An Examination of the Efficacy of Schema-Based Word Problem Instruction in Improving the Executive Functions of Mathematically Impairment among Students with Specific Learning Disorders

Ebrahimi, O. et al.

Extended Abstract

Aim

An increasingly utilized pedagogical strategy, schema-based instruction in word problems is an effort to improve the academic achievements of pupils who have specific learning disorders. The objective of this study was to assess the efficacy of schema-based instruction in solving word problems in enhancing the executive functions of students who have mathematical impairments and specific learning disorders.

Methodology

This was a semi-experimental study with a control group and a pre-test and post-test design. Initial approval for the research was obtained from District 2 of the Department of Education. A purposive sampling method was employed to select 30 second and third grade students with math learning disorders at random from the community of male elementary school students in Tabriz who had specific learning disorders during the academic year 2019-20. These students were then divided into two groups of 15 individuals each. The inclusion criteria for the research were as follows: informed consent of the participants and obtaining a written consent from the parents, ranged from 85 to 115, not having a concurrent verbal or other disorder; and the exclusion criteria was not attending all training sessions. There were two phases to this investigation: diagnostic and implementation. The diagnostic phase consisted of two sessions in which the researcher and specialists from the learning disorder center administered the WISC-IV, Key Math, and conducted a clinical interview in accordance with DSM-5 criteria. The samples were deemed eligible for inclusion in the study by assessing the IQ score and examining the specific disorder as well as any comorbid or similar conditions. The research implementation phase comprised fourteen training sessions and four distinct phases. Prior to commencing the training, the study groups provided pre-test scores. The experimental group was subsequently instructed in the solution of word problems using Schema-Based Instruction (SBI) for a total of fourteen 45-minute sessions over the course of two months; the control group did not receive this training. Post-test scores were acquired subsequent to the training and subjected to analysis utilizing multivariate covariance in SPSS-24.

Findings

Multivariatecovariance analysis (MANCOVA) revealed that schema-based instruction in the solution of word problems improves inhibition and working memory. At the $P<0.05$ level, the calculated F-values for the working memory component ($F=11.85$ and $\eta 2=0.313$) and inhibition ($F=6.95$ and $\eta 2=0.211$) are both statistically significant. With this information, it is possible to conclude that schema-based instruction in solving word problems can predict inhibition by 21.1% and working memory variable by 31.3%. Constraint-based instruction negatively impacted the components of inhibitory control and working memory, according to these results. In other words, students with math disorders experienced a reduction in inhibition control and working memory difficulties, while their executive function abilities improved as a result of this training modality.

Conclusion

By elucidating the results, one could assert that schema-based instruction places predominant emphasis on the function of schemas within word problems. By establishing schemas for solving word problems and instructing learners on them, schema-based instruction increases the working memory capacity of the students and aids in the organization of their mathematical knowledge and problem-solving expertise. The text of the problems comprises a restricted number of schemas, which are presented to the students in a segmented format. Furthermore, schemas prevent the automatic activation of irrelevant and stereotypical answers, as well as the entry of irrelevant information and dimensions required to select the correct answer, by means of correcting and absorbing input information. In a sense, they safeguard against the weakness and malfunction of the inhibition skill. It is recommended that educational institutions and learning disorders centers implement schema-based instruction in order to assist students with specific learning disorders in solving mathematical problems.

Keywords: Mathematic, Problem Solving, Schematic-based Instruction, specific learning disorders.