

Ana Paola Nicolielo-Carrilho¹
Simone Rocha de Vasconcellos Hage¹

Metacognitive reading strategies of children with learning disabilities

Estratégias metacognitivas de leitura de crianças com distúrbio de aprendizagem

Keywords

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Correspondence address:

Simone Rocha de Vasconcellos Hage
Alameda Dr. Otávio Pinheiro Brisola,
9-75, Vila Nova Cidade Universitária,
Bauru (SP), Brazil, CEP: 17012-901.
E-mail: simonehage@usp.br

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ABSTRACT

Purpose: to check the use of metacognitive reading strategies in children with learning disabilities and determine whether there is a relationship between their use and text comprehension. **Methods:** the study was conducted on 30 children, aged 8 to 12 years, of both genders, divided into experimental group (EG) - 15 children with learning disabilities; and control group (CG) - 15 children without disability. All children were submitted to the Reading Strategies Scale and Prolec text comprehension subtest. The sample was described in mean, median, minimum and maximum values. Comparative analysis was performed between the groups using the Mann-Whitney test. The degree of correlation between variables was verified by Spearman Correlation Analysis. The significance level was set at 5%. **Results:** across the total scores of the scale, EG performance was lower in all descriptive measures, with a significant difference compared to CG. The EG achieved a performance close to children without difficulties only in global strategies. The correlation between the use of metacognitive strategies and reading comprehension was positive. **Conclusion:** children with learning disabilities showed deficits in the use of metacognitive reading strategies when compared to children without learning disabilities. The better the performance in reading strategies, the better textual comprehension was and vice versa, suggesting that metacognitive reading skills contribute to reading comprehension.

RESUMO

Objetivo: verificar o uso de estratégias metacognitivas de leitura de crianças com Distúrbio de Aprendizagem e averiguar se há relação entre este uso e a compreensão de textos. **Método:** participaram 30 crianças, de 8 a 12 anos, de ambos os gêneros, divididas em grupo experimental (GE) - 15 crianças com Distúrbio de Aprendizagem; e grupo controle (GC) - 15 crianças sem dificuldades. Todas foram submetidas à Escala de Estratégias de Leitura e o subteste compreensão de textos do *Prolec*. A descrição da amostra foi feita em valores de média, mediana, mínimo e máximo. Para análise comparativa entre os grupos, foi utilizado o Teste de *Mann-Whitney*. O grau de correlação entre as variáveis foi verificado pela *Análise de Correlação de Spearman*. Foi adotado o nível de significância de 5%. **Resultados:** na pontuação total da escala, o desempenho do GE foi inferior em todas as medidas descritivas com diferença significativa em relação ao GC. O GE apresentou desempenho próximo ao das crianças sem dificuldade somente nas estratégias globais. A correlação entre o uso de estratégias metacognitivas e a compreensão de textos foi positiva. **Conclusão:** as crianças com Distúrbio de Aprendizagem evidenciaram déficits na utilização de estratégias metacognitivas de leitura quando comparadas às crianças sem dificuldade de aprendizagem. Quanto melhor o desempenho na escala de estratégias de leitura, melhor foi o desempenho na compreensão dos textos e vice-versa, sugerindo que habilidades metacognitivas para leitura contribuem para a compreensão leitora.

Study carried out at Departamento de Fonoaudiologia, Faculdade de Odontologia de Bauru, Universidade de São Paulo – USP - Bauru (SP), Brazil.

¹ Universidade de São Paulo – USP - Bauru (SP), Brazil.

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INTRODUCTION

Some schoolchildren present important problems while learning how to read and write, posing a great challenge to educators and health professionals⁽¹⁾. The difficulties experienced by them imply low performance in reading and/or writing activities, besides mathematical operations, even though they present normal intelligence, no visual or hearing impairment or emotional disorders, and appropriate academic opportunities⁽²⁾. These characteristics are present in cases of Learning Disabilities (LD)⁽³⁾.

The characteristics of LD become more evident during school learning, yet its manifestations may occur earlier. Schoolchildren with LD present failures in cognitive, linguistic, metalinguistic, hearing and/or visual processing, which in turn impair the abilities to analyze, synthesize, manipulate, store and evoke linguistic information, impairing the learning of alphabet-based writing systems⁽⁴⁾.

Metalinguistic abilities, such as phonological, lexical and syntactic consciousness, have been shown as important aspects for the appropriation of written language, and limitations in such abilities may explain difficulties in reading⁽⁵⁾ and written expression⁽⁶⁾. Not only metalanguage, but also metacognition have been related with good school performance, and impaired metacognitive abilities have been related with difficulties in the learning process.

The understanding of individuals about their own cognitive processing is named by Cognitive Psychology as metacognition⁽⁷⁾. It refers to knowledge on noticing and reporting about internal and external factors that affect learning, and also what to do to achieve better performance based on this knowledge⁽⁸⁾. It has great influence on the learning process of writing⁽⁹⁾. At school, metacognitive strategies are defined as mental actions with which the student is involved during learning and that facilitate the recovery of acquired knowledge, enhancing the quality of this process^(10,11). Thus, difficulties in the learning process may be related with failures in the ability of planning, monitoring and control of some academic activities⁽¹²⁾.

Studies have demonstrated that the practice of metacognitive activities may improve reading comprehension, enhancing the chances of text understanding among schoolchildren compared to those who do not use them⁽¹³⁻¹⁶⁾. Within this context, the role of metacognitive abilities should be emphasized in the diagnosis and intervention of schoolchildren with LD, who among other characteristics present difficulties in text understanding.

Therefore, this study evaluated the utilization of metacognitive reading strategies in children with Learning Disabilities, besides assessing if there is a relationship between this use and the ability of text comprehension.

METHODS

This study was approved by the Institutional Review Board of Faculdade de Odontologia de Bauru, Universidade de São Paulo (CAAE 17047013.2.0000.5417, protocol n. 321978).

All parents or caretakers of children signed an informed consent form agreeing with their participation.

The study was conducted on 30 children, aged 8 to 12 years, of both genders, regularly enrolled in fundamental school, who were equally divided into two groups: experimental (EG), composed of 15 children previously diagnosed with Learning Disability; and control (CG), composed of 15 children without learning difficulties.

As inclusion criteria, children in the EG should present previous diagnosis of Learning Disability (LD) performed by an interdisciplinary team of a higher education institution. They were submitted to neuropsychological and speech-language therapy assessment (oral language, writing and listening). The criteria adopted by the team for the diagnosis of LD were those described by the "National Joint Committee on Learning Disabilities"⁽³⁾ and DSM-IV⁽²⁾. This diagnosis is achieved when the academic skills of children are substantially below the expected, in the absence of intellectual, hearing or visual disability, emotional disorder nor inadequate educational instruction. Despite the average or even above average intelligence, these children have significant difficulties to acquire basic academic skills as fluent reading of words, correct spelling, written expression and domain of mathematical operations.

The GC was achieved to compare the performance of skills tested. Schoolchildren without learning disabilities were matched with those with LD according to gender, age, educational level and type of school (public or private). The schoolchildren were recruited in the clinic of Pediatric Dentistry of Faculdade de Odontologia da Universidade de São Paulo, where they undergo dental evaluation and/or intervention. To be included in the study, they should not have complaint and/or previous history of disturbances in the development of oral language and hearing, and should present reading performance compatible with their school level. These criteria were checked by applying a brief anamnesis with the parents or caretakers of children, as well as application of a reading text of the book *Compreensão da Leitura 1 – Fichas para desenvolvimento da compreensão de leitura com crianças*⁽¹⁷⁾.

All children in EG and CG were submitted to evaluation of metacognitive reading strategies by reading the *Escala de Estratégias de Leitura Ensino Fundamental I*⁽¹⁸⁾. This scale aims to verify the type and frequency of metacognitive strategies used by children before, during and after reading child literary texts. It consists of 13 Likert-type statements with three scores (never: 0 point; sometimes: 1 point; always: 2 points). The statements are divided into three categories, which indicate the factors related to the strategies. Factor 1 (questions 1, 7, 9, 11 and 13) includes reading support strategies, called Metacognitive Strategies for Reading Support, with maximum score of 10 points. Factor 2 (questions 4, 6, 8, 10 and 12) gathers items related to strategies used to solve understanding problems, called Metacognitive Strategies of Problem Solving. Factor 3 (questions 2, 3 and 5) groups strategies used for general analysis of the text, and is identified as Global Metacognitive Reading Strategies. The statements could also be analyzed according to the moment in relation to

reading: before (questions 1 to 3), during (questions 4 to 9) and after (questions 10 to 13). The sum of the points is performed by factor, by reading moment and considering all items. Chart 1 presents the questions of the Reading Strategies Scale, the factor and moment to which they belong.

Instructions about the test were provided to the children. After elucidating any doubts, the questions were read by the examiner, and the child should select one alternative (never, sometimes or always). This study considered the raw score.

For the assessment of reading understanding, the text understanding subtest “*Prova de Avaliação dos Processos de Leitura*” (*Prolec*)⁽¹⁹⁾ was used. This consists of four texts, being two narrative and two expository, which should be read by the child and, for each of them, the child should read and answer four questions, being two literal and two inferential. The total score obtained in the subtest was considered.

The sample was described by the mean, median, minimum and maximum values. Comparative analysis between groups

was performed by the Mann-Whitney, at a significance level of 5% (0.050). The degree of correlation between variables of interest was verified by the Spearman correlation analysis.

RESULTS

The study sample presented mean age 9.8 years, with educational level between third and sixth grades, with predominance (76%) of males.

Table 1 exhibits the descriptive measurements of performance of the experimental and control groups in the reading strategies scale, considering the total score, type and moment of utilization of the strategy.

Table 2 indicates the values of comparison between groups with and without learning disability, considering a significance level of 0.05.

Data in Table 3 present the Spearman correlation analysis between performance in the utilization of metacognitive strategies and text understanding in the experimental group.

Chart 1. Questions of the Reading Strategy Scale and classification according to Factor and Moment

Questions	Factor	Moment
1) Imagine how the story is by reading the title	1	Before
2) Check the number of pages before reading	3	Before
3) Check the story sequence before reading	3	Before
4) Read again parts of the story that were not understood	2	During
5) Observe the book figures to enhance the comprehension	3	During
6) Read again part when distracted	2	During
7) Use text markers to highlight what is considered important	1	During
8) Read attentively and slowly to improve comprehension	2	During
9) Search for new words in the dictionary	1	During
10) Remember the main parts of the story after finishing reading	2	During
11) Re-read the text several times in case of difficulty to understand it	1	After
12) Remember the main parts of the story to check comprehension	2	After
13) Talk with colleagues about the stories to check comprehension	1	After

Table 1. Performance of EG and CG in the reading strategy scale considering the total score, type of strategy (support, solution and global) and moment of strategy (before, during and after)

Variable	Group	N	Mean	Standard deviation	Minimum	Maximum	Percentile 25	Percentile 50 (Median)	Percentile 75
Reading Strategy Scale – total score	EG	15	11.87	5.62	2.00	22.00	9.00	11.00	16.00
	CG	15	16.87	4.29	11.00	24.00	13.00	19.00	20.00
Supporting strategies – score	EG	15	4.13	2.64	0.00	10.00	2.00	4.00	6.00
	CG	15	5.67	1.99	3.00	10.00	4.00	6.00	6.00
Solution strategies – score	EG	15	3.93	2.69	0.00	8.00	2.00	3.00	7.00
	CG	15	7.00	2.45	2.00	10.00	6.00	8.00	9.00
Global strategies – score	EG	15	3.80	1.66	1.00	6.00	2.00	4.00	5.00
	CG	15	4.20	1.94	2.00	9.00	3.00	4.00	5.00
Strategies before reading	EG	15	2.93	1.62	0.00	6.00	2.00	3.00	4.00
	CG	15	3.53	1.36	2.00	6.00	2.00	3.00	4.00
Strategies during reading	EG	15	6.00	3.68	0.00	12.00	3.00	5.00	9.00
	CG	15	7.73	2.22	5.00	12.00	5.00	8.00	9.00
Strategies after reading	EG	15	2.60	1.35	0.00	5.00	2.00	3.00	3.00
	CG	15	5.60	1.84	2.00	8.00	4.00	6.00	7.00

Table 2. Comparison between Experimental and Control Groups in the utilization of metacognitive strategies and text comprehension test of the Prolec

Variable	Group	N	Mean	Standard deviation	Minimum	Maximum	Percentile 25	Percentile 50 (Median)	Percentile 75	Sig. (p)
Reading Strategy Scale – total score	EG1	15	11.87	5.62	2.00	22.00	9.00	11.00	16.00	0.015
	CG1	15	16.87	4.29	11.00	24.00	13.00	19.00	20.00	
	Total	30	14.37	5.53	2.00	24.00	10.75	14.00	19.00	
Supporting strategies – score	EG1	15	4.13	2.64	0.00	10.00	2.00	4.00	6.00	0.091
	CG1	15	5.67	1.99	3.00	10.00	4.00	6.00	6.00	
	Total	30	4.90	2.43	0.00	10.00	3.75	4.50	6.00	
Solution strategies – score	EG1	15	3.93	2.69	0.00	8.00	2.00	3.00	7.00	0.005
	CG1	15	7.00	2.45	2.00	10.00	6.00	8.00	9.00	
	Total	30	5.47	2.97	0.00	10.00	2.00	6.00	8.00	
Global strategies – score	EG1	15	3.80	1.66	1.00	6.00	2.00	4.00	5.00	0.703
	CG1	15	4.20	1.94	2.00	9.00	3.00	4.00	5.00	
	Total	30	4.00	1.78	1.00	9.00	2.75	4.00	5.00	
Strategies before reading	EG1	15	2.93	1.62	0.00	6.00	2.00	3.00	4.00	0.278
	CG1	15	3.53	1.36	2.00	6.00	2.00	3.00	4.00	
	Total	30	3.23	1.50	0.00	6.00	2.00	3.00	4.00	
Strategies during reading	EG1	15	6.00	3.68	0.00	12.00	3.00	5.00	9.00	0.127
	CG1	15	7.73	2.22	5.00	12.00	5.00	8.00	9.00	
	Total	30	6.87	3.12	0.00	12.00	5.00	7.00	9.00	
Strategies after reading	EG1	15	2.60	1.35	0.00	5.00	2.00	3.00	3.00	0.001
	CG1	15	5.60	1.84	2.00	8.00	4.00	6.00	7.00	
	Total	30	4.10	2.20	0.00	8.00	2.75	4.00	6.00	
Text comprehension Prolec	EG1	15	7.40	5.05	0.00	14.00	0.00	8.00	11.00	0.001
	CG1	15	14.40	1.50	12.00	16.00	14.00	14.00	16.00	
	Total	30	10.90	5.11	0.00	16.00	8.00	12.00	14.25	

Table 3. Spearman correlation analysis for the EG between performance in the utilization of metacognitive strategies and reading comprehension

Variable	Statistics	Text comprehension – Prolec
Reading Strategy Scale – Total score	Correl. Coeff. (r)	0.533
	Sig. (p)	0.041
Supporting strategies	Correl. Coeff. (r)	0.463
	Sig. (p)	0.082
Solution strategies	Correl. Coeff. (r)	0.636
	Sig. (p)	0.011
Global strategies	Correl. Coeff. (r)	0.149
	Sig. (p)	0.597
Strategies before reading	Correl. Coeff. (r)	0.254
	Sig. (p)	0.361
Strategies during reading	Correl. Coeff. (r)	0.463
	Sig. (p)	0.082
Strategies after reading	Correl. Coeff. (r)	0.451
	Sig. (p)	0.092

DISCUSSION

Many children will learn to read and write without any significant difficulties in this process; however, others will have problems to perform mathematical operations, spelling, read fluently and understand what they read, despite the proper instruction and absence of sensory or intellectual disabilities, constituting a case of LD. The occurrence of reading understanding difficulties in

individuals with LD is widely reported in the literature, especially in Brazilian publications⁽²⁰⁻²³⁾, and has been related with damage in oral language, visual and speech-language recognition of the word, working memory, reader's capacity to integrate explicit and implicit information, among others.

The reading understanding includes several interrelated cognitive processes, such as recognition and extraction of meanings of printed words and, though necessary, they are not sufficient⁽²²⁾, since they also depend on metacognitive skills to adopt strategies that may facilitate understanding of the read material⁽²⁴⁾. The present study aims to contribute in this sense.

Children with LD and without any difficulty in school were questioned as to the utilization of metacognitive reading strategies by application of a questionnaire with 13 statements. The mean performance of children with LD was lower compared to those without difficulty in all categories of the scale, namely reading support strategies, problem solving for understanding and global text analysis (Table 1). In the total score of the scale, their performance was lower in all descriptive measurements (Table 1), with significant difference compared to the group without difficulties (Table 2).

The EG presented similar performance as children without difficulties in more global strategies (Factor 1), such as looking at the number of pages of the story and sequence, adopted before reading (questions 2 and 3), and on the observation of figures while reading (question 5). The strategies used during and after reading, such as reading carefully to check

the understanding, rereading parts of the text that were not understood or when distracted, remembering the key parts of the story after finishing and remembering the main parts of the story to check the understanding were the strategies (problem solving for understanding, factor 2) less used by children with LD, with statistical difference compared to CG (Table 2).

People who are efficient in academic tasks have, among other skills, well-developed metacognitive abilities, since they consciously use the study strategies and are able to evaluate their own implementation process⁽⁹⁾. Metacognition influences fundamental areas of school learning, constituting a key element in the process of learning how to learn⁽²⁵⁾. Thus, individuals with disorders in the learning process may present poorly developed metacognitive skills. In the studied sample, children in CG made more use of strategies, both by factor and moment, compared with children in EG, indicating that, throughout the learning process, they developed and made frequent use of metacognitive strategies that aided the reading understanding. At the onset there is stimulation in the classroom, yet some children present less ability to do this, despite the regular educational instruction.

The processing and acquisition of information in children with LD occur differently than in children with typical development. They apply great effort in processing the sequences of letters, identifying unfamiliar words, accessing the of the structural knowledge of language, as well as in the order of words, which probably leaves little chance to develop metacognitive skills to facilitate the text understanding.

It is important to emphasize that not only children with LD may have difficulty to identify the best way to evaluate their own learning; many schools have the same difficulty, leading to a poor academic performance⁽²⁶⁾. Within this context, the teaching of metacognitive strategies at school is useful, helping students to plan and monitor their own learning⁽²⁷⁾.

Comparison of the performance in comprehension of Prolec texts between groups indicated significant difference (Table 2). Ten out of 15 children with LD presented “difficulty” or “great difficulty” in the test, while all children in CG had adequate performance, which was expected, since the difficulty in text understanding was an exclusion criterion. The difficulty to understand the meaning of what is read and making inferences are among the criteria for diagnosis of LD^(2,3).

The correlation between the use of metacognitive strategies and the Prolec text understanding subtest was positive (*r* values, Table 3), indicating that these variables present parallel behavior, i.e. the better the performance in the reading strategies scale, the better was the performance in text understanding and vice versa. The correlation between metacognitive reading strategies, as verified by the reading strategies scale, was effective, i.e. statistically significant (*p* values smaller than 0.05, Table 3), suggesting that one variable may explain the other.

During reading, according to their needs, purposes and expectations, readers use different reading strategies, and their selection directly influences reading comprehension. Therefore, it is not enough only to have availability of a wide range of reading strategies, but mainly it is important to take decisions on their applicability and effectiveness in each new reading⁽²⁸⁾. Thinking about these strategies leads the reader to the appropriate

choice and its utilization to facilitate the understanding process. By themselves, children without learning disabilities appear to develop individual strategies that facilitate understanding of the read text, since those with difficulty require special support, either because they were not developed or because they use strategies that are not effective. Thus, it is possible to help the learner to exert greater control and reflect on his or her own learning process by teaching the learning strategies, recognizing the important role that these strategies play in the processes of self-regulation of students^(29,30).

In the educational context, it is possible to develop the skills needed for a more efficient reading, yet this requires teachers to be aware of the variables that influence the ability to reflect about reading and how to extract these from schoolchildren⁽²⁴⁾. In the clinical context, metacognitive strategies may be inserted when planning the speech-language therapy of children with LD with reading comprehension problems, such as those that emphasize the deliberate activities of control, monitoring and reflection about the linguistic objects involved in reading, as well as on the proper act of reading and writing.

Considering this importance, metacognitive abilities should be further analyzed by both speech-language therapy and pedagogy in the classroom, and their utilization would certainly be relevant in the evolution of children with some type of learning disorder or disability. Therefore, studies should be conducted to apply these strategies in children with learning deficits.

CONCLUSION

Children with Learning Disabilities presented deficits in using metacognitive reading strategies compared to children without learning disorders. The better the performance in the reading strategies scale, the better was the performance in text comprehension and vice-versa, suggesting that metacognitive reading abilities collaborate with text comprehension.

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Author contributions

APNC participated in writing the legislation, the data collection and analysis, writing of scientific articles; SRVH outlined the study, participated in the drafting of the project and writing the scientific article.