



Is there any difference in executive function and social adequacy between the children with dyslexia or dyscalculia disorder?

Mahsa Shakouri¹, Hadi Hashemi-Razini²

1 Department of Psychology, School of Humanities Sciences, Science and Research Branch, Islamic Azad University, Tehran, Iran

2 Department of General Psychology, School of Psychology and Education, Kharazmi University, Tehran, Iran

Short Communication

Abstract

BACKGROUND: Review of literature indicates that there is difference between various types of learning disorder based on functional skills. This study aims to compare the executive function and social adequacy of children with dyslexia and dyscalculia.

METHODS: This descriptive fundamental research was a comparative causative type study. The statistical population included all children with dyslexia and dyscalculia in Tehran Province, Iran, in 2018. Using available sampling method, 43 children (24 with dyslexia and 19 with dyscalculia) were selected from learning disorder centers. Fellner questionnaire was used to assess the social adequacy of the children, and to evaluate the executive functions, Parental Reflective Functioning Questionnaire (PRFQ) was used. The data were analyzed using multivariate analysis of variance (MANOVA).

RESULTS: There was no significant difference between the various components of executive functions and social adequacy of children with dyslexia and dyscalculia ($P > 0.050$).

CONCLUSION: Based on the research findings, function of children with dyslexia and dyscalculia is equivalent in executive function and social adequacy.

KEYWORDS: Executive Function, Dyslexia, Dyscalculia

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Introduction

The dyslexia disorder (reading disorder) term was presented in 1962 by Samuel Kirk. He used this term for children who had little progress in reading, writing, and mathematical computing, and introduced learning disruptions into the educational curriculum.¹ Dyslexia disorder refers to a unitary structure or disorder that is associated with defect and deficiency in the development of academic skills.² According to different studies that were performed, dyslexia and dyscalculia disorder (math dyslexia) have separate cognitive

profiles. In a division, the disturbances are divided into two parts: auditory-verbal and visual-motor, the problem of reading is in the auditory-verbal class and mathematical problem is in the visual-motor category.³ Weakness in visual-motor skills leads to problems in mathematics and handwriting, which is often independent of dyslexia disorder. The problems of this group of children include problems in social awareness and judgment. These problems are not linguistic and in neuroscience texts are associated with a set of nonverbal learning disorder.⁴ Neuroscientists believe that children with non-verbal learning disabilities experience internalized problems like

Corresponding Author:

Hadi Hashemi-Razini

Email: hadihashemi@khu.ac.ir

depression and anxiety more than those with dyslexia disorder. A review of various studies suggests that about 75% of children with learning disabilities have problems in social skills.⁵ Studies indicate that executive functions play an important role in this disorder. Children with learning disabilities have difficulty executing tasks.^{6,7} Therefore, the main objective of this study is to compare social adequacy and executive functions among children with dyslexia disorder and dyscalculia disorder.

Materials and Methods

The method of this research was fundamental and in terms of the purpose and the type of data collection, it was a causal-comparative type. The statistical population consisted of all children with dyslexia disorder in Tehran Province, Iran, in 2018. Due to the research constraints, the subjects were selected through the available sampling method from the learning disorders centers (2 centers) in Tehran Province. Since for experimental research, at least 15 samples per group are sufficient, the sample size was considered as 43 children (24 children with dyslexia disorder and 19 children with dyscalculia disorder). Sample inclusion criteria were: definitive diagnosis of dyslexia disorder, definitive diagnosis of dyscalculia disorder, age range of 7 to 12 years, and being at the elementary school level. In addition, the existence of any common disorder other than dyslexia disorder and dyscalculia disorder, the presence of writing disorder, physical disability, and intelligence quotient (IQ) less than 85 were considered as the exclusion criteria for sample. For collecting data, Parental Reflective Functioning Questionnaire (PRFQ) and Fellner social adequacy questionnaire were used.

Parental reflective functioning questionnaire (PRFQ): This questionnaire has 86 items that are used to determine the level of executive performance of children aged 6 to 11 years, but

the parental version of the behavior questionnaire includes 63 items. Responses to questions were never (1), sometimes (2), and most often (3). This questionnaire assesses working or active memory, change (cognitive flexibility), emotional control, inhibition, start-up, and planning/organizing and organizing/monitoring materials as executive functions. For this questionnaire, the internal consistency coefficients have been reported using Cronbach's alpha coefficient from 0.70 to 0.80, and for its retest reliability, after four and a half weeks, correlation coefficients have been reported between 0.78 to 0.90.⁸

Fellner social adequacy questionnaire: It is a questionnaire with 47 questions that is based on Fellner's theory and four dimensions of cognitive skills and abilities, behavioral skills, emotional adequacy, and motivational and anticipatory factors. In this questionnaire, each statement contains 7 options: quite agree, agree, somewhat agree, I have no idea, somewhat disagree, disagree, and quite disagree. The parents should choose an option that more reflects the feelings and views of their child. The alpha coefficient obtained from a researcher-made social adequacy questionnaire after removing the questions that had a solidarity correlation with the total score was 0.88, which shows acceptable internal consistency coefficient. In addition, for the purpose of using the reliability method, the rearrangement was 0.90 after 4 weeks.⁹ After identifying the centers that would cooperate, the questionnaire was distributed to the children by parents' consent, so that in the two centers, after determining the subjects by the psychology center, the questionnaires were delivered to parents by the researcher. In the second center, the questionnaires were delivered by the relevant psychologist. By providing the explanation, the parents responded to the questionnaire. Before entering the samples, they were given the necessary information about the goals,

duration of the research, and how they would collaborate during the study. After obtaining informed consent from them, they were selected as members of the sample group. It should be noted that the provisions contained in the Helsinki Statement were observed in this study. Descriptive statistics such as frequency, percentage, mean, and standard deviation (SD) and inferential statistics such as multivariate analysis of variance (MANOVA) were used to analyze the data. All data were analyzed by SPSS statistical software (version 20, IBM Corporation, Armonk, NY, USA). P -value < 0.050 was considered as statistically significant.

Results

Among the subjects, 74.4% (32 persons) of all children were boys. The mean age of children with dyslexia disorder was 9.22 years and mean age of children with dyscalculia disorder was 8.68 years. The t -test result confirmed that the two groups were similar in age ($t = 224.1$, $P = 0.228$). The mean and SD of the variables in the research are presented in table 1 by the two groups. In order to compare executive function and social adequacy (dependent variables), two groups of children with reading disorder and children with math learning disorder (independent variables) were used for MANOVA. Regarding the parametricity of this

test, its preconditions were evaluated before implementation. For this purpose, the Kolmogorov-Smirnov test (K-S test), Levene's test, and Box's M test were used. The results of these tests showed the use of MANOVA according to the pre-test of parametric test.

As shown in table 2, the P -value for meaningful tests of MANOVA in comparison with the two groups in terms of social adequacy (and its components) and executive functions (and its components) were higher than the P -value defined ($P = 0.050$). Therefore, there is no possibility of using MANOVA. This indicates that there is no significant difference between the two groups in terms of executive functions and its subscales ($P > 0.050$).

Discussion

Based on the results, the two groups did not have a significant difference in performance and social adequacy. The review of scientific evidence in this field reveals contradictory findings in the comparison of the two groups in terms of executive functions. For example, according to Nabizadeh research, children with non-verbal learning disabilities have difficulty performing executive functions (according to the function of the brain hemispheres), which separates children from dyslexia disorder in mathematics.¹⁰

Table 1. Mean and standard deviation (SD) of two groups in the research variables

Variables	Group	Dyslexia disorder	Dyscalculia disorder	Total
		Mean \pm SD	Mean \pm SD	Mean \pm SD
Active memory		22.12 \pm 3.32	21.94 \pm 2.48	22.04 \pm 2.95
Flexibility		15.12 \pm 3.43	15.63 \pm 2.75	15.34 \pm 3.12
Emotional control		20.16 \pm 3.19	21.68 \pm 3.18	20.83 \pm 3.24
Inhibition		19.20 \pm 5.62	19.75 \pm 4.79	19.37 \pm 5.21
Start		14.20 \pm 3.12	13.94 \pm 2.93	14.09 \pm 3.00
Planning/organizing		25.50 \pm 3.70	26.63 \pm 3.25	26.01 \pm 3.51
Organizing/monitoring material		11.91 \pm 3.11	12.63 \pm 2.43	12.23 \pm 2.82
Supervision		16.91 \pm 2.76	18.10 \pm 2.84	17.44 \pm 2.83
Overall executive score		145.16 \pm 23.60	150.15 \pm 17.46	147.37 \pm 21.04
Behavioral skills		115.75 \pm 20.01	121.14 \pm 14.28	118.44 \pm 17.17
Motivational and anticipatory affiliates		26.83 \pm 6.25	28.01 \pm 4.08	27.35 \pm 5.37
Cognitive skills		9.33 \pm 3.33	8.74 \pm 4.48	9.07 \pm 3.84
Excellence		10.46 \pm 2.97	11.05 \pm 2.39	10.72 \pm 2.72
Overall score of social adequacy		162.38 \pm 26.53	169.63 \pm 20.13	165.85 \pm 23.92

SD: Standard deviation

Table 2. Significance analysis of multivariate analysis of variance (MANOVA) in comparison of two groups in research variable

Variables	Test	P	F	P
Social adequacy	Pillai's trace	0.107	1.143	0.351
	Wilks lambda	0.893	1.143	0.351
	Hotelling's trace	0.120	1.143	0.351
	Roy's largest root	0.120	1.143	0.351
Executive functions	Pillai's trace	0.385	1.566	0.155
	Wilks lambda	0.615	1.566	0.155
	Hotelling's trace	0.627	1.566	0.155
	Roy's largest root	0.627	1.566	0.155

F: Fisher-Snedecor (F)

In the study of Saghafi et al., programming and attention indexes in students with non-verbal learning disorders were similar to those of students with dyslexia. Also, the results of this study showed that the flexibility of students with non-verbal learning disorders was more than students with dyslexia, and dyslexic students, on the other hand, had a better memory than students with non-verbal learning disorders.¹¹ In analyzing the data obtained, there is no significant difference between them. We should point out that the degree of similarity between dyslexia disorder and dyscalculia disorder is partially demonstrated in Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-V), the problem of learning and using scientific skills. DSM-V is based on the high correlation between problems in the accounting and reading. This can be an explanation for the results. Another factor that can explain heterogeneity in research is the great tendency of brain activity of children with dyslexia disorder and dyscalculia disorder. Peters et al. performed a study in which the children's brain activity in 4 groups (control group, dyscalculia disorder, dyslexia disorder, and dyscalculia disorder/dyslexia disorder) was compared during a math design that allowed them to separate the various processes that might be associated with specific or common neural roots of these disorders.¹² The limitations of the present study were to find children who had only a dyslexia disorder or dyscalculia disorder. Hence, the low sample

size of the research makes the distribution of results difficult. Since today, effective interventions for the treatment of dyslexia disorder have been designed, it is suggested that parents pay attention to the symptoms of these abnormalities before that the children enter school.

Conclusion

The results of the present study showed that there was no significant difference between the type of dyslexia disorder and dyscalculia disorder in terms of social adequacy and executive function. These results explain that homogeneity of these types is considered in terms of the structures that were studied.

Conflict of Interests

Authors have no conflict of interests.

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