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Original Article

Artigo Original

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Spelling performance of students with developmental dyslexia and with developmental dyslexia associated to attention deficit disorder and hyperactivity

Desempenho ortográfico de escolares com dislexia do desenvolvimento e com dislexia do desenvolvimento associado ao transtorno do déficit de atenção e hiperatividade

Keywords

Dyslexia
Attention Deficit Disorder with Hyperactivity
Handwriting
Learning
Evaluation

ABSTRACT

Purpose: to analyze and classify the spelling performance according to the semiology of spelling error of children with developmental dyslexia (DD) and with developmental dyslexia associated to attention deficit disorder and hyperactivity(DD and ADHD) comparing them to a group of children without learning process complaints. **Methods**: Seventy students, from the third to fifth grade, participated in this study divided as follows: 32 children without complaints of learning difficulties (GI), mean age 9.5 years; 22 students with developmental dyslexia (GII), mean age 10 years; 16 scholars with developmental dyslexia associated to attention deficit disorders and hyperactivity (GIII), mean age 9.9. Spelling skills were assessed through a standardized word dictation task. **Results**: Data indicated that GII and GIII children presented lower performance when compared with typically developed children. There was no statistical difference between the performance of GII and GIII children regarding the score reached in spelling, although GIII children presented the lowest performance. We observed differences between GII and GIII only in the type of misspelling. **Conclusion**: Data from this research contribute to develop better programs for intervention in the studied population.

Descritores

Dislexia
Transtorno do Déficit de Atenção e Hiperatividade
Escrita Manual
Aprendizagem
Avaliação

RESUMO

Objetivo: Analisar e classificar o desempenho ortográfico, de acordo com a semiologia dos erros, de crianças com dislexia do desenvolvimento e com dislexia do desenvolvimento e transtorno do déficit de atenção e hiperatividade em relação a um grupo de crianças sem queixas de aprendizagem escolar. **Métodos**: Participaram da pesquisa 70 crianças, estudantes do 3º ao 5º distribuídas em três grupos: 32 escolares sem queixa de dificuldade de aprendizagem (GI), média de idade de 9,5 anos; 22 escolares com dislexia do desenvolvimento (GII), média de idade de 10 anos; e 16 escolares com dislexia do desenvolvimento e transtorno do déficit de atenção e hiperatividade (GIII), média de idade de 9,9. A habilidade de ortografia das crianças foi avaliada por meio de um ditado de palavras padronizado. **Resultados**: Os dados indicaram que os escolares do GII e do GIII apresentaram um pior desempenho quando comparados ao GI. Não houve diferença estatística entre o desempenho dos escolares do GII e do GIII quanto ao número de acertos na ortografia, embora o desempenho do GIII tenha sido pior. Os escolares do GII e do GIII diferiram apenas quanto ao tipo de erro ortográfico produzido por cada grupo. **Conclusão**: Os dados da presente pesquisa contribuem para o delineamento de melhores programas interventivos para a população estudada.

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INTRODUCTION

The Brazilian Portuguese writing system presents alphabetical basis, characterized by the transparency and opacity of spelling, with a more transparent configuration in the sense of decodification and more opaque in the encoding process[1]. It is understood as spelling transparency, the correlation of a phoneme and a single grapheme and vice versa; the spelling opacity is characterized by the irregularity with which the grapheme may correspond to more than one phoneme and with phonemes that correspond to various graphemes[2]. This more opaque characteristic of the language may generate some difficulties in learning the written language.

In Brazil, 30%-40% of children had some kind of difficulty to learn how to read and write in their first school years, considering 3%–5% of those children have learning disorders[3].

Among these disorders, developmental dyslexia (DD) is the most common one. As well as in DD, the attention deficit hyperactivity disorder (ADHD) is also quite frequent in childhood, both of them being among the most common causes of school failure[4-6].

Both dyslexia and the ADHD may occur in isolation or simultaneously in the individual. The co-occurrence of these disorders is quite common[7-11] and some studies have demonstrated independent etiologies and cognitive basis, considering this co-occurrence is the sum of both central deficits[6,9].

Some authors have found a predominance of deficit in speech-language processing skills and in decodification among dyslexic children with attention and visuospatial memory alterations among ADHD patients, while children with both disorders have a combination of the alterations found in the isolated conditions[12].

Students with attention or information processing flaws will have difficulty in triggering the visual processing, which will hinder the phonological process necessary to perform reading and writing[13].

Learning the written language is not easy, once it presupposes the acquisition of some skills such as differentiating the layout of letter, understanding the phoneme–grapheme conversion, establishing quantitative correspondence, and identifying the grapheme position in the word, which makes the spelling knowledge a multidimensional construct[14,15].

The spelling knowledge regards the understanding of how letters are matched in order to form words, being acquired by means of the repeated exposure to printed material, the acquisition of phonological awareness and the knowledge of rules to form the spelling mental lexicon[15,16].

The specific difficulty in acquiring this knowledge is called dysorthographia and is part of an appropriation process of the spelling system of the language, being overcome throughout schooling. However, in cases of learning disorders, the dysorthographia does not disappear with the progression of schooling, since these individuals have a poor phonological system, causing changes in the phoneme–grapheme conversion. The most common characteristics of dysorthographia are omissions, substitutions, and inversion of grapheme, due to the difficulty of absorbing the spelling of words[2].

Researches that evaluated the writing of students both with dyslexia and with dyslexia and ADHD are still scarce; however, they are necessary in order to trace the intervention strategies that would help this population.

One way to evaluate the writing of these students is through the balanced dictation of words. This kind of task allows the probing of the spelling performance, which favors the analysis and classification of the kind of spelling mistake made[17,18].

Some researchers have classified these mistakes, by semiology, as natural and arbitrary spelling mistakes[2,17,18].

The natural spelling mistakes are directly related to the processing of language, being considered predominantly phonological. The arbitrary spelling mistakes, in turn, are related to lexicon, morphology, visual memory, and the knowledge of spelling rules[2].

Understanding the spelling mistakes found in the written production of students with DD and with DD and ADHD brings about important contributions that should be considered at the moment of elaboration of interventional speech–language practices, whether clinical or educational.

Given this, the present research had the objective of analyzing and classifying spelling performance, according to the semiology of the mistakes, of children with DD and with DD and ADHD in relation to the group of children without school learning complaints, with the assumption that students with the comorbidity of the disorders would present higher spelling delay due to the overlap of deficits.

METHODS

The research was conducted after the approval of the Ethics Committee for Analysis of Projects of the Institution under No. 523/11.

The research consisted of 70 children, students from the 3rd to the 5th years of elementary school, distributed into three groups: Group I (GI), consisting of 32 students without complaints of learning difficulty, mean age of 9.5 years; Group II (GII), consisting of 22 students with DD, mean age of 10 years; and Groups III (GIII), consisting of 16 students with DD and ADHD, mean age of 9.9 years.

The subjects who comprised the control group, or GI, were selected from the same school of the Industry Social Services, in the city of São Paulo.

The inclusion criteria for the GI were being enrolled between the 3rd and 5th years of elementary school, signed the informed consent and handed in the SNAP-IV questionnaire[19], absence of complaints regarding ADHD, absence of learning disorders according to the report of the teacher, having performance within the expected for the age in the phonology test, having mean or superior performance for schooling in the School Performance Test (SPT)[20], performing within the expected for the phonological awareness test, rapid automatic naming, phonological operational memory, reading and spelling, and having an Intelligence Quotient (IQ) equal to or higher than 90.

In turn, the students in GII and GIII were selected from the attendance and/or waiting lists of the Learning Disorders Clinic of the institution where the research was carried out.

The inclusion criteria for the initial stage of the research were the following: being enrolled between the 3rd and 5th years of elementary school, having complaints on learning difficulty, absence of cognitive deficit and auditory and visual complaints, performing within the expected for that age range in the phonology test, inferior performance for the education in SPT in the Reading and Writing subtests, performing below the expected for the tests of phonological awareness, rapid automatic naming, phonological operational memory, reading and spelling, having IQ equal to or higher than 90, or having another entity's report containing the diagnosis of DD with or without ADHD.

The diagnosis of these student groups (when in the absence of another entity's report) was made after evaluation of the multidisciplinary team consisting of a neurologist, a neuropsychologist, and a speech–language therapist.

Procedure

All students went through evaluation of the language phonological processing, in the phonological awareness skills; phonological operational memory and naming; and reading and spelling processes; however, just the procedure related to the objective of this study will be described next.

In order to investigate of the spelling performance of the students, we used the subtest of Words Dictation of the Pro-Spelling Assessment Protocol (*Ditado de Palavras do Protocolo de Avaliação do Pró-Ortografia)*[21], consisting of 86 words, being 3 monosyllabic words, 33 disyllabic words, 35 trisyllabic words, and 15 polysyllabic words, which was applied individually, in a single session.

All scoring followed the criteria established by the test, being attributed one point for each legible and orthographically encoded word, including stress punctuation. The spelling mistakes made by students were analyzed and classified based on the semiology of the mistakes[2]. The nature of the mistakes and their description are shown in Chart 1.

In order to obtain the results, the data were submitted to the statistical analysis of the Stata software, version 10.0. In order to verify whether there was difference between the groups the Kruskal–Wallis test was used, adopting a significance level of 5%. To clarify which groups differ from each other, we used the Mann–Whitney test with Bonferroni correction for three comparisons, resulting in a significance level of 0.017.

In order to verify which word, from the variable dictation, had higher percentage of mistakes and/or correct answers among the groups, the chi-square test was used.

RESULTS

Table 1 summarizes the performance of students in relation to the number of correct answers obtained for each group in written dictation. Both the students in GII and GIII had median well below the one obtained by the children in GI. There was no statistical difference between GII and GIII.

Table 2 presents the types of spelling mistakes made by the groups evaluated and shows statistical significance for the univocal phoneme–grapheme correspondence mistakes (P/GC), omission and addition of segments (OAS), alteration of the order of the segments (AOS), phoneme–grapheme correspondence depending on the phonetic context/position (P/GCDC), phoneme–grapheme correspondence regardless of rules (P/GCRR), absence or inadequate presence of word accentuation (IAPS), and other findings (OF).

The children in GI had better performance in this task and therefore made less spelling mistakes. Although with higher median, the performance of students in GIII did not present statistical significance in mistake type P/GC, AOS, and P/GCRR.

There was no difference in the performance between the three groups in the mistake of separation or improper junction of words (SIJW).

The inferior performance of GIII in relation to GI and GII was statistically significant in mistake types OAS and OF, meaning, mistakes in natural spelling. GII was statistically

Chart 1. Brazilian classification of spelling mistakes based on the semiology of the mistakes

Spelling	Number	Type	Meaning
Natural	1	P/GC	Univocal Phoneme–Grapheme Correspondence
Natural	2	OAS	Omission and Addition of Segments
Natural	3	AOS	Alteration of the Order of the Segments
Natural	4	SIJW	Separation or Improper Junction of Words
Arbitrary	5	P/GCDC	Phoneme–Grapheme Correspondence Depending on the Phonetic Context/Position
Arbitrary	6	P/GCRR	Phoneme–Grapheme Correspondence Regardless Rules
Arbitrary	7	IAPS	Inadequate Absence or presence of Word Stress (acute and circumflex accent)
-	8	OF	Other Findings (letters with tracing problems /mirroring, writing of another Word and/or made up word)

Source: Batista[21]

Table 1. Comparison of the performance of students in the dictation of words test regarding the number of correct spellings

Group	Median	Interquartile Interval	P-value	Comparisons of pairs
GI	64.5	57-70		GI ≠ GII ($p < 0.001$*)
GII	17.5	5.75-32	<0.001*	GI ≠ GIII ($p < 0.001$*)
GIII	7.5	2.25-22.5		GII = GIII ($p = 0.078$)

*$p < .05$

Table 2. Comparison of the performance of students in the dictation of words test regarding the number and the type of spelling mistakes

Variable	Group	Median	Interquartile Interval	P-value	Comparisons of pairs
P/GC	GI	0	0	<0.001*	GI ≠ GII (p < 0.001*)
	GII	8.5	5.5-15.25		GI ≠ GIII (p < 0.001*)
	GIII	11.5	6-13.75		GII = GIII (p = 0.614)
OAS	GI	2	1-3	<0.001*	GI ≠ GII (p < 0.001*)
	GII	14	9.5-28.25		GI ≠ GIII (p < 0.001*)
	GIII	24	20.25-40.5		GII ≠ GIII (p = 0.014*)
AOS	GI	0	0	<0.001*	GI ≠ GII (p < 0.001*)
	GII	1	0 - 2.25		GI ≠ GIII (p < 0.001*)
	GIII	1	0 - 2		GII = GIII (p = 0.951)
SIJW	GI	0	0	0.866	GI = GII (p = 0.375)
	GII	0	0		GI = GIII (p = 0.231)
	GIII	0	0		GII = GIII (p = 0.739)
P/GCDC	GI	7	4.25-8	<0.001*	GI ≠ GII (p < 0.001*)
	GII	23	16.75-27.75		GI ≠ GIII (p = 0.001*)
	GIII	14.5	7-19.75		GII ≠ GIII (p = 0.004*)
P/GCRR	GI	8.5	5-11	<0.001*	GI ≠ GII (p < 0.001*)
	GII	21	18.75-26		GI ≠ GIII (p < 0.001*)
	GIII	20.5	15.25-24.75		GII = GIII (p = 0.543)
IAPS	GI	8	6-11	0.002*	GI ≠ GII (p = 0.001*)
	GII	13	11.75-14		GI = GIII (p = 0.055)
	GIII	12.5	7-14.75		GII = GIII (p = 0.503)
OF	GI	0	0-1	<0.001*	GI ≠ GII (p < 0.001*)
	GII	7.5	3 - 13.5		GI ≠ GIII (p < 0.001*)
	GIII	17.5	7.25 - 38		GII ≠ GIII (p = 0.015*)

Caption: P/GC = Univocal Phoneme–Grapheme Correspondence; OAS = Omission and Addition of Segments; AOS = Alteration of the Order of the Segments; SIJW = Separation or Improper Junction of Words; P/GCDC = Phoneme–Grapheme Correspondence Depending on the Phonetic Context/Position; P/GCRR = Phoneme–Grapheme Correspondence Regardless Rules; IAPS = Inadequate Absence or Presence of Word Stress; OF = Other Findings
*p < .05

worse in mistake type P/GCDC. In the mistake type IAPS, the GII had worse statistical performance only when compared to the GI. The types of mistakes made by the GII indicate the predominance of arbitrary spelling mistakes.

The distribution, by groups, of spelling mistakes according to their typology based on the semiology of the mistakes may be best visualized in Graphic 1. It is noted that all children surveyed, regardless the group, make spelling mistakes when writing dictation, varying the quantity of these mistakes. The students of the GI presented more difficulty with arbitrary spelling than with natural spelling (Graphic 2).

The distribution of the percentages of correct answers of each word used in the test of dictation may be verified in Table 3. It is observed that students in GII and GIII had great difficulty with irregular words, with cases of no children within these two groups being able to establish the correct phoneme–grapheme relation in writing some words during the dictation task.

DISCUSSION

The orthographic evaluation performed in this study indicated that the number of correct answers obtained by the students in GI was much higher than that obtained by the students in GII and GIII, being a statistically significant difference. There was no statistical difference between the performances of the groups of children with dyslexia.

This low orthographic performance observed in students of the GII and the GIII was already expected, once that this population presents an impairment of the skills of phonological processing that favors the written language delay[14,17,22].

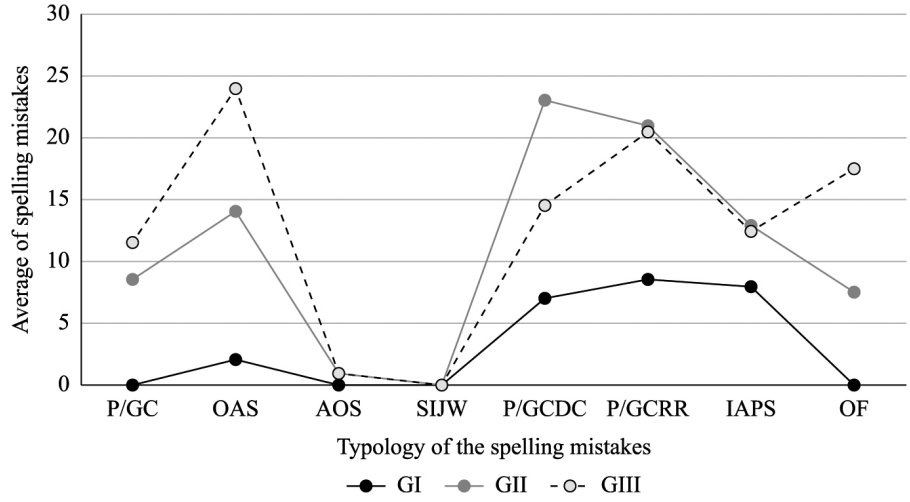
Although no statistical difference was found in the number of correct answers between the GII and GIII, the groups differed in the quantity of each kind of spelling mistake made. These findings allowed a better understanding of the orthographic functioning of each group, contributing for the design of specific intervention.

When analyzing each kind of mistake made by the groups surveyed, an inferior performance of GIII was found in the mistakes of OAS, which is a kind of natural spelling mistake, but which was added to the classification adopted in this research due to the great occurrence observed in the original study[21].

The attentional issue may justify the fact that students of the GII presented more original spelling mistakes related to the OAS. The same can be concluded for the mistake type OF, in which at times the omission of segments was so extent that it compromised the intelligibility of the speech.

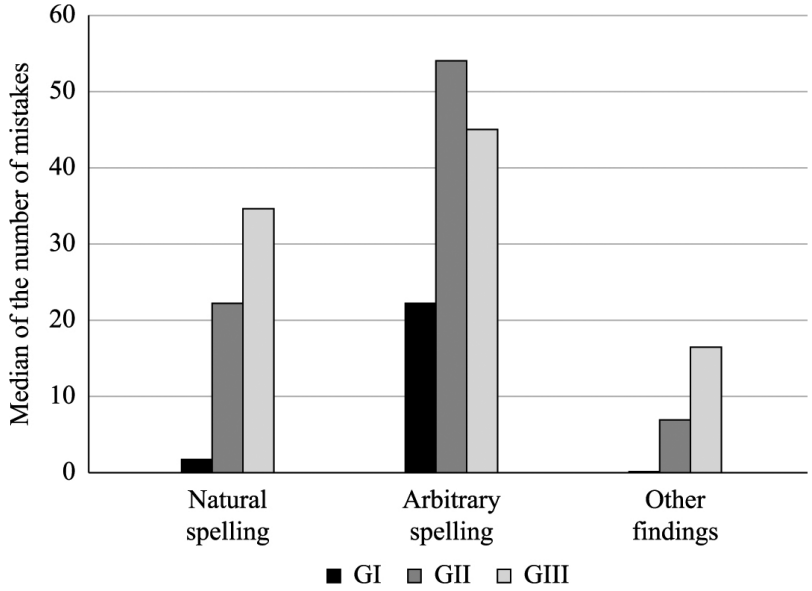
In a study conducted in children with ADHD, greater predominance of mistakes of addition, substitution, transposition, and omission was observed related to the loss of attentional aspects that compromise the storage of the orthographic representation of words[23].

The worst performance in GIII may also be related to problems in executive function, especially in operational memory, which



Caption: P/GC = Univocal Phoneme–Grapheme Correspondence; OAS = Omission and Addition of Segments; AOS = Alteration of the Order of the Segments; SIJW = Separation or Improper Junction of Words; P/GCDC = Phoneme–Grapheme Correspondence Depending on the Phonetic Context/Position; P/GCRR = Phoneme–Grapheme Correspondence Regardless Rules; IAPS = Inadequate Absence or Presence of Word Stress; OF = Other Findings

Graphic 1. Median of the number of spelling mistakes of each group, according to the typology of mistakes



Graphic 2. Sum of the medians of the spelling mistakes by type of spelling and other findings

make the recovery of the orthographic representation less automatic among these children[24].

The students in GII had worse performance than those in GIII in making mistake in phoneme–grapheme correspondence depending on the P/GCDC. A possible explanation for this is that students in GII were in a more evolved written level than those in GIII. Thus, the mistakes made by students in the GII are likely to be classified into some categories, while the students in GIII wrote, mostly, in an unintelligible way, making mistakes, mostly, of type OF.

In the mistake of IAPS, the GII had worse statistical performance only when compared to GI. The types of mistakes made by the students in GII indicated a predominance of arbitrary spelling mistakes.

The mistake of IAPS is related to the orthographic rule considered complex, which demands a refined knowledge of the student, such as notions of orthographic syllabic division, word stress and classification of the word into oxytone, paroxytone, or proparoxytone, and therefore it is a common occurrence[18].

These results corroborate other researches, which report worse performance of dyslexic students in writing under dictation, when compared to children without school difficulties, for having difficulties in encoding the phoneme and grapheme[14].

The fact that decodification is impaired among students with dyslexia causes lesser exposure to reading, which hinders

Table 3. Distribution of the percentages of correct spellings and the p-value of each word of the dictation test

	GI Correct Spellings	GII Correct Spellings	GIII Correct Spellings	p-value
Feliz	96.9	45.5	31.2	<0.001
Asfaltada	81.2	31.8	12.5	<0.001
Classe	84.4	9.1	6.2	<0.001
Vez	96.9	31.8	25	<0.001
Avisem	81.2	18.1	0	<0.001
Cuidava	100	63.6	43.8	<0.001
Futebol	90.6	45.5	6.2	<0.001
Bem	96.9	68.2	31.2	<0.001
Enxergando	34.4	4.5	0	0.002
Bobagens	87.5	22.7	6.2	<0.001
Juiz	71.9	18.2	0	<0.001
Cãozinho	71.9	13.6	12.5	<0.001
Xadrez	65.6	13.6	6.2	<0.001
Dança	96.9	22.7	25	<0.001
Mesada	100	77.3	43.8	<0.001
Zoológico	28.1	4.5	0	0.009
Colchões	46.9	0	0	<0.001
Também	71.9	4.5	0	<0.001
Exemplo	75	4.5	6.2	<0.001
Azul	96.9	36.4	37.5	<0.001
Chiques	78.1	22.7	22.7	<0.001
Desça	21.9	0	0	0.010
Herói	37.5	0	0	<0.001
Ensinar	84.4	27.3	6.2	<0.001
Bilhete	96.9	27.3	25	<0.001
Escuro	93.8	68.2	56.2	0.007
Garçom	40.6	9.1	0	0.001
Examinou	56.2	0	0	<0.001
Confeccionado	40.6	0	0	<0.001
Visual	87.5	27.3	12.5	<0.001
Portuguesa	81.2	27.3	12.5	<0.001
Fósforo	43.8	0	0	<0.001
Barulho	96.9	45.5	31.2	<0.001
Ônibus	64.5	18.2	0	<0.001
Exclamaram	46.9	4.5	0	<0.001
Guerra	100	13.6	18.8	<0.001
Doente	96.9	54.5	37.5	<0.001
Hospital	100	22.7	6.2	<0.001
Mamãe	93.7	50	12.5	<0.001
Inseticida	28.1	0	0	0.002
Jeito	78.1	4.5	12.5	<0.001
Osso	81.2	31.8	25	<0.001
Campeonato	81.2	0	0	<0.001
Lixo	100	81.8	56.2	<0.001
Macarrão	75	9.1	18.8	<0.001
Tristeza	59.4	13.6	15.5	<0.001
Inglês	53.1	0	0	<0.001
Manhãzinha	37.5	0	0	<0.001
Próximo	34.4	0	0	<0.001
Nascimento	68.8	0	6.2	<0.001
Xícara	40.6	0	0	<0.001
Jornal	96.9	40.9	12.5	<0.001
Lápis	53.1	4.5	6.2	<0.001
Fazenda	96.9	40.9	25	<0.001

Table 3. Continued...

	GI Correct Spellings	GII Correct Spellings	GIII Correct Spellings	p-value
Ciranda	93.8	18.2	18.8	<0.001
Anéis	78.1	4.5	0	<0.001
Morcego	96.9	40.9	18.8	<0.001
Quadrado	100	31.8	18.8	<0.001
Saudável	18.8	0	0	0.020
Queixo	65.6	18.2	18.8	<0.001
Palhaço	93.8	18.2	6.2	<0.001
Rejeição	43.8	4.5	0	<0.001
Sujeira	46.9	18.2	6.2	0.006
Íris	28.1	0	6.2	0.009
Tesoura	90.6	40.9	12.5	<0.001
Sombras	93.8	27.3	6.2	<0.001
Colégio	75	18.2	0	<0.001
Maluquice	31.2	4.5	12.5	0.036
Trouxe	59.4	4.5	0	<0.001
Sítio	46.9	4.5	0	<0.001
Aumentam	40.6	0	0	<0.001
Quebra	93.8	54.5	6.2	<0.001
Viajarão	31.2	31.8	6.2	0.128
Faixa	96.9	27.3	37.5	<0.001
Casca	100	72.7	62.5	0.002
Ordem	90.6	40.9	25	<0.001
Aula	100	72.7	75	0.007
Seguida	93.8	18.2	6.2	<0.001
Garrafa	93.8	4.5	6.2	<0.001
Maçã	75	9.1	25	<0.001
Homem	93.8	31.8	18.8	<0.001
Caminhão	90.6	22.7	25	<0.001
Resfriado	100	45.5	25	<0.001
Céu	84.4	36.4	18.8	<0.001
Elegância	15.6	0	0	0.041
Longe	100	31.8	6.2	<0.001

the storage of rules and the access to the semantic lexicon[17], contributing to greater difficulty in the composition of the orthographic mental lexicon observed in students of GII and GIII[25].

In general, it was verified that all children researched, regardless their groups, made spelling mistakes when writing under dictation, varying the number of occurrences of those mistakes. The students in GI had more difficulty with arbitrary spelling than with natural spelling.

These data do not corroborate those from studies that found greater frequency of natural spelling mistakes among students without learning complaints, although this type of mistake had been more frequent in the early years of literacy[17,18].

These data also differed from another research that did not observe a distinct or specific category of spelling mistakes when several learning disorders were studied[26].

In this study, the fact that individuals without complaint are enrolled from the 3rd year of elementary school, and therefore are past the early stage of language and writing acquisition, it justifies the presence of more mistakes related to the acquisition of Portuguese spelling rules, once that the natural spelling mistakes tend to decrease with school progression, due to the increased exposure of the child to reading[17,18].

The mistake of SIJW was not observed in this research. Researchers state that in order to identify in writing the mistakes characterized by vocabulary juncture and by the improper segmentation is necessary to analyze writing through phrases and not only isolated words[27], which justifies the nonoccurrence of this kind of mistake in this study.

Regarding the distribution of correct answers of each word used in the dictation, we observed that all students in the groups without complaints correctly wrote the words: "*cuidava*", "*hospital*", "*lixo*", "*quadrado*", "*casca*", "*aula*", "*resfriado*", and "*longe*", indicating ease phoneme–grapheme relation in these words and access to the preserved orthographic mental lexicon, especially in the words "*hospital*", "*lixo*", and "*longe*", which depend on the memory for their correct spelling. This set of words could be useful for the formation of a database to be used in future researches.

On the other hand, no children of both groups with DD managed to establish the correct phoneme–grapheme relation of the words "*colchões*", "*desça*", "*herói*", "*examinou*", "*confeccionado*", "*fósforo*", "*inseticida*", "*campeonato*", "*inglês*", "*manhãzinha*", "*próximo*", "*nascimento*", "*saudável*", "*aumentam*", and "*elegância*", which are considered irregular words, some of them, also low-frequency words.

The low performance in this kind of word indicates the poor development of lexical knowledge, once that irregular words, in order to be written correctly, demands more operational memory, helping in the correct establishment of the phoneme–grapheme conversion[28].

It is known that orthographic difficulties have a negative impact on general academic performance and on professional life. The orthographic system, being conventionally established, is not developed only with maturity but also it needs to be taught. This way, the spelling skills of a child depend on the strategies taught to them[29]. By the performance shown by students in this study, it may be inferred the existence of a major failure in the formal teaching of the phoneme–grapheme relation and, later on, the spelling rules, both for students without learning complaints and, especially, for the ones with learning disorders.

CONCLUSION

The students in GII and GIII had worse performance in the task of written dictation when compared to those in GI.

There was no statistical difference between the performance of students in GII and GIII as for the number of correct spellings.

The students in GIII had worse performance in spelling mistakes for OAS and for OF in comparison to students in GII.

The students in GII had worse performance in spelling mistakes of P/GCDC in comparison to the students in GIII.

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Author contributions

DCA participated in the research as a performing researcher and was responsible for the writing of the article; EBC was responsible for the statistical analysis of the study; AAF was responsible for the statistical analysis of the study.