Original Article

Artigo Original

Rapid naming, reading and comprehension in students with learning difficulties

Nomeação rápida, leitura e compreensão em escolares com dificuldades de aprendizagem

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Keywords

Learning
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ABSTRACT

Purpose: To compare and correlate the performance of students with learning difficulties in rapid naming, reading and comprehension. **Methods:** Participants were 32 students from 4th grade of elementary school of both genders, with ages between 11 years and 4 months and 12 years and 7 months. The first and second oral reading of a text selected based on the indication of 4th grade teachers were conducted, as well as the first and second reading comprehension task composed by four questions presented right after the reading, to which students should answered orally, and the rapid naming task from the Test of Cognitive-Linguistic Performance, individual version. **Results:** Differences were found between the first and the second comprehension scores, and between rapid naming, first and second reading. There was a strong correlation between comprehension and reading, suggesting that the performance in the first reading significantly influenced the performance in the second reading, which also occurred for comprehension. **Conclusion:** The delay in the activities of naming, reading and comprehension in the first evaluation provoked failures in the phoneme-grapheme conversion that may be enough to cause learning difficulties in reading.

Descritores

Aprendizagem
Leitura
Compreensão
Memória
Educação

RESUMO

Objetivo: Comparar e correlacionar o desempenho em nomeação rápida, leitura e compreensão de escolares com dificuldades de aprendizagem. **Métodos:** Participaram deste estudo 32 escolares da 4ª série do ensino fundamental, de ambos os gêneros, com faixa etária entre 11 anos e 4 meses e 12 anos e 7 meses. Foram realizadas a primeira e a segunda tomada de leitura oral de um texto, selecionado a partir da indicação dos professores da 4ª série; a primeira e a segunda tomada de compreensão por meio de quatro perguntas apresentadas sequencialmente ao texto, em que os escolares deveriam responder oralmente; e a prova de nomeação rápida do Teste de Desempenho Cognitivo-Linguístico, versão individual. **Resultados:** Houve diferença entre a primeira e a segunda compreensão e entre nomeação rápida, primeira e segunda leitura. Houve forte correlação entre compreensão e leitura, sugerindo que o desempenho na primeira tomada de leitura influenciou de forma significativa o desempenho na segunda tomada de leitura; o mesmo ocorreu para a compreensão. **Conclusão:** A defasagem na realização das atividades de nomeação, leitura e compreensão na primeira avaliação ocasionou falhas no mecanismo de conversão fonema-grafema que podem ser suficientes para desencadear dificuldades na aprendizagem da leitura.

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INTRODUCTION

Learning difficulty refers to a deficit in the assimilation and/or understanding of the contents offered in the classroom. Such difficulties can be lasting or transient, can occur at any time in the process of teaching-learning, leading students to drop out of school, to failure, low school performance, delay in learning pace or even the need for specialized assistance. Thus, this condition, when persistent and associated to the broader risk factors present in family and social environments, can affect negatively the development of the individual and their adjustment in subsequent stages[1,2].

There isn't a consensus among the various authors of the area about the definition of learning difficulty, or how, why or when it manifests itself. According to the literature, the most frequent manifestations in learning difficulty are, in addition to poor academic performance, the difficulty to read, write, solve mathematical calculations, inattention, altered perception, memory impairment, lack of motivation, feelings of inferiority and low self-esteem[3-7].

For children diagnosed with learning difficulty, the primary findings in reading are related to phonological awareness, letter naming, working memory, rapid naming, expressive vocabulary and repetition of non-words. Phonological awareness, letter naming and rapid automatized naming are the most powerful predictors of reading acquisition, and phonological awareness is considered the strongest influencing factor when considering the acquisition of reading[7-12].

For the reading process to occur it is necessary that the child has acquired some skills, such as: language, attention to understand and interpret written language, auditory memory, visual memory, word identification, structural and contextual analysis of language, logic synthesis, expansion of vocabulary, comprehension and fluency in reading. Thus, reading involves a variety of processes that starts with the visual identification of letters and goes to the comprehension of the content and context of the written word[13-15].

Reading comprehension, as well as the reading process, also depends on the inter-relationship between various cognitive and linguistic processes. Therefore, it is necessary that the reader realize high-level cognitive processes such as the ability to make inferences, memory, access to lexicon, vocabulary and fluent reading. Basic processes such as word recognition and extraction of the meaning of printed words are not enough for a successful reading comprehension[14,16-18].

For students to present a good performance in activities of rapid naming, it is necessary to involve components such as phonological working memory, access to mental lexicon, organization and processing of visual information, retention and manipulation of information. However, according to the literature, an impairment in one of these skills can lead to poor performance in tests involving processing speed[8,11,15,19].

The skill to process visual symbols quickly is usually evaluated by means of rapid serial naming tasks. In these tasks, the time spent by the participant to name a series of familiar visual stimuli, such as letters, colors, figures and digits, repeatedly presented and in random order, is evaluated. Since the speed in decoding the written symbols (letters) is an important factor for reading a text fluently, it is expected that the performance in tasks of rapid naming be related to reading, as well as the tasks of reading comprehension, after all, the greater the skill to recognize written words rapidly and accurately, the greater the quantity of intellectual resources available for comprehension[8,11,20].

Thus, recent studies associating the skills involved in reading, such as memory, phonological awareness, reading speed, comprehension, lexical access and rapid naming of letters and figures, have become a focus of interest for work carried out on individuals with learning disorders[9,10,18,20-23]. Nevertheless, it is recent research that relates reading skills to comprehension and rapid naming, especially among students with learning difficulties. In this way, these studies, when developed, can help speech therapists to direct their treatment plan for students with reading difficulties, minimizing thus its impact in academic learning.

As a result of the above, this study aimed to compare and to correlate the performance in rapid naming, reading and comprehension of students with learning difficulties.

METHODS

This study was realized after the approval of the Ethics Committee of the School of Philosophy and Sciences of the Universidade Estadual Paulista "Júlio de Mesquita Filho" (CEP/FFC/UNESP) Marília (SP), under protocol nº 2596/2007.

The study included 32 students of the 4th grade of an elementary public school in a city in the state of São Paulo, being 23 (87,5%) males and nine (28,1%) females, aged between 11 years and 4 months and 12 years and 7 months old.

The students selected for the study were nominated by teachers, following the inclusion criteria of unsatisfactory performance in classroom in two consecutive bimesters (average scores below seven, the discretion of the school), lower performance in relation to group class, school history of learning difficulties in previous years in assessments of reading and writing, no behavioral changes, signing of the Consent Term and absence of visual or auditory complaints described in the school records of the students participating in this study. The exclusion criterion was the presence of sensory (visual or auditory), motor or cognitive impairment, described in school records.

For realization of this study, initially it was applied the Consent Term, according to resolution of the National Health Council NHC 196/96. Prior to the start of the application of the procedure, parents or caretakers of the selected students signed a consent term authorizing the realization of the study.

As procedures the tasks carried out were the first and second oral reading of a text, the comprehension through four questions sequentially presented after the text, also carried out twice, and a rapid naming test of figures.

For the performance of oral reading it was used a text selected from the suggestion of five 4th grade teachers from the municipal schools of a city in the state of São Paulo. The

teachers were asked to choose a text that best suited the grade from three text options. The text with the highest approval rating by teachers was selected for the 4th grade to realize the oral reading and text comprehension. The selected text is composed of 265 words, with the degree of complexity and word length according to the grade.

The reading of the text was done orally, in which the researcher used a stopwatch to mark the total time of reading, this procedure being performed on the first and second reading.

The text comprehension was realized by means of four questions presented sequentially after the reading of the text, and the students responded orally to these questions asked by the researcher. The questions were developed considering the levels of mental activity necessary for comprehension[24,25], involving processes of local character, to verify if the student understood the parts composing the text, and interconnected the ideas of the text, and processes of global character to verify if the student understood the text as a whole, that is, globally.

The answers to the questions of the text were recorded and analyzed to check reading comprehension, according to the following criteria: four correct answers = 100% accuracy (full comprehension), three correct answers = 75% (partial comprehension, with great detail), two correct answers = 50% (partial comprehension without great detail and accuracy in responding), one correct answer = 25% (insufficient comprehension), no correct answer (no reading comprehension). The questions were asked after the two readings were done, and the marking of the responses was carried out individually both in the first and second reading.

The rapid naming was realized after the reading and text comprehension. We used the rapid naming test of the Test of Cognitive-Linguistic Performance – individual version[26]. The test consists of a framework, presented in A4 paper, with four different figures that are repeated in random order, making a total of forty figures, and the student was told to point quickly the figures, presented in sequence, from left to right. To mark the time required for the rapid naming, the researcher used a stopwatch.

Data collection was realized in a public school in a city in the São Paulo state, in the opposite period of regular classes of the students. Text reading, reading comprehension and rapid naming were performed in one session lasting 50 minutes, individually for each student. All students in this study underwent the same procedures.

The results were analyzed statistically with significance level of 5% (0.05) for the application of statistical tests using the Statistical Package for Social Sciences program (SPSS), version 17.0. The tests used for statistical analysis were the Wilcoxon Signed-Rank test, the Friedman test and the Spearman Correlation Analysis test.

RESULTS

The means, standard deviations, minimum and maximum reference values and p-value of the variables reading and comprehension, in the comparison of the performance of the students with learning difficulties from 4th grade (Table 1), when the Wilcoxon Signed-rank test was applied, in order to verify possible differences between the variables, it was observed that there were statistically significant differences for the first comprehension and second comprehension variables, indicating that students had better performance in the second comprehension compared to the first comprehension.

Table 1. Performance of the students in reading and comprehension skills

Variables	Mean	SD	Minimum	Maximum	p-value
Comp1	0.17	0.26	0.00	0.75	0.003*
Comp2	0.27	0.29	0.00	1.00	
L1	393.91	183.79	157.00	960.00	0.701
L2	399.94	208.98	140.00	1080.00	

*Significant values (p≤0.050) – Statistical Wilcoxon Signed-rank test
Note: Comp1 = first comprehension; Comp2 = second comprehension; L1 = first reading; L2 = second reading; SD = standard deviation

To comparison of the performance of students in rapid naming compared to the first and second reading (Table 2), to used the Friedman test in order to verify possible differences between the variables of interest. The table presents the means, standard deviations, minimum and maximum reference values and p-value of the variables in the comparison of the performance of the 4th grade students with learning difficulties. According to the data, it was observed that there was statistically significant difference between the variables of rapid naming and first reading and rapid naming and second reading, suggesting means with superior performance for the second reading variable compared to the rapid naming.

Table 2. Performance of students in rapid naming and reading skills

Variables	Mean	SD	Minimum	Maximum	p-value
NR	45.09	10.96	30.00	80.00	<0.001*
L1	393.91	183.79	157.00	960.00	
NR	45.09	10.96	30.00	80.00	<0.001*
L2	399.94	208.98	140.00	1080.00	

*Significant values (p≤0,050) – Statistical Friedman test
Note: NR = rapid naming; L1 = first reading; L2 = second reading; SD = standard deviation

In the correlation between variables of rapid naming, reading and comprehension (Table 3), when the Spearman Correlation Analysis was applied, to assess the degree of relationship among variables, it was observed that there was a statistically significant difference, with positive correlation coefficient between the variables: first comprehension and

second comprehension, first reading and second reading, pointing to a strong correlation between first and second comprehension (correlation coefficient: 0.836), where the performance of students in the second comprehension suffered interference of the first comprehension realized; the same happened to reading, with strong correlation in this skill (correlation coefficient: 0.887).

Table 3. Correlation on the performance of students in the variables of rapid naming, reading and comprehension

Statistic variable		Comp1	Comp2	NR	L1
Comp2	Correlation coefficient	0.836			
	p-value	0.000*			
NR	Correlation coefficient	0.204	0.325		
	p-value	0.263	0.070		
L1	Correlation coefficient	0.336	0.141	0.139	
	p-value	0.060	0.440	0.449	
L2	Correlation coefficient	0.180	0.004	0.097	0.887
	p-value	0.324	0.984	0.599	0.000*

*Significant values (p≤0.050) – Statistical Correlation of Spearman test
Note: Comp1 = first comprehension; Comp2 = second comprehension; NR = rapid naming; L1 = first reading; L2 = second reading

DISCUSSION

The results of this study revealed that, in the comparison of the comprehension skill, students showed superior performance when they realized the second reading comprehension, indicating that after the second reading, the students obtained better performance than in the first reading for the comprehension of the questions related to the text.

These results are in agreement with studies that indicate that after the second reading of a text, the capacity to retain information about the text increases, so that the words found in the material for reading become easier to be recognized/decoded, and as for those less recurrent words, difficult to decode in a first contact and that can impair full comprehension of the reading material, they become more familiar, besides the influence of storage resources, available for the achievement of the task of reading comprehension, which allows a full comprehension of the text and in the case of students with learning difficulties allows a richer comprehension in detail, although not obtained fully[8,17,27].

According to the correlation analysis, we can see that the performance of students both in the first reading and in the first comprehension are influenced by prior knowledge of the text, and this can be verified by the degree of association obtained between the first and second reading and comprehension.

This means that in every test there was a significant increase compared to the other tests and that all students presented the same performance. The data support research that points to the expansion of memory capacity, higher retention of information from reading material, when the student is exposed to the same content repeatedly, indicating that for students with learning difficulties there is greater use of attentional, perceptual and visual processes for the recovery of lexicon of greater extension[25,29].

For the reading skill, when the comparison of the performance of students between the first and second reading was conducted, it was possible to verify superior performance for the second reading, indicating that the time necessary to achieve the activity decreased, improving the performance of these students.

The ability to recognize and decode letters and words presented in the text becomes higher when the student is exposed to a second attempt to read. Thus, the mechanisms that composes the reading processing, such as phonological memory, visual processing and access to mental lexicon, permit processing and organization of the reading. Likewise, they are requested by the central executive component in tasks of comprehension, naming, spelling, and even in tasks of phonological awareness and grapheme-phoneme association[7,14].

Regarding the strong positive correlation between the variables of the first and second reading, we can verify that the average performance in the first reading resulted in an increase in average performance on the second reading, indicating that these variables have parallel behavior with a significant increase when compared.

We know that, as well as for comprehension, there are in reading several skills that correlate for these processes to occur and may sufferer interference of an attentional factor that acts directly on the capture of stimuli. The ability to read through letter decoding or letter sequence with their corresponding sounds relates directly to the ability to process visual symbols quickly. It is therefore not surprising that individuals with learning difficulties and, consequently, with a possible deficit in reading and comprehension have changes in the letter/sound conversion mechanism, with poor performance on tasks that assess awareness of phonemic segments and rapid naming of stimuli[18,21,25].

When rapid naming skills were compared to reading, we observed a statistically significant difference between rapid naming and the first reading, and rapid naming and the second reading. In some studies we found evidence that the skill of rapid serial naming is modulated by the reading skill, therefore, to perform reading, the reader must decode symbols correctly, quickly and successively, using their phonological awareness, and for the performance in tests of rapid naming to be satisfactory, the same should occur, that is, the quick decoding of symbols presented repeatedly and randomly. Moreover, not only the skills mentioned above are involved for reading and rapid naming successfully, but also skills of memory, lexicon access, visual processing and processing speed need to be present[15,23,30].

These data corroborate studies that relate tasks of rapid naming to tasks of reading and spelling, providing support for

a possible correlation between rapid naming and phonological awareness associated with reading performance. This indicates that the accuracy for the grapheme-phoneme representation, that is, fast access to the phonological representation is a prerequisite for the development of automaticity in reading in a writing system of alphabetical basis. Thus, rapid naming has a phonological component used in decoding/naming of several symbols that can interfere, even if independently, in specific skills needed for literacy[11,29,30].

Previous studies suggest that rapid naming and phonological awareness contribute to the reading skill, showing a connection between the skill to read and the fast and successive encoding of phonemes, pointing to an even closer relationship between the rapid naming skill and the fluent reading skill. Both the skill to quickly name series of stimuli (pictures, colors, numbers, etc) and the skill to recognize regular and irregular words involve the skill to learn arbitrary symbol-name-sound relationships[10,11,30].

CONCLUSION

According to the data obtained in this study, we conclude that there was an increase of the average performance of students with learning difficulties in the skill of reading and comprehension in the second assessment when compared to the first, indicating that exposure of these students to the same reading content allows better decoding and retention of linguistic material.

Regarding the correlation analysis, for reading and comprehension, we found that there was a strong correlation, indicating that the better the performance of students in reading, the better the performance in reading comprehension, suggesting, thus, that the gap in learning of these students to realize activities of naming, reading and, consequently, comprehension, in a first reading, can generate failures in the phoneme-grapheme conversion mechanism that can be enough to cause learning difficulties of reading.

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