

Clinical significance of using the mental map in interventions on schoolchildren with learning disorders

Significância clínica do uso do mapa mental na intervenção de escolares com transtornos de aprendizagem

Significado clínico del uso del mapa mental en la intervención de estudiantes con trastornos de aprendizaje

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Abstract

Introduction: For a good reading performance, the student needs to be able to develop specific skills to understand the information read, creating strategies such as: construction of meaning, assimilation of content, establishment of relationships, organization and evaluation of information, as well as thinking about using these correctly. **Objective:** to verify the rate of change and clinical significance of the Mind Map in the intervention of students with learning disorders in pre- and post-testing situations. **Methods:** This study is characterized as quasi-experimental. The pretest and post-test were done using the Reading Comprehension Evaluation Protocol (PROCOMLE), and the intervention was accomplished by applying mind mapping techniques on studies of 15 texts within 4 months. The pre and posttest data were analyzed using the JT Method. **Results:** Comparison of the pre- and post-testing, using the JT Method, showed that: students S1, S2, S3 and S6 presented a reliable change in the literal questions of narrative texts from

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Authors' contributions:

LNB: Study design; data collection; methodology.

ABPCC: Methodology; outline of the results discussion.

BS: Statistical analysis of the data; description of the results.

SAC: Guidance; Methodology; Critical review.

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the Reading Comprehension Assessment Protocol; and students S1, S3, S6 and S7 presented a reliable change in the inferential questions. **Conclusion:** The intervention using Mind Mapping proved to be effective for students with Learning Disorders.

Keywords: Comprehension; Reading; Strategies; Learning.

Resumo

Introdução: Para um bom desempenho de leitura, o escolar precisa ser capaz de desenvolver habilidades específicas para compreensão da informação lida, criando estratégias como: construção de significado, assimilação do conteúdo, estabelecimento de relações, organização e avaliação das informações, bem como pensar na utilização dessas de forma correta. **Objetivo:** verificar o índice de mudança e significância clínica do Mapa Mental na intervenção de escolares com transtornos de aprendizagem em situação de pré e pós-testagem. **Métodos:** Este estudo se caracteriza por ser quase-experimental. Participaram deste estudo 7 escolares com diagnóstico interdisciplinar de transtornos de aprendizagem, de ambos os sexos, na faixa etária de 10 anos e 6 meses a 15 anos e 4 meses de idade. Os escolares foram submetidos à pré-testagem, intervenção e pós-testagem. A pré-testagem e a pós-testagem foram realizadas com o Protocolo de Avaliação de Compreensão de Leitura (PROCOMLE), e a intervenção foi realizada com o uso do mapa mental durante 4 meses, sendo trabalhados 15 textos. Os dados de pré e pós-testagem foram analisados por meio do Método JT. **Resultados:** na comparação da pré com a pós-testagem, foi possível verificar que os escolares S1, S2, S3 e S6 apresentaram mudança confiável nas questões literais de textos narrativos do Protocolo de Avaliação de Compreensão de Leitura. Os escolares S1, S3, S6 e S7 apresentaram mudança confiável nas questões inferenciais de textos narrativos do Protocolo de Avaliação de Compreensão de Leitura. **Conclusão:** a intervenção com o uso do Mapa Mental mostrou-se eficaz para escolares com Transtornos de Aprendizagem.

Palavras-chave: Compreensão; Leitura; Estratégias; Aprendizagem.

Resumen

Introducción: Para un buen desempeño de lectura, el estudiante debe ser capaz de desarrollar habilidades específicas para comprender la información leída, crear estrategias tales como: construcción de significado, asimilación de contenido, establecimiento de relaciones, organización y evaluación de información, así como pensar en úselos correctamente. **Objetivo:** verificar el índice de cambios y significado clínico del Mapa Mental en la intervención de estudiantes con trastornos de aprendizaje en situación de pre y post prueba. **Métodos:** Este estudio se caracteriza por ser cuasi-experimental. En este estudio participaron siete estudiantes con diagnóstico interdisciplinario de trastornos del aprendizaje, de ambos sexos, de 10 años y 6 meses a 15 años y 4 meses de edad. Los estudiantes fueron sometidos a pruebas previas, de intervención y posteriores. El pretest y el postest se realizaron mediante el Protocolo de Evaluación de Comprensión Lectora (PROCOMLE) y la intervención se realizó mediante un mapa mental durante 4 meses, trabajando en 15 textos. Los datos anteriores y posteriores a la prueba se analizaron mediante el método JT. **Resultados:** En la comparación de la pre con la post prueba, a partir del Método JT, ha sido posible comprobar que los estudiantes S1, S2, S3 y S6 han presentado cambios confiables en las preguntas literales de textos narrativos del Protocolo de Evaluación de Comprensión de Lectura. Los estudiantes S1, S3, S6 y S7 han presentado cambios confiables en las preguntas inferencias de textos narrativos del Protocolo de Evaluación de Comprensión de Lectura. **Conclusión:** La intervención con el uso del Mapa Mental resultó efectivo para estudiantes con Trastornos de Aprendizaje.

Palabras clave: Comprensión; Lectura; Estrategias; Aprendizaje.

Introduction

Silva and Capellini¹, and Silver et al.² define Learning Disorders as a group of heterogeneous difficulties characterized by the presence of a neurological dysfunction, which is responsible for the failure in writing, reading and mathematical calculation.

Reading is a highly demanded activity at all stages of our lives and is also considered to be very complex, although essential for the comprehension of a text that goes beyond all of its exposed content. In addition to understanding the material read, reading is related to learning in general, as it is present in all aspects and methods taught at school. All subjects require the student to have fluency in reading, as, for example, to understand a mathematical calculation the student must be able to understand the statements and what was asked. In texts, the student should be able to understand the main events and know how to relate them all, while always recognizing the time cycle of the material read³.

For good reading performance, the student needs to be able to develop specific skills to understand the information read, creating strategies such as: construction of meaning, assimilation of content, establishment of relationships, organization and evaluation of information, as well as thinking about the use of all this information correctly. Students with learning disorders have a lower performance in the development of such skills, as well as in writing and math skills^{4,5,6,7}.

Students with learning disorders present a lower performance in reading comprehension due to a neurological dysfunction, which causes difficulty in organizing the information read and directly compromises the necessary reading skills, these difficulties caused because the linguistic cognitive process is directly altered⁸.

One of the resources that can be used to develop reading comprehension is Mind Mapping. The Mind Map was developed with the aim of facilitating learning and memorization, in all aspects of life. More specifically in Education, Mind Maps have been used as a more didactic form in the classroom and even outside it, since they stimulate the student's attention. With the Mind Map, it is possible for teachers to prepare their class according to the difficulties of a certain group, thus having greater flexibility to present content. Use of

the Mind Map is also indicated for students with learning difficulties, since it is creative, versatile and uses visual attention for its execution; in addition to being a method that presents a facility to establish relationships between all the information, thus helping the student who presents difficulties in comprehension skills⁹.

Objective

The aim of this study is to verify the index of change and clinical significance of the Mind Map in the intervention of students with learning disorders in pre- and post-testing situations.

Material and Method

This study is characterized as quasi-experimental, realized with schoolchildren from municipal state education in the city of Marília/SP. The research was approved by the Ethics Committee under protocol nº 40514615.8.0000.5406 of the Universidade Estadual Paulista - Faculdade de Filosofia e Ciências de Marília "Júlio de Mesquita Filho" (FFC/UNESP).

Seven students with an interdisciplinary diagnosis of learning disorders, of both sexes, participated in this study, aged 10 years and 6 months to 15 years and 4 months.

All students in this study underwent pre-testing, intervention with the mind map and post-testing. The pre- and post-testing comprised the procedure described below:

- **Reading Comprehension Assessment Protocol**¹⁰: this study used two narrative texts ("The Umbrella" and "The Secret of the Cupboard") in this protocol each is composed of eight multiple-choice comprehension questions, four of which related to the microstructure of the text (two literal and two inferential) and four related to the microstructure of the text (two literal and two inferential). The text "The Umbrella" was used for pre-testing and "The Secret of the Cupboard" for post-testing.

The application of this procedure was carried out individually with a mean duration of 50 minutes before/after school, at CER / UNESP / FFC (Specialized Center for Rehabilitation) in an individual and quiet consulting room.

After applying the protocols at the time of pre-testing, the students underwent intervention using the Mind Map for a period of four months. The intervention was performed individually with

students, on a weekly basis, lasting 50 minutes per session.

The intervention with the Mind Map was divided into two stages; in the first stage, oral reading was performed by the student, followed by comprehension of a serial text; after reading, the story was recounted by the researcher, who performed interventions when necessary. In the second stage, the student should analyze and locate the central idea of the story, the order of events in the facts and the most important facts, thereby creating textual memory; afterwards, the construction of a mental map was carried out, where the student should organize and write the information in each schematic structure (title, characters, actions - unfolding of the story and conclusion - moral of the story). Altogether, 15 texts were worked on with each student.

The pre- and post-testing data were analyzed using the JT Method^{11,12} for single case analysis, since this method provides for a comparative analysis between pre- and post-intervention scores in order to establish whether the differences between them represent reliable changes and whether they are clinically relevant, thus allowing a verification of the Mind Map's clinical significance.

This method is carried out by means of two complementary processes: calculation of the reliability of the changes that occurred between the pre- and the post-intervention evaluations, described in terms of a Reliable Change Index (RCI); and analysis of the clinical significance of these changes. The difference is calculated based on the difference between pre- and post-test divided by the standard error of the difference. Thus, the change from pre- to post-testing can be: reliable positive (when there is improvement); reliable negative (when there is worsening); with clinical significance (which makes or will make a difference in the clinical scope); or absence of change.

It is important to underscore that there is a difference in the effect of treatment from a statistical perspective and from a clinical perspective, regardless of the number of subjects^{13,14}. Furthermore, there is little data in the literature reporting a need for changes in the JT Method; therefore, this method is effective to verify clinical significance and control changes by comparing the subject with him or herself¹⁴.

The analysis performed using the JT Method generates graphs, which can be transformed into

tables, according to the values presented. Based on the graph generated, four quadrants can be visualized that represent the combinations between positive or negative oscillations depending on the initial and final condition of the participants, in which each point (Sx) corresponds to a student participating in the study.

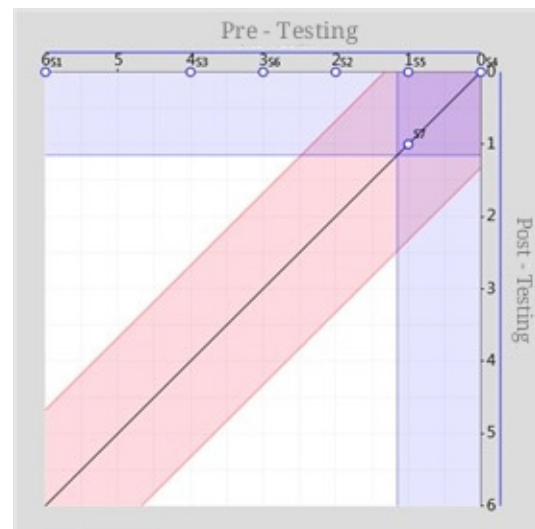
Since in this study, the performance analysis of students in the Reading Comprehension Assessment Protocol was performed based on errors, the graphs will be shown in reverse, because in this case the type of indicator is negative, or that is, the better the student's performance, the lower the errors presented, therefore, the lower the score.

Results

The performance of the students in this study on the literal and inferential questions of narrative texts of the Reading Comprehension Assessment Protocol was analyzed.

Graph 1 shows the reliability of change in the literal questions of narrative texts from the Reading Comprehension Assessment Protocol.

Graph 1. Reliability of change in the literal questions for the narrative text from the Reading Comprehension Assessment Protocol.

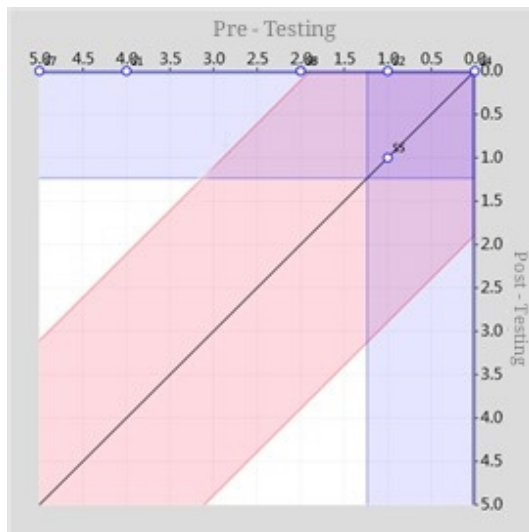


Regarding clinical significance, the seven students in this study are located between the upper and lower horizontal lines where no conclusions can be reached about a change in clinical status, since they are within the range of uncertainty.

As for the reliable change index, students S1, S2, S3 and S6 are above the upper diagonal line, where they showed improvement that can be attributed to the intervention. On the other hand, students S4, S5 and S7 are located between the upper and lower lines of the bisector, where statements of improvement or worsening due to the intervention cannot be made.

Graph 2 shows the reliability of change in the inferential questions of narrative texts from the Reading Comprehension Assessment Protocol.

Graph 2. Reliability of change in the inferential questions for the narrative text from the Reading Comprehension Assessment Protocol.



As for Clinical Significance, students S1 to S7 are located between the upper and lower horizontal lines where nothing can be affirmed about changing clinical status, as they are in the range of uncertainty.

As for the reliable change index, students S1, S3, S6 and S7 are above the upper diagonal line, where they showed improvement that can be attributed to the intervention. Students S2, S4 and S5 are located between the upper and lower lines of the bisector, where conclusions of improvement or worsening due to the intervention cannot be made.

Discussion

Reading is considered effective when there is an understanding of the material read. It is a complex skill that involves various cognitive aspects,

such as working memory, stored knowledge, monitoring, integration of information and inferences, as well as linguistic considerations, such as syntactic, semantic, lexical elements and decoding¹⁵.

Reading comprehension is a skill that requires the use of processes considered basic, such as decoding referring to word recognition (a process that allows the transformation of the orthographic signs of written words in a language) and extraction of the meaning of printed words, in addition to the need for the reader to also use cognitive processes considered to be high level, such as the ability to make inferences¹⁶.

When stating that a student presents difficulty in reading comprehension, the evaluator must base this affirmation on a reliable test, because, in order to have good reading comprehension, the reader must abstract ideas from the text, contextualize and have strategies that enable use of the intra, inter and extratextual elements to achieve understanding. Therefore, a pre- and post-testing assessment instrument was selected for this study, which made it possible to identify the performance of students in these items described as fundamental according to the literature^{3,17}.

Although the students in this study presented a reliable change rate in relation to reading comprehension, there were also students who showed no change, which suggests that the literacy methodology being used for the students in this study does not focus on teaching strategies for the development of reading comprehension in the classroom¹⁸.

Although the students in this study are diagnosed with learning disorders, this research corroborates studies^{19,16} that suggest that 5th year students use their development of working memory and experiences with texts and rely on memory to answer the questions.

According to Macedo et al²⁰, experiences with reading aloud and shared, which was carried out prior to the elaboration of the Mind Map scheme, are efficient to develop prior skills for the development of reading comprehension, as well as the ability to make inferences, memory skills and knowledge of the world.

According to studies^{21,22}, reading competence is the ability of the reader to create their strategies for understanding the material read, adapting to the text, building meaning, identifying the macrostructure, microstructure and superstructure of the text, thus establishing a network of relationships and

organizing the information that makes up the different parts of the material, making inferences and locating relevant information. Thus, as described in this study, the Mind Map technique is a relevant and important tool for understanding the text read, since the students demonstrated improvement in questions of microstructure and macrostructure.

The Mind Map is a technique relevant for the development of reading comprehension, because, according to Cunha and Capellini¹⁰, students tend to build a mental model of what they read, which is constantly updated according to the relationships they establish during the text, or that is, the Mind Map in a schematic and written form allows the student to concretize ideas about what he or she read and understood when writing them.

It can also be affirmed that the students in this study showed an improvement in reading comprehension, since the macrostructure consists of building global ideas that give meaning and unity to the text; therefore, these students managed in a post-testing situation to read and mentally build global ideas about that text¹⁰.

There are still few studies described in the literature that used the Mind Map as an intervention strategy; however, this study showed that the use of this strategy presents a reliable change index in the performance of students with learning disorders and can assist in the development of reading comprehension among these students.

Conclusion

We conclude that the intervention using the Mind Map proved to be a reliable positive change index for students with Learning Disorders, and it can be used as an intervention instrument based on scientific evidence that helps in understanding the textual macrostructure, leading the student to a good performance in reading comprehension skills in narrative texts.

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