteration, it was found that groups with learning difficulties presented these skills changed, which suggests that these students had gaps in the perception of initial and final sounds of words, highlighting difficulties in grouping of words that have phonological similarity, revealing changes in the use of phonological working memory 6,21.

It was also found that the students performed better in reading and writing real words of high frequency than in low-frequency words and in non-word regular words than rule and irregular and non-word words, corroborating studies 22,23, which said that the higher the perceptual, auditory and visual contact with words, the more these words become familiar to children. In comparisons of real words, high frequency regular and irregular rule, only GI, GIII, GIV and GVI were statistically different, indicating the need for formal teaching of spelling and reading incentive in the school context 7,24,25.

Regarding the performance of students in reading and writing, there was superior performance for reading and writing real words of high frequency than low frequency words, non-word regular words than irregular and rule, according to literature 20,26 which describes that lexicon of high frequency is filed in the graphemic lexicon, thus facilitating the development of writing without errors.

The school groups without learning disabilities showed lower speed / time in naming tasks, and thus superior performance in phonological awareness and activity of reading and writing of single words compared to the performance of groups with learning disabilities who had higher relation time/speed in naming tasks and hence lower performance on tasks of phonological awareness, reading and writing single words 18,27.

The profile of students with learning difficulties in this study, in relation to phonological awareness, naming speed, ability to lexical access, visual discrimination, frequency of use of stimuli and competition for the retrieval of information and naming, may be sufficient to infer that this may be the cause of failure in learning the mechanism of phoneme-grapheme conversion required to achieve the reading and writing of irregular and non-words 3,8,28.

In Brazil, a profile of students with learning difficulties is of paramount importance because the high percentage of children with problems in phonological awareness and rapid naming causes them to be confused with elementary school children with the framework of developmental dyslexia7.

Thus, this profile might help to fill a gap in speech therapy, which is to establish the profile of the poor readers and dyslexic readers, which would avoid the misdiagnosis and its consequences, which usually affect the quality of life for children within the family, and in social and educational contexts.

Conclusion

The results of this study indicate that:

. GIV, GV and GVI had lower performance in phonological awareness, rapid naming, reading and writing compared to GI, GII and GIII, indicating that, when present, the learning difficulties are not overcome during schooling.
. GIV, GV and GVI showed higher speed/time in naming tasks, poorer performance in tasks of phonological awareness and reading and writing, compared to GI, GII and GIII, thus suggesting that changes in these abilities may have been crucial to the academic failure of the participants of this study.

References

1. Wagner RK, Torgensen JK, Rshotte CA, Hecht SA, Barker TA, Burgess SR, et al. Changing relations between phonological processing abilities and word-level reading as children develop from beginning to skilled readers: as 5 year longitudinal study. Dev Psychol. 1997;33(3):468-79.

2. Scheltinga F, Van der Leij A, Van Beinun F. Importance of phonological skills and underlying processes to reading achievement: a study on dyslexic and specific language impaired children. IFA Proc. 2003;(25):21-30.

3. Cardoso Martins C, Pennington B. Qual é a contribuição da nomeação seriada rápida para a habilidade de leitura e escrita? Evidência de crianças e adolescentes com e sem dificuldade de leitura. Psicol Reflex Crit. 2004;14(2):387-97

4. Sprugevica I, Hojen T. Early phonological skills as a predictor of reading acquisition: a follow-up study from kindergarten to the middle of grade 2. Scand J Psychol. 2003;44(2):119-24.

5. Vukovic RK, Siegel LS. The double-deficit hypothesis: a comprehensive analysis of the evidence. J Learn Disab. 2006;39(1):25-47.

6. Van der Leij A, Morfidi E. Core deficits and variable differences in Dutch poor readers learning English. J Learn Disabil. 2006;39(1):74-90.

7. Capellini SA, Capano, TLB. Desempenho de escolares com e sem dificuldades de aprendizagem de ensino particular em habilidade fonológica, nomeação rápida, leitura e escrita. Rev Cefac. 2009;11(2):183-93.

8. Hogan TP, Catts HW, Little TD. The relationship between phonological awareness and reading: implications for the assessment of phonological. Lang Speech Hear Serv Sch. 2005;36(4):285-93.

9. Leppänen U, Kaisa A, Pekka N, Jari-Erik N. Letter knowledge predicts grade 4 reading fluency and reading comprehension. Learn Instr. 2008;18:548-64.

10. Alves LM, Reis C, Pinheiro A MV, Capellini SA. Aspectos prosódicos temporais da leitura de escolares com dislexia do desenvolvimento. Rev Soc Bras Fonoaudiol. 2009;14(2):197-204.

11. Ávila CRB, Capellini SA. Relation between oral and written language. In: Capellini SA, editor. Neuropsycholinguistic perspectives on dyslexia and other learning disabilities. New York: Nova Science Publisher; 2007. p. 15-22.

12. Mousinho R, Correa J. Linguistic and cognitive skills in readers and nonreaders. Pro-Fono: Rev Atual Cient. 2009;21(2):113-8.

13. Smythe I, Everatt E, Al-Menaye NHX, Capellini S, Gyarmathy E, Siegel L. Predictors of word-level literacy amongst grade 3 children in five diverse languages. Dyslexia. 2008;14(3):170-87.

14. Denckla MB, Rudel R. Rapid automatized naming of picture objects, colors, letters, and numbers by normal children. Cortex.1974;10(1):186-202.

15. Ferreira TL, Capellini SA, Ciasca SM, Tonelotto JMF. Desempenho de escolares leitores proficientes no teste de nomeação automatizada rápida RAN. Temas Desenvol. 2003;12(69):26-32.

16. Capovilla AGS, Capovilla FC. Prova de consciência fonológica: desenvolvimento de dez habilidades da pré-escola à segunda série. Temas Desenvol. 1998;7(37):14-20.

17. Pinheiro AMV. Leitura e escrita: uma abordagem cognitiva. Campinas: Psy II; 1994.

18. Swanson HL, Howard CB, Saez L. Do different components of working memory underlie different subgroups of reading disabilities? J Learn Disabil. 2006;39(3):252-69.

19. Capellini SA, Ferreira TL, Salgado CA, Ciasca SM. Desempenho de escolares bons leitores, com dislexia e com transtorno do déficit de atenção e hiperatividade em nomeação automática rápida. Rev Soc Bras Fonoaudiol. 2007;12(2):114-9.

20. Savage RS, Frederickson N, Goodwin R, Patni U, Smith N, Tuersley L. Relationship among rapid digit naming, phonological processing, motor automaticity, and speech perception in poor, average, and good readers and spellers. J LearnDisabil. 2005;38(1):12-28.

21. Steinbrink C, Klatte M. Phonological working memory in German children with poor reading and spelling abilities. Dyslexia 2008;14(4):271-90.

22. Snowling MJ, Gallagher A, Frith U. Family risk of dyslexia is continuous: individual differences in the precursors of reading skill. Child Dev. 2003;74(2):358-73

23. Mcquiston K, O'Shea D, MCcollin M. Improving phonological awareness and decoding skills of high schools students from diverse backgrounds. Prev Sch Failure. 2008;52(2):67-70.

24. Cunha VLO, 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.

25. Pinheiro AMV, Lúcio PS, Silva DR. Avaliação cognitiva de leitura: o efeito de regularidade grafema-fonema e fonema-grafema na leitura em voz alta de palavras isoladas no português do Brasil. Psicol Teor Prat. 2008;10(2):16-30.

26. Bowers PG, Newby-Clark E. The role of naming speed within a model of reading acquisition. Read Writ: Interd J. 2002;15(1-2):109-26.

27. Lervåg A, Hulme C. Rapid automatized naming (RAN) taps a mechanism that places constraints on the development of early reading fluency. Psychol Sci. 2009;20(8):1040-8.

28. Protopapas A, Skaloumbakas C. Traditional and computer-based screening and diagnosis of reading disabilities in Greek. J Learn Disabil. 2007;40(1):15-36.

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