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The Effectiveness of Cognitive Rehabilitation on Improving Selective Attention, Cognitive Flexibility and Academic Progress of Students with Specific Learning Disorders

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Extended Abstract

Aim

Specific learning disorder is a type of neurodevelopmental disorder that arises from the interaction between certain genetic and environmental factors, affecting the brain's ability to perceive verbal and nonverbal information quickly, accurately, and easily (Savatt & Mirasht, 2021). The hallmark of learning disorders in children or teenagers is the lack of educational progress in reading, writing, or mathematics compared to their general intellectual ability (Barjis et al., 2012).

In explaining and understanding the etiology of specific learning disorder, cognitive deficits, including cognitive flexibility, are considered influential in the manifestation of this disability (Kiefer & Chirstoldou, 2020; Gholamali Nejad et al., 2019). Cognitive flexibility refers to the ability to adapt to stimuli occurring in the surrounding world (Pettica and Bigam, 2018). Research findings (Khassawanah, 2021; Amai et al., 2017; Kibby & Cohen, 2008) have shown that students with specific learning disorders perform poorer on cognitive flexibility tests compared to typically developing students.

Given the widespread prevalence of learning disorders among students, failure to diagnose and treat these conditions early can lead to significant difficulties in the educational process. These difficulties may result in failure and academic decline, with long-term negative impacts on all aspects of personal and social life (Diagnostic and Statistical Manual of Mental Disorders, 2015). Therefore, timely diagnosis and identification of students with specific learning disorders, along with early intervention, can significantly contribute to the prevention and treatment of these disorders.

Methodology

This research is classified as applied research in terms of purpose, quantitative research in terms of method, and semi-experimental research in terms of data collection, utilizing a pre-test-post-test design with both an experimental and a control group. The statistical population for this study comprised all elementary school students referred to special learning disorder centers in Zanjan city during the academic year 2021-2022. Forty participants were selected via convenience sampling and randomly assigned to either the experimental or control group, with 20 participants in each group. The instruments employed included Captain Log's Cognitive Rehabilitation Software (Sandford, 2007) to enhance selective attention, cognitive flexibility, and academic achievement; the Stroop Computerized Test (SCWT) (Stroop, 1935) to measure selective attention; the Wisconsin Computerized Test

(WCST) (Grant & Berg, 1948) to measure cognitive flexibility, and the teacher's monthly test to assess academic achievement.

The experimental group underwent cognitive rehabilitation interventions over 12 sessions, while the control group was placed on a waiting list. Data were analyzed using SPSS version 24 software and repeated measures analysis.

Findings

The findings revealed that following cognitive rehabilitation interventions, there was a notable increase in the levels of selective attention, cognitive flexibility, and academic progress among students with specific learning disorders. A significant difference was observed between the post-test scores of the experimental group and those of the control group ($p < 0.05$).

Furthermore, the results of the paired t-test indicated no significant difference between the post-test and the follow-up assessment in the experimental group. This suggests that the changes induced by the independent variables had remained stable over time.

Conclusion

Based on these findings, it can be concluded that the cognitive rehabilitation program has proven effective in enhancing selective attention, cognitive flexibility, and academic progress among students with specific learning disorders. The underlying principle of cognitive rehabilitation is brain plasticity (Eyvazi, Yazdanbakhsh & Moradi, 2018). According to this principle, cognitive rehabilitation interventions, through repeated stimulation of less active brain regions, induce structural changes in neurons and promote neuronal repair in these areas. Consequently, stable synaptic changes occur in these regions (Kolb & Gibb, 2016).

Human brain imaging studies have demonstrated that teaching cognitive functions results in alterations in synaptic activity, thickening of the prefrontal cortex, and an increase in gray matter volume in the brain following rehabilitation and mindfulness exercises (Fox et al., 2016). Hence, it is recommended that officials of learning disabilities centers consider computerized cognitive rehabilitation as an effective, cost-efficient, and potentially complementary treatment approach for enhancing the cognitive performance of students with specific learning disabilities.

Moreover, cognitive rehabilitation workshops for teachers and trainers at learning disabilities centers should be implemented to acquaint them with both new and established methods in academic research, supplementing traditional approaches.

Keywords: Academic achievement, Cognitive flexibility, Cognitive rehabilitation, Selective attention, Specific learning disabilities.

Ethical Considerations

At the outset of the research, written consent forms were obtained from the parents of all participating students. Throughout the research process, subjects were afforded the option to withdraw from the study at any stage. Students were treated with impartiality and respect, and strict confidentiality measures were upheld regarding the collected information.

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Conflict of Interest

There are no conflicts of interest to declare in this article.

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