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Reading comprehension in dyslexic schoolchildren after an intervention program

Compreensão de leitura em disléxicos após programa de intervenção

Keywords

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Descritores

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ABSTRACT

Purpose: To develop a Speech-language Pathology (SLP) program and verify its effects on the reading comprehension of dyslexic students. **Methods:** Participants were eleven 4th and 5th-grade Elementary School students, eight boys and three girls, aged 9-11 years, diagnosed with developmental dyslexia. All individuals underwent the therapeutic program, which was composed of 16 sessions divided into four levels of complexity. A text adapted according to the Cloze technique and reading comprehension and orthography tasks were used in each session. The schoolchildren had their reading comprehension assessed pre- and post-program using a text available at the Test of Reading Comprehension of Expository Texts, adapted for application of the structural Cloze technique without support, according to the Evaluation of Reading Comprehension Levels. **Results:** The participants showed better performance in reading comprehension at the post-program assessment not only in the filling of blanks in the text adapted according to the Cloze technique and in the Responses to Reading Comprehension Questions, but also in the level of reading comprehension achieved. **Conclusion:** The SLP program improved the reading comprehension performance and increased motivation to reading of dyslexic schoolchildren. Both the Cloze technique and the Reading Comprehension Questions were useful tools to develop and identify changes in the reading comprehension of the students assessed. This study is relevant because it prepared and verified the effects of a specific remediation program for schoolchildren with dyslexia by proposing the use of texts adapted according to the Cloze technique combined with other various tasks of reading comprehension and orthography.

RESUMO

Objetivo: Elaborar um programa terapêutico fonoaudiológico e verificar seus efeitos na compreensão de leitura de escolares disléxicos. **Métodos:** Participaram do estudo onze escolares de 4^o e 5^o anos do ensino fundamental, diagnosticados com Dislexia do Desenvolvimento, com idades entre nove e onze anos, sendo oito meninos. Todos foram submetidos ao programa terapêutico fonoaudiológico com 16 sessões, divididas em quatro níveis de complexidade. Em cada sessão, foram utilizados um texto adaptado com a Técnica de Cloze e tarefas de Compreensão Textual e Ortografia. Os sujeitos realizaram avaliação da compreensão leitora no pré e no pós-teste com um texto do Teste de Compreensão Leitora de Textos Expositivos, adaptado com a Técnica de Cloze estrutural sem apoio, seguido da Avaliação dos Níveis de Compreensão de Leitura. **Resultados:** Os sujeitos apresentaram melhor desempenho na compreensão leitora no pós-teste, tanto no preenchimento do texto adaptado com a Técnica de Cloze e nas respostas às Perguntas de Compreensão Textual quanto no nível de compreensão de leitura atingido. **Conclusão:** O programa elaborado gerou melhor desempenho na compreensão leitora dos escolares disléxicos e na motivação para a leitura. A Técnica de Cloze e as Perguntas de Compreensão Textual foram instrumentos úteis para desenvolver e apontar mudanças na compreensão de leitura dos sujeitos desta pesquisa. Trata-se de estudo relevante, por elaborar e verificar os efeitos de um programa específico de remediação para disléxicos, com uma proposta de aplicação de textos usando a Técnica de Cloze e aliando-a a outras tarefas diversificadas de compreensão de leitura textual e ortografia.

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INTRODUCTION

Reading comprehension is an interactive process in which the reader builds a mental representation about the meaning of the text read using cognitive strategies to deal with the information conveyed in the text and associating them with their previous knowledge^(1,2).

Reading processing has been studied for several decades, and various theoretical models have been proposed for this analysis, such as the Text Comprehension and Production model proposed by Kintsch and Van Dijk⁽¹⁾. According to those authors, reading comprehension can occur in three different sets of operations: 1 - the first and most basic, the surface structure of the discourse, consists of the construction of the text microstructure. At this level, the reader decodes words and phrases, send them to the working memory and access their meanings, relate them to each other and constructs an initial mental representation of the propositions and ideas in the text; 2 - in the following set, representation of the text-base, the reader organizes the information of the microstructure of the text and forms a coherent mental representation of the subject addressed, in a global way, to construct the text macrostructure; 3 - the third and highest set is the level at which the information on the text-base is related and integrated to the reader's previous knowledge, constructing a mental representation of the situation present in the text. It is important to emphasize that the knowledge and previous experiences are specific to each individual, a fact that can influence the comprehension of the texts.

Castillo is another researcher who suggests the identification of reading comprehension levels⁽³⁾. According to that author, reading comprehension can be observed at three different levels: 1- Literal Comprehension: the reader is able to understand the meaning of sentences or clauses, report what has been read, store specific details or facts, and answer questions related to explicit content; 2- Independent Comprehension: the reader is able to localize and establish relationships between the main and secondary ideas of the text, paraphrase the content read, activate previous knowledge, formulate predictions, hypotheses and inferences, establish analogies, and draw conclusions; 3- Critical Comprehension: the reader is able to analyze the accuracy of the information and the depth at which the theme was worked by the author, recognize ambiguities and confusion, and understand the pertinence of the conclusions.

Those two reading comprehension proposals influenced the analysis of text reading comprehension performed in this study.

Fluent reading and comprehension have also been associated with orthographic knowledge, because the motivation of orthography learning favors the automatic recognition of words, which in turn positively influences reading fluency and provides clues for activation of the phonological, morphologic, syntactic and semantic systems^(4,5).

Developmental dyslexia (DD) is a specific learning disorder of neurobiological origin characterized by difficulties in the accuracy and fluency in reading words and by impaired decoding and orthography skills. Such difficulties generally result from a deficit in the phonological component of language and are not expected in other cognitive abilities and in access to adequate

school instruction. Secondary consequences of DD include problems in reading comprehension and reduced experience with writing, which can hinder vocabulary increase and general knowledge⁽⁶⁾.

Despite the broad understanding of the characteristics observed in this population, there are few studies addressing the preparation of specific programs aimed at motivating text reading comprehension in dyslexic individuals⁽⁴⁾.

There are several instruments focused on the evaluation and intervention of reading comprehension in individuals with typical development and/or with reading and writing difficulties⁽⁷⁾. Two of these instruments were used in this study: the Cloze technique and the Responses to Reading Comprehension Questions, presented ahead.

The Cloze technique (CT)⁽⁸⁾ is a method used to assess the reading comprehension of texts. This procedure consists in organizing a text of approximately 200 words leaving the first and last sentences intact and deleting, in the rest of the text, the fifth, seventh or tenth functional words and/or lexically deleting words from the same grammatical category. Empty spaces (blanks) are inserted in the places of the deleted words. These blanks should be filled by the reader in order to restore the full meaning of the sentence and of the text as a whole.

The CT requires knowledge that supports reading comprehension, such as readers' expectations (due to their previous knowledge), use of textual cues (syntactic and semantic), vocabulary, attention and motivation for reading activities.

In the literature, the CT has been used mainly to develop and evaluate reading comprehension in children with typical development and the results indicate that, in addition to being a good assessment instrument, it has been able to develop reading comprehension in this population⁽⁸⁻¹¹⁾.

Responses to Reading Comprehension Questions (RCQ)^(9,12,13) is a tool widely used to evaluate and develop reading comprehension in schoolchildren, including those with DD, through the use of questions about the content of the text read. When the questions are prepared according to the reading level of the students and discuss information extracted from the reading itself, students are encouraged to reflect on the reading strategies and answer the questions according to their comprehension of the material read, thus enabling critical, logical and creative thinking^(12,13).

In this context, justification for the present study is based on the premise that the CT combined with the responses to RCQ can be relevant instruments for evaluating and developing reading comprehension in schoolchildren with DD.

By initially proposing the reading of the text as a whole and then reading and filling the blanks, CT can direct dyslexic children to pay attention to each element within the phrase, favoring their knowledge on orthography and phrase and text structure. Moreover, it is considered that, because this technique provides self-monitoring of reading and self-correction in filling the blanks, it can increase the motivation of dyslexic individuals to read larger segments, such as texts.

Responses to RCQ can assist dyslexic children with understanding which points they should focus on during reading, by directing attention to elements with different levels of relevance for understanding the contents of the reading therapists intend to stimulate and/or evaluate. These experiences can assist readers

with identifying, autonomously, which information to seek in the text and how to integrate it with their previous knowledge to obtain coherent reading comprehension⁽¹⁴⁾.

Therefore, this study aimed to develop a Speech-language Pathology (SLP) program and verify its effects on the reading comprehension of students with DD.

METHODS

This study was approved by the Research Ethics Committee of the Institution of origin under protocol no. 119/14. The parents and/or legal guardians of the participants were informed about the procedures and signed an Informed Consent Form (ICF) prior to study commencement. The participating children were informed, in a simplified way, about the procedures they would perform and signed an Assent Form.

Participants

Fifty-five schoolchildren were initially selected for this study, but 44 were excluded because they did not meet the inclusion criteria: be authorized by parents and/or legal guardians to participate in the study, confirmed by an ICF; have the informative questionnaire responded by parents and/or legal guardians⁽¹⁵⁾; present diagnosis of developmental dyslexia (DD) confirmed by a multidisciplinary team; show alphabetic level of writing and basic reading decoding level (understood as the ability to read, minimally, words of consonant/vowel structure with a univocal phoneme-to-grapheme ratio) measured by tasks of Dictation and Reading of Words of the School Performance Test (SPT)⁽¹⁶⁾; present absence of cognitive deficits and auditory and visual complaints informed by the parents in the informative questionnaire or identified by the tests applied by the multidisciplinary team for the diagnosis of DD; be enrolled in the 4th or 5th grade of Elementary School in the public or private school network; be aged 8-12 years; not undergo Speech-language therapy (SLP) or psychoeducational therapy during the study period.

Therefore, the final study sample was composed of 11 children (three girls and eight boys) aged 9-11 years diagnosed with DD. Of these, three were 4th and eight were 5th grade students.

Materials and methods

Pre- and post-program assessments

All study participants were assessed before and after undergoing the Speech-language Pathology program (pre- and post-intervention assessments) with the objective of evaluating their reading comprehension performance. Evaluation lasted 60 min on average. The same tests and materials were used at both assessment moments to ensure homogeneity of the material: 1 - Test of Reading Comprehension of Expository Texts⁽¹⁷⁾: a 4th grade level text (“*As Llamas*”) adapted for application of the structural Cloze Technique without support with deletion every five words was used. The students were initially instructed to read the entire text silently trying to understand the message, even in the presence of blanks. Then they were asked to fill in each of the blanks with the words they deemed appropriate for maintenance of the content; 2 - Evaluation of Reading

Comprehension Levels (Cárnio MS, Soares AJC, Alves DC. Protocolo adaptado de Castillo, HV para utilização no Programa Escola e no Laboratório de Investigação Fonoaudiológica em Leitura e Escrita do Curso de Fonoaudiologia da FMUSP. 2012): when the participants finished reading and filling the blanks in the text (“*As Llamas*”), they were asked to respond orally to seven Reading Comprehension Questions (RCQ) without support (open) about its content, so that the examiner could fill in the specific protocol of the assessment and thus classify the students into a level of reading comprehension.

It is worth noting that both tests were applied with an interval of more than three months, which hinders generalization of learning for the application of the post-program assessment.

Intervention program

The Speech-language Pathology Program for Reading Comprehension and Orthography (PRCO) in Individuals with Developmental Dyslexia was developed and applied in two master’s degree studies, entirely. Therefore, to better understand the structure of the program and the materials used in its preparation, we suggest consulting the study by Nogueira and Cárnio⁽⁴⁾.

It is important to highlight that each research emphasized different aspects. The present study aimed at analyzing reading comprehension, whereas the other addressed orthography⁽⁴⁾. Thus, this study will present only data referring to reading comprehension.

The PRCO is a closed program comprising 16 individual weekly sessions of 60 min each. The program was organized into four levels of complexity, consisting of four motivation sessions. The criterion to advance to a different level was 50% of correct answers in the completion of the text with application of the Cloze technique (CT), in the last session of each level.

Participants who reached or exceeded this percentage of correct answers in the fourth session of each level completed the total program (16 sessions) and the four levels proposed.

In cases where the participants failed at some level of the program, they had to perform it again (with four new texts and activities at the same level of complexity); fulfilling the 16 sessions proposed, but without completing the four levels of the PRCO.

Preparation of the PRCO included 16 sessions for level I, 12 sessions for level II, eight sessions for level III, and four sessions for level IV.

The levels of the PRCO present increasing difficulty, and the sessions were composed of a text with application of the structural CT, with deletion every five words, tasks based on the different levels of reading comprehension proposed by Castillo⁽³⁾, and orthography tasks⁽⁴⁾.

Statistical analysis

In order to compare the means of correct response percentages at both assessment times (pre- and post-program), the Paired sample *t*-test was applied for the results of the structural CT without support and for the RCQ without support (open) on text content. Normality of the difference between the two

assessment times was verified through the construction of a normal probability plot. The Pearson's correlation coefficient was considered as a measure of the linear correlation between the percentages of correct answers in the CT and RCQ at the pre- and post-program assessments. To verify whether the intervention program had an effect on the students' reading comprehension level (through questions without support), categories were assigned to this variable for each individual and the Friedman test was applied. The data were processed using the SPSS 18 and Minitab 17 software. A significance level of 5% ($p < 0.05$) was adopted for all statistical analyses.

RESULTS

Table 1 shows that the mean of correct answers in the filling of text blanks using the Cloze technique (CT) obtained at the post-program assessment was higher than that at the pre-assessment, which indicates an evolution in the reading comprehension of the dyslexic students, considering that they should understand the correct meaning of words and phrases in order to fill the blanks correctly.

Statistically significant difference was observed between the means of correct response percentages at the pre- and post-program assessments ($p = 0.001$), with higher means found at the post-program assessment. The estimated mean difference was 23.4% (CI 95%: [12.6; 34.1]).

In the individual profiles shown in Figure 1, it can also be observed that most individuals had a higher percentage of correct answers at the post-program assessment, except for individual 1.

Table 2 shows the average percentages of correct answers in the Text Comprehension Questions without support and the difference in performance in pre-test and post-test.

The mean percentage of correct answers observed at the post-program assessment was higher than that found at the pre-assessment, a fact that suggests evolution in the reading comprehension performance of the schoolchildren, because it is understood that they need to understand the text properties in order to answer the questions related to it correctly.

Statistically significant difference was verified between the means correct response percentages in the RCQ at both assessment times ($p = 0.002$), with higher mean observed at the

post-assessment. The estimated mean difference was 28.6% (CI 95%: [13.10; 44.1]).

In the individual profiles illustrated in Figure 2, it can be verified that most individuals had a higher percentage of correct answers at the post-program assessment.

Dispersion diagrams were built in order to evaluate the correlation between the percentages of correct answers in the CT and RCQ at the pre- and post-program assessments (Figure 3). The dispersion diagrams show that the percentage of correct answers in the RCQ tends to increase as the percentage of correct answers in the CT increases, at both assessment times.

The Pearson correlation coefficients of the correct response percentages in the CT and RCQ in the pre- and post-program assessments were 0.81 ($p = 0.003$) and 0.84 ($p = 0.001$), respectively. These data indicate that there is a positive linear correlation between both variables.

Table 3 shows the distributions of frequencies and marginal and joint percentages of the reading comprehension level using questions without support at both assessment times. A change in the distributions of marginal percentages was observed between the pre- and post-program assessments: while 45.5% of the individuals were classified in the "does not understand" level at the pre-assessment, only 9.1% of them remained at this level at the post-assessment. It was also observed that most individuals were classified in the "literal comprehension" level

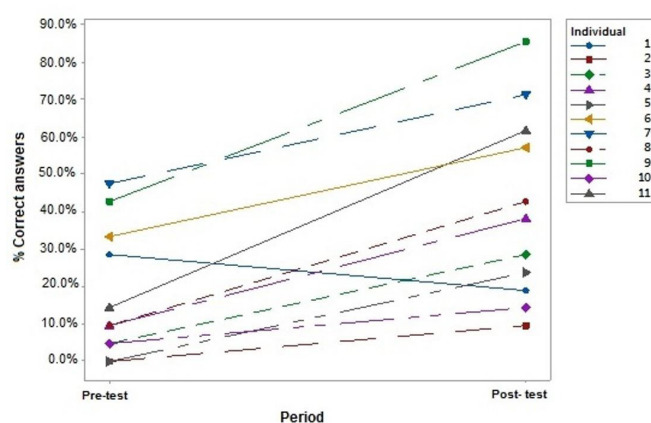


Figure 1. Individual profiles of the percentage of correct answers in the Cloze technique

Table 1. Percentage and difference of correct answers in filling text blanks with application of the Cloze technique at the pre- and post-program assessments

Period	N	Mean	Standard deviation	Minimum	Median	Maximum
Pre-program	11	17.7	17.3	0.0	9.5	47.6
Post-program	11	41.1	25.0	9.5	38.1	85.7
Difference	11	23.4	16.0	-9.5	23.8	47.6

Paired sample *t*-test: $p = 0.001$; Significance level = 0.05

Table 2. Percentage and difference of correct answers in the Reading Comprehension Questions at the pre- and post-program assessments

Period	N	Mean	Standard deviation	Minimum	Median	Maximum
Pre-program	11	15.6	19.6	0.0	0.0	42.9
Post-program	11	44.2	28.2	0.0	42.9	100.0
Difference	11	28.6	23.0	0.0	14.3	57.1

Paired sample *t*-test: $p = 0.002$; Significance level = 0.05

Table 3. Distributions of frequencies and marginal and joint percentages of the reading comprehension level using questions without support at the pre-and post-program assessments

Pre-program	Post-program				Total
	Does not comprehend	Initial Comprehension	Literal Comprehension	Critical Comprehension	
Does not comprehend	1 9.1%	1 9.1%	3 27.3%	0 0.0%	5 45.5%
Initial Comprehension	0 0.0%	1 9.1%	2 18.2%	0 0.0%	3 27.3%
Literal Comprehension	0 0.0%	0 0.0%	2 18.2%	1 9.1%	3 27.3%
Total	1 9.1%	2 18.2%	7 63.6%	1 9.1%	11 100.0%

Friedman test: $p=0.008$; Significance level=0.05

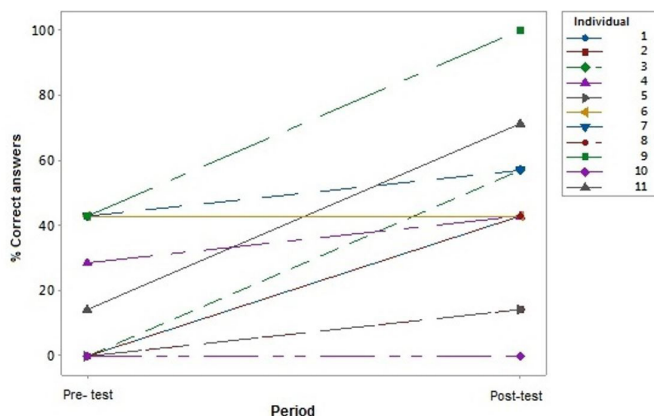


Figure 2. Individual profiles of the percentage of correct answers in the Reading Comprehension Questions

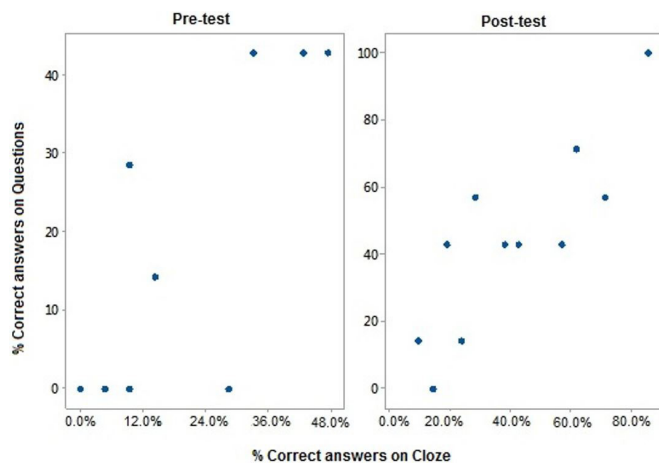


Figure 3. Dispersion diagrams of the percentage of correct answers in the Cloze technique and Reading Comprehension Questions at the pre-and post-program assessments. Note: Pearson's correlation coefficient at the pre-program assessment = 0.81 ($p=0.003$). Pearson's correlation coefficient in the post-program assessment = 0.84 ($p=0.001$). Significance level=0.05

at the pre-assessment and only one individual (9.1%) reached the “critical comprehension” level at the post-assessment. It is worth emphasizing that none of the individuals was classified in the “independent comprehension” level at both evaluation times of this study.

The Friedman test showed that the level of reading comprehension at the post-program assessment tends to be higher than that at the pre-assessment ($p=0.008$).

DISCUSSION

This study aimed to develop a Speech-language Pathology program (PRCO) and verify its effects on the reading comprehension of students with developmental dyslexia (DD).

The objective was achieved with respect to the preparation of the intervention program considering that the PRCO comprises 16 sessions focused on the motivation of reading comprehension and orthography, with positive effects both in the study by Nogueira and Cárnio⁽⁴⁾ and in this study, in texts with application of the Cloze technique (CT) and Reading Comprehension Questions (RCQ). It was a challenge to prepare the PRCO because of the difficulty in selecting texts, preferably narrative, that respected the requirements of the current study, since they needed to present increasing complexity of reading comprehension and orthography levels, encompassing phonological, morphosyntactic and semantic aspects.

The schooling level of the study participants was considered in the selection of texts, because dyslexic children present reading performance (decoding, speed and comprehension) substantially below the expected for their age group and level of education⁽¹⁸⁾.

Comparison between the pre- and post-program assessments for the filling of blanks in a text adapted using the CT (without support) showed that, in general, the students obtained larger number of correct responses in this task at the post-assessment than at the pre-assessment, with an mean difference of 23.4%. Only Individual 1 achieved better performance at the pre-assessment (28.57%) compared with that at the post-assessment (19.05%). It is worth noting that this individual missed several PRCO sessions because of serious family problems, a fact that may have negatively influenced his learning process.

These data suggest, initially, that students with DD who were previously unfamiliar with this task began to understand the mechanisms involved in it and its relevance to reading comprehension after the stimulation period. More specifically, the importance of the first reading of the text without filling the blanks can be highlighted. At the pre-program assessment,

the students complained and wanted to read the text and fill the blanks at the same time, but there were no complaints at the post-assessment, which shows that they understood the importance of this task. Being able to organize the semantic information of the text at the micro- and macrostructure levels allowed them, during the second reading, to reflect on which words would be more appropriate to fill the blanks, thus indicating that working with reading levels is fundamental also for schoolchildren with DD^(1,3).

Another important aspect to be considered is that the CT requires and encourages the reader to make use of textual cues (syntactic and semantic), a fact that may have positively contributed to the reading comprehension development process of dyslexic children, since the recent literature points out that semantic abilities can predict the efficiency of decoding words and pseudo-words⁽¹⁹⁾.

Moreover, it should be emphasized that the text adapted according to the CT (without support) used at the pre- and post-program assessments enabled identification of differences, in percentage of correct answers, in the reading comprehension and orthography performance⁽⁴⁾ of the individuals.

These findings corroborate the literature, which considers CT as an important instrument for the evaluation and development of reading comprehension, because the individual needs to understand the text syntactically and semantically in order to fill in the blanks correctly^(11,20,21).

Another aspect to consider is that, although the literature points out that dyslexic schoolchildren have little motivation for reading⁽²²⁾, the way the program was prepared allowed measurement of the correct response percentage at the end of each intervention session and the gradual increase of blank filling complexity (per level). This enabled the students to monitor their performance along the PRCO, aiming to progress to the next level, a fact that may have positively influenced the motivation of individuals to read and fill in the blanks, paying attention to their orthography and reading comprehension performance⁽⁴⁾.

In this context, the present study suggests that the CT can be considered an instrument capable of evaluating and developing the reading comprehension of schoolchildren with DD.

Comparison between the pre- and post-program assessments using the Reading Comprehension Questions (RCQ) without support showed similar results, since most students presented better performance at the post-assessment, with statistically significant difference between the means of correct response percentages between both assessment times (estimated mean difference of 28.6%). In this method of reading comprehension evaluation, performance at the post-assessment was always better than at the pre-assessment, which evidences the relevance of this method for children with DD.

According to the literature, responses to questions about a text read or heard are a resource widely used to evaluate and develop reading comprehension in children and adolescents, because even if they read slowly, they need to understand the text content to answer the questions correctly⁽⁹⁾. In addition, preparing the questions considering the level of reading and the requirement of answers that result from the comprehension of the text allow individuals to reflect about their reading strategies,

adequately respond to them, and develop critical, logical and creative thinking⁽¹²⁾.

The way the program was organized, with gradual increase in complexity of the questions (reading comprehension levels), may have been a facilitating factor for the reading comprehension development of dyslexic schoolchildren, as it assisted them with understanding on which points they should focus during the reading. The program started from questions of literal comprehension, which led the individuals to understand the importance of identifying basic points of the structure of a narrative text (characters, place, time, development, climax and outcome). Then it shifts to independent comprehension questions, leading the students to localize and establish relationships between the main and secondary ideas of the text. It ended with questions of critical comprehension, which, in turn, assisted them with formulating hypotheses, recognizing ambiguities, and understanding the coherence of their conclusions.

Thus, readers were guided to understand the importance of some factors, such as localizing relevant information, establishing relationships between main and secondary ideas, activating previous knowledge, formulating predictions and inferences, drawing conclusions, and recognizing ambiguities and inconsistencies to achieve the reading comprehension of a text.

The results obtained in this study demonstrated the efficacy of the use of RCQ, corroborating the literature. Readers can formulate their own questions directed to comprehension before and during reading, and recognize when they did not understand, thus being able to perform a rereading or other actions to resolve such difficulties^(2,14).

It should be emphasized that RCQ are widely used in the school context and, thus being an evaluation method that is closer to the students in this study than the CT^(12,23), a fact confirmed by the results obtained. Overall, performance in the RCQ was higher than that in the CT.

Comparison between the evaluation methods showed that the percentage of correct answers in the RCQ tends to increase as the percentage of correct responses in the CT increases, at both assessment times. Therefore, this study demonstrated that both the RCQ and the filling of blanks in texts with application of the CT are equally valid instruments to assess reading comprehension in children with DD. Given the positive correlation, these findings enable professionals to use either of these instruments alone or combined, depending on the time available, the number of individuals to be evaluated, and on many other variables inherent in each research, clinical or educational situation.

This finding brings an important contribution to professionals working with this population, since both evaluation methods used in this study are extremely accessible, because they are easy to prepare, of low cost, can be applied individually or in groups, and can be used in scientific, educational and clinical contexts. However, a possible limitation to this study concerns the fact that the same text was used in both evaluation methods, which may have influenced the reading comprehension of the individuals in the second evaluation method.

In this study, analysis of the reading comprehension levels achieved by the students at the pre- and post-program assessments suggest that, most of the study participants showed evolution,

though small, after the intervention program. The results indicate that the schoolchildren migrated from lower to higher levels of reading comprehension, that is, five students did not understand what they read at the pre-assessment, but only one individual remained in this situation at the post-assessment. The results showed that most (seven) schoolchildren achieved the level of literal comprehension at the post-program assessment, demonstrating that these students were able to develop ability to understand the explicit elements of the text.

It can also be speculated that, if the program had included a larger number of sessions directed not only to the students, but also to their teachers and relatives, more schoolchildren could have achieved the reading level of critical comprehension, a fact that occurred with Individual 9 of this study⁽²⁴⁾. This student was outstanding due to the active participation in the program, taking the knowledge acquired to other contexts, such as search for reading materials and educational applications of interest.

The involvement of this student's family with the PRCO, through the support and assistance with performing home tasks similar to those presented in the sessions, can be considered a differential in relation to the other participants of the program. This finding corroborates the literature, which reports the importance of family participation in the teaching-learning process of reading and writing⁽²⁵⁾.

It is worth noting that, despite the evolution observed in the dyslexic schoolchildren throughout the program, most of the study participants still present difficulties in reading comprehension. In this sense, other studies have also reported that dyslexic individuals responded slowly to the therapeutic interventions undergone, and that reading and writing difficulties may persist even after stimulation. Nevertheless, these interventions are extremely relevant to their reading and writing development^(4,26,27).

Finally, it can be stated that the PRCO was an instrument of easy applicability and verification both for the evaluation and the development of reading comprehension in schoolchildren with DD.

We consider that the differential of this program was the stimulation of decoding and reading comprehension with combination of the use of texts adapted using the CT and RCQ (with and without support) of different levels of complexity (literal, independent and critical), as well as other various orthography tasks, with careful selection of the texts regarding grammatical, morphological, syntactic, phonological and semantic aspects.

CONCLUSION

The Speech-language Pathology Program in Reading Comprehension and Orthography (PRCO) in Individuals with Developmental Dyslexia (PRCO) prepared for this study improved the reading comprehension capacity of the dyslexic 4th and 5th grade students who participated in this study. It also increased their motivation to perform reading comprehension and orthography activities.

The Cloze technique (CT) and the Reading Comprehension Questions (RCQ) without support are relevant instruments for evaluation and intervention in the reading comprehension of students with developmental dyslexia (DD), because they are

complementary and enable accurate diagnosis at the beginning, during, and at the end of the intervention program.

This study brings relevant contributions to the reading and writing area, because the PRCO used involves a combination of tasks of filling blanks in texts with application of the CT, responses to RCQ, and other diversified orthography tasks, demonstrating that its comprehensive design improves reading comprehension development in students with DD after a short period of intervention.

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Author contributions

LZM was responsible for collection, tabulation, analysis and interpretation of the data and writing of the manuscript; MSC was responsible for the study design, analysis and interpretation of the data, and writing and revision of the manuscript.