

Comparison of the effect of neuropsychological therapy, rhythmic movements and cognitive empowerment on reading in students with special learning disabilities

Rahnama F.,¹ * Bayazi MH.,² Rajaei A.³, Khoeinejad GH.⁴

Abstract

Introduction: Specific learning disorder is a disorder that affects the ability to understand, or use written language, to perform mathematical calculations, to coordinate movements, or to pay direct attention. Various educational and therapeutic methods used to treat and improve specific learning disabilities; Sometimes it has shown good effectiveness and, in some cases, it has not been effective enough or the results have been contradictory. The aim of this study was to compare the effect of psychological neurotherapy, rhythmic movements and cognitive empowerment on students' reading improvement with special learning disabilities.

Methods: The research method was quasi-experimental and the pretest-posttest design was with a control group. Statistical population of elementary school female students with special learning disabilities with difficulty reading Torbat Jam in the academic year of 2018-2019, 48 people were purposefully selected and randomly substituted in three experimental groups and one control group (12 people in each group). The dyslexia questionnaire of Karami Nouri et al. was used.:

Results: Data were analyzed using multivariate analysis of covariance and the results showed: The effect of psychological neuropathy treatment on reading disorders in students with special learning disabilities with more difficulty reading than rhythmic movements and cognitive empowerment.

Conclusions: The conclusion is that neuropsychological treatment has a greater effect on improving the reading of students with special learning disabilities than the other two therapies. And the education of these students to be effective.

Keywords: rhythmic movements, special learning disorder with reading difficulties, Treatment of neuropsychological disorders

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Introduction:

Developmental neurological disorders are disorders in which the developmental process of the brain and central nervous system is not complete properly. The brain is the thinking and leading part of the body organs, and if this part is disturbed, the person's functions are affected. The central nervous system also plays a role in directing and transmitting commands from the brain to the organs of the body. Developmental neurological disorders have a detrimental effect on excitement, learning ability, growth, and memory by causing defects in these two areas. These disorders are divided into six main categories: special learning disorder, communication disorders, attention deficit hyperactivity disorder, autism spectrum disorder, mental disability and movement disorders (1). In diagnostic and Statistical Manual of Psychiatric Disorders questionnaire (DSM-5), learning disability has been renamed to specific learning disorder, and Reading Disorder, Writing Disorder, and Math Disorder, each of which were previously considered independent and distinct disorders, are now included as a hallmark in specific learning disorders. Learning disabilities are common between 5 and 15% in school-age children and in different languages and cultures, in all functional areas such as reading, writing and mathematics (3). Reading is one of the areas in which students with learning disabilities have difficulty, considering that one of the important goals of the Ministry of Education in primary school is to train active, motivated and autonomous students in the most basic learning tool which is reading. However, some students, despite having natural intelligence, appropriate educational opportunities and the absence of emotional disorders, have some difficulty in reading skills that in most of the academic failures of these students, traces of weakness in reading skills can be seen (4). The realities that exist in the society show the low ability of Iranian students in reading skills (5).

From the beginning of identifying learning disorders, experts in this field have tried to provide a theory or model to explain the etiology of this disorder. One of the theories in recent decades in explaining learning disorders are cognitive and neuropsychological theories that have made a significant contribution to understanding the mechanism of action of learning disorders and have provided a lot of research data to confirm their theory. Neuropsychological studies include tests to evaluate brain function in a clinical setting to diagnose disorders. These studies are an experimental field in psychology that aim to understand how behavior and cognition are affected by the brain and to examine the diagnosis and treatment of behavioral and cognitive effects of neurological disorders. While classical theories of the mind focus on the nervous system, neuropsychological theory looks at how the brain and mind relate to each other. Thus, a significant part of neuropsychological programs is related to the brain and behavioral nervous system (6). Numerous

studies on the effectiveness of neuropsychological therapy on children's language performance (7), executive actions and academic performance of students (8), reading accuracy and comprehension of students with reading disorders (9), reading improvement (10), Neurodevelopmental Disorders and reading (11), improvement of learning disorder (12), improvement of maladaptive behaviors and phonetic problems of children with reading disorder (13) were approved by researchers.

kephart, on the other hand, believes that learning disabilities are the result of a lack of normal motor development, and about rhythmic movements, he thinks that these movements cause interactions and communication in the mind that led children to a correct perception of themselves and their environment. In rhythmic movements, due to the dominance of weight, order and coordination on its components and elements, as well as having rich sensory-motor experiences, musical-auditory and visual stimuli, and the emergence of sequences of stimuli and responses, conditions are created for children that in addition to mental, cognitive, perceptual and motor questions, the conditions for successful development and learning of academic skills in the future, such as reading, writing, arithmetic, are created (14). Good and chronological age-appropriate motor behaviors in children who have these characteristics are a sign of physical and mental health in them, and in the presence of physical, mental and emotional disorders, motor skills in these children are impaired and delayed (15). One of the easiest and fastest ways to discover and stimulate children's brain abilities is to play with the axis of movement (16). Various studies have linked cognitive function and brain flexibility to exercise and motor activities (17). Due to the lively and rhythmic aspect of rhythmic movements and games, as well as the combination of these movements with music, in addition to performing movements, children implicitly learn many educational and cognitive concepts and themes.

Numerous studies on the effectiveness of rhythmic movements on students 'working memory (18), visual perception and executive function (19), children's handwriting function (20), short-term memory and students' auditory memory (21), executive functions (22), hand and foot coordination, in girls with developmental coordination disorder (23), psychological function of memory (24), cognitive processes, perceptual attention, concentration, neuromuscular coordination and development of personal relationships and social skills (25) and motor skills (26) were approved by researchers.

Cognitive empowerment is a therapeutic method whose main goal is to improve and repair a person's cognitive deficits and functions such as memory, social perception, executive function, concentration and attention. Cognitive empowerment is fundamentally different from cognitive therapy because the goal of cognitive therapy is to correct and reconstruct misconceptions and misconceptions (27). Cognitive empowerment is a learning experience that covers a wider area than cognitive retraining. Numerous studies on the effectiveness of the effect of cognitive empowerment on executive functions (focused attention, ability to organize and plan and auditory and visual working memory) (28), self-regulatory executive functions and reading performance (29), reduction of students' cognitive deficits and cognitive avoidance (30), Improving executive

functions in students with special learning disorder with reading difficulties (31), Reading accuracy and comprehension of students with reading disorders (32), cognitive functions (attention, problem solving, memory, arithmetic) Children with learning disabilities (33) Executive functions (working memory and attention) and students' academic achievement (34), improvement of learning disability (35) and decoding, phonological awareness, comprehension (36) were approved by researchers.

As mentioned, various studies have been conducted on the effectiveness of three types of treatments for reading disorders in students with special learning disorders with reading difficulties. However, no research has been done on which of the three methods has a greater effect on improving the reading of students with special learning disorders. Does cognitive construction have an effect on improving the reading of students with special learning disorders?

Research method:

In this research, quasi-experimental research method has been used in pre-test-post-test method with experimental and control groups. The statistical population of the study included students with special learning disorders with a focus on learning disorders in Torbat-e Jam city in Khorasan Razavi province in the academic year 2018-2019. Inclusion criteria in this study were: elementary school students, diagnosis of special learning disorder with reading difficulties by the teacher and therapist and exclusion criteria in this study were: non-cooperation of the student or family and absence of more than two sessions. The sampling method of the present study was purposive in which 48 people were selected and randomly divided into four groups of 12 people (three experimental groups and one control group). The ethical considerations of the present study were: obtaining written consent from parents and students, providing written information about the research to students and parents, confidentiality of information and identity of the subjects.

Research tools:

Dyslexia reading test: This questionnaire was developed and standardized by Karami Noor et al in order to measure the level of reading ability and diagnosis of dyslexic students (37). This test has ten subtests including reading, rhyme, naming pictures, text comprehension, word comprehension, deletion of sounds, reading non-words and pseudo-words, letter signs. The validity of these ten subtests is as follows: Cronbach's reading subtest is 0.98 and in dual coding mode is 0.97. Cronbach's alpha of the rhyme subtest in hexadecimal and dual coding is 0.93 and 0.66, respectively. Cronbach's alpha subtest for naming images (this subtest has two forms) quadruple and dual modes of coding form A are 0.92 and 0.86, respectively, and Cronbach's alpha quadruple and dual modes of coding form B are calculated as 0.97 and 0.90. The text comprehension subtest consists of two subtests (one common text for all grades and two specific texts for each grade). Cronbach's alpha of the word comprehension subtest was calculated to be 0.72 in the six-coding mode and 0.87 in the dual-coding mode. Cronbach's alpha coefficient subtest for removing sounds in quadruple item encoding mode, is 0.96 and in dual encoding mode is 0.96. The subtest of reading non-words and quasi-words in quadruple mode is 0.98 and in the case of dual coding mode is 0.98.

The subtest related to the signs was the same as the previous subtest and was made of 6 signs and the subject of research was given one minute and he was asked to mention as much as he can from the members of the relevant category and after the end of the time, he should mention the members of the next category for one minute (38).

Neuropsychological treatment program: After the pre-test, to strengthen and teach the psychological aspects of neuropsychology (attention, executive functions, language, visual-spatial processing and working memory), Neuropsychological interventions were designed and validated by professors based on a combination of educational programs of Korkman et al. (39), Billy and Thornton (40) and Gary (41). Neuropsychological interventions were performed in 20 one-hour sessions (two sessions per week).

Table 1, Psychological neuropathy

Sessions contents	Title	sessions
Auditory attention, visual attention, rhythmic movements, maintenance and change of attention, playing with dolls and crowding cards.	Introduction, group rules, reinforcement	1 to 4
Plan for a short-term goal, design with cubes, build towers, maintain and recall details of a task, categorize cards by color, shape, and size.	Executive functions	5 to 8
Improving auditory memory, visual memory, auditory and visual memory exercises, play with pictures, execute commands, watch movies, recognize memory, recall memory, learning list, following instructions.	Working memory	9 to 12
Enhance auditory attention, auditory clarity, auditory sensitivity, phonological awareness, comprehension of sentences and problems, comprehension of auditory content, comprehension of words and mathematical concepts.	Language	13 to 16
Improving eye movement coordination, identifying geometric shapes, position in space, navigation in mazes, orientation, perception of shape, perception of shape and background, spatial awareness, copying an image from different images	Visual-spatial processing, post-test performance	17 to 20

Rhythmic Movement Therapy Program: Spark exercise program includes recreational activities, games and exercise for children and has been used in many researches and is a comprehensive program designed to achieve goals such as increasing physical fitness and motor skills for people to enjoy physical activity and providing high levels of activity (42) the content validity of the Spark exercise program was confirmed by the professors, and was done with the help of two physical education professors and the researcher.

Table 2. Rhythmic movement program

Sessions contents	Title	session
Warming up, walking with heels, jumping while rotation, strengthening large muscles, musical line game (in this game, the child must run on the right line according to the beat of the music and the instructions provided in the music text (jump , Sit, rock, hop , etc.) in each session, the last 10 minutes were dedicated to cooling the body.	Introduction, announcement of group rules	1 to 4
Warming up, walking on heels and toes, jumping with a spin, playing chessboard (the student sits on a chessboard and starts moving in one direction with the direction of music (two houses up, three houses to the right, etc.), it starts moving in one direction in different directions or in the form of a pair of legs.	Teaching chess	5 to 8
Warming up, lifting, jumping and clapping hands, balance exercises, playing field shapes (different shapes (circle, square, etc.) are placed in different parts of the hall. Moves in poetry, in this game you can use other shapes such as animals, objects and even Persian words.	Strengthening balance, movements	9 to 12
Warming up, movement skills (with open and closed , performing Bronnix-Ozertsky motor skills test exercises, sound play) In this game, children in the environment display the shape of the sound according to the sounds played. For example, when they hear the sound of an airplane or a train, they start moving like an airplane or a train.	Motor skills test exercises	13 to 16
Warming up, Seven Stones game , Sack Racing game , Bronnix-Ozertsky Motor Skills Test, Post-Test	Local games, continuation of motor proficiency test exercises	17 to 20

Cognitive empowerment treatment program

Smart sound Cognitive Advancement Educational Software is an attractive educational program produced by Brain Train Company and for the first time by a group of computer and psychology experts at the Parand Institute of Cognitive Sciences in Tehran and is localized under theoretical supervision in 2011. The space of this software is designed like computer games. This software consists of three basic parts, which include: teaching and practicing auditory attention, teaching and practicing mental mathematics, and teaching and practicing auditory clarity; Each of these three parts has several parts such as speed, endurance and so on. It is generally a software that is suitable for memory enhancement, visual and auditory processing, language processing, and many other skills. The reliability of the software using Cronbach's alpha method has been reported to be

0.91 (43). This program was used in 20 sessions (3 sessions of 60 minutes per week). Finally, the post-test was performed.

Table 3. Cognitive empowerment treatment program

Sessions contents	Title	Sessions
Teaching how to work with the mouse with students who have not worked with computers, eye-hand coordination, mindfulness game, attention and concentration enhancement, visual memory enhancement game	Introduction, enouncement of group rules	1 to 4
Speed action game, visual memory boost game, active memory	Reviewing and teaching how to work with the computer, playing the desired games	5 to 8
Active memory game, background shape recognition game, eye-hand coordination	Introducing the desired games and playing them	9 to 12
Recognizing differences, strengthening attention and focus, playing the perception of spatial relationships	Review, practice and play games	13 to 16
Game strengthens perceptual organization (puzzle), working memory, speed of action, recognizing differences	Performing selected games, performing post-test.	17 to 20

Result:

Multivariate analysis of covariance test was used to evaluate the effectiveness of neuropsychological therapy and rhythmic movements and cognitive empowerment on reading disorder. Tables 4 and 5 show the mean and standard deviation of the scores of the reading disorder components (reading and comprehension of the text) in four groups in the pre-test and post-test stages.

Table 4: Mean and standard deviation of reading scores in the three experimental and control groups in the pre-test, post-test

Group	Statistical index	Stage		Normality	
		Pre-test	Post-test	Shapiro-Wilk	Significance level
First group	Mean	53/17	69/33	0.95	0.64
	The standard deviation	4.69	8.00	0.90	0.15
	Mean	54/42	66.92	0.94	0.53

Second group	The standard deviation	3.85	5.70	0.95	0.66
Third group	Mean	55.83	61.25	0.92	0.33
	The standard deviation	4.84	7.33	0.98	0.97
Fourth group	Mean	50.58	51.00	0.87	0.06
	The standard deviation	9.74	10.13	0.88	0.07

The first group: Treatment of neuropsychological disorders

The second group: Rhythmic movements

The third group: Cognitive empowerment

The fourth group: Control

The above table, in addition to the mean and standard deviation of reading, shows the indicators related to the Shapiro-Wilk test of each of them in the pre-test and post-test measurement stages separately for each group. Table 4 shows that Shapiro-Wilk indices are not significant in any of the four groups at the 0.05 level. This indicates the establishment of the assumption of normal distribution of data in all four nodes of testing and control in the pre-test and test phase. In order to evaluate the second hypothesis of the independence of dependent variables in the pre-test stage, one-way analysis of variance (ANOVA) was used. The assumption of independence seeks to answer the question of whether there is a significant difference between groups in terms of dependent variables before the implementation of independent variables. Using one-way analysis of variance test showed that there was no significant difference in terms of reading before performing independent variables ($P = 0.21$, $F = 1.58$ (3.44)).

Table 5: Mean and standard deviation of text comprehension scores in the three experimental and control groups in the pre-test and post-test

Group	Statistical index	Stage		Normality	
		Pre-test	Post-test	Shapiro-Wilk	Significance level
First group	Mean	16.58	20.58	0.97	0.94
	Standard deviation	3.32	2.61	0.94	0.52
Second group	Mean	14.00	19.83	0.95	0.67
	Standard deviation	3.30	3.38	0.94	0.52
	Mean	13.92	20.17	0.95	0.65

Third group	Standard deviation	2.64	3.24	0.96	0.78
Fourth group	Mean	15.25	15.17	0.90	0.18
	Standard deviation	3.05	3.51	0.93	0.34

The first group: Treatment of neuropsychological disorders

The second group: Rhythmic movements

The third group: Cognitive empowerment

The fourth group: Control

The above table, in addition to the mean and standard deviation of text comprehension, shows the indicators related to the Shapiro-Wilk test of each of them in the pre-test and post-test measurement stages separately for each group. Table 4 shows that Shapiro-Wilk indices are not significant in any of the four groups at the 0.05 level. This indicates the assumption that the distribution of data is normal in all four nodes of testing and control in the pre-test and test phase. In order to evaluate the second hypothesis of the independence of dependent variables in the pre-test stage, one-way analysis of variance (ANOVA) was used. The assumption of independence seeks to answer the question of whether there is a significant difference between groups in terms of dependent variables before the implementation of independent variables. Using one-way analysis of variance test showed that there was no significant difference in terms of text comprehension before performing the independent variables ($P = 0.13$, $F = 1.98$ (1.44)).

Table 6: Test and Levin for homogeneity of variances and homogeneity of regression slopes

Variable	Homogeneity of regression slopes		Homogeneity of variances	
	Significance level	F	Significance level	F
Reading	0.11	2.91	0.23	1.31
Comprehension	0.22	1.57	0.97	0.37

According to Table 6, the results of Levin test at the level of 0.05 are not significant ($p > 0.05$). Therefore, there is a assumption of homogeneity of variances for both components of reading disorder (reading, text comprehension). Reading and understanding the text is not meaningful. ($P > 0.05$) Therefore, the regression curves of pre-test and post-test reading and comprehension of the text in the experimental and control groups are not significantly different and the assumption of homogeneity of regression slopes is confirmed.

Table 7: Results of Wilkes Lambda multivariate test to evaluate the differences between reading disorder components in experimental and control groups

Effect	Significance level	Degree of error freedom	Degree of assumption freedom	F	Value
Lambda Wickels	0.001	82	6	11.72	0.29

Based on the results of Table 8 shows the difference between the four groups in reading variables (P = 0.001, F = 14.82) text comprehension (P = 0.001, F = 16.88) level p <0.01 significant Is. Therefore, it can be concluded that there is a significant difference between the scores of reading disorder components in the groups of psychological neurotherapy, rhythmic movements, cognitive empowerment and the control group. Therefore, we conclude that the treatment of psychological nerve, rhythmic movements, cognitive empowerment increases students' ability to read and understand the text. The post hoc test is used to examine more closely and determine the groups that are different from each other.

Table 9: Pair comparisons of reading disorder components in the treatment of psychological neuropathy, rhythmic movements, cognitive empowerment and control group

	<i>I</i>	<i>j</i>	<i>Mean difference</i>	<i>Significancy level</i>
Reading	Neuropsychological Treatment	Rhythmic movements	3.84	0.18
		Cognitive empowerment	10.59	0.001
		control	16.61	0.001
	Rhythmic movements	Neuropsychological Treatment	-3.84	0.18
		Cognitive empowerment	6.76	0.02
		control	12.77	0.001
	cognitive empowerment	Neuropsychological Treatment	-10.59	0.001
		Rhythmic movements	-6.76	0.02
		control	6.01	0.04
		Neuropsychological	-16.61	0.001

		Treatment			
	Control	Rhythmic movements	-12.77	0.001	
		Cognitive empowerment	-6.01	0.04	
comprehension	Acceptance and commitment therapy	Rhythmic movements	-1.20	0.16	
		Cognitive empowerment	-1.51	0.11	
		control	4.21	0.001	
	Rhythmic movements	Neuropsychological Treatment	1.20	0.19	
		Cognitive empowerment	-0.13	0.72	
		control	5.41	0.001	
	Cognitive empowerment	Neuropsychological Treatment	1.51	0.11	
		Rhythmic movements	0.31	0.72	
		Rhythmic movements	0.31	0.72	
			Neuropsychological Treatment	4.21	0.001
		Control	Rhythmic movements	-5.41	0.001
			Cognitive empowerment	-5.73	0.001

According to Table 9, there is a significant level in all components of reading disorder of the neuropsychological treatment test, rhythmic movements of cognitive empowerment with the control group is less than 0.01. Therefore, the null hypothesis is rejected. The difference between the means and the control group indicates the greater effect of psychological neurotherapy on reading and the effect of cognitive ability on text comprehension.

Discussion and conclusion:

The aim of this study was to compare the effect of neuropsychological therapy, rhythmic movements and cognitive empowerment on improving the reading of students with special learning disorders. As observed in the findings section, all three types of treatment had an effect

on the improvement of reading disorder, but respectively, neuropsychological therapy, then rhythmic movements and finally cognitive empowerment. So far, no study has been conducted in the country and abroad to simultaneously review and compare these treatments on dyslexic students. Extensive research on the effectiveness of neuropsychological therapy on children's language performance (7), executive actions and students' academic performance (8), reading accuracy and comprehension of students with reading disorders (9), reading improvement (10), disorder Developmental nerve and reading (11), improvement of learning disability (12), improvement of maladaptive behaviors and phonetic problems of children with reading disorder (13) have been approved by researchers. Explaining the findings of this study, it can be said that children must have mastered a set of skills to master reading. These skills have aspects of the psychological nerve and are acquired through experience, teaching and learning. Most children develop these skills automatically, but dyslexic children have difficulty learning these skills and need to be taught. In other words, identifying what problems dyslexic students have in neuropsychological skills can help the training set to understand how the problem is or to design appropriate training programs.

Children with reading disorders usually have poor skills in sensory perception, reading speed, reading accuracy, reading comprehension and language processing, and therefore teaching students neuropsychological skills can improve these skills. In fact, the treatment of psychological neuropathy is such that it involves a significant role in improving learning by involving more than one sense. In general, he et al. (12) believes that the effects of sustained therapy, the absence of side effects, and the adverse effects of some judges are the benefits of neuropsychological therapy.

Also, according to this type of research, neuropsychological variables can be considered as the least predictors of reading progress, because even if they can not determine the IQ score alone, they will have accurate predictions when added to IQ scores. In other words, identifying what problems dyslexic students have in the neuropsychological aspects can help the education system understand the type of problem or design appropriate curricula. A very important point in developing neuropsychological interventions is that a child's inability to read can be related to several aspects of his or her neuropsychological skills, such as attention, executive functions, visual-spatial processing, language, and memory. For example, memory problems may be essentially a secondary issue (44).

Dyslexia from a psychological neurological point of view is caused by a disorder in the structure and function of the cerebral hemispheres. This model is based on the perspective of the psychological nerve, which explains the types of dyslexia and reading development. According to this model, both left and right cerebral hemispheres are involved in the process of reading evolution. Reading first requires a perceptual analysis of the shape and direction of the letters and words. This perceptual analysis is performed by the right hemisphere. Then this introductory reading should be smooth and smooth. This is only possible if the reading management is transferred from the right hemisphere to the left hemisphere. Therefore, according to this model, reading is mainly done in the introductory stages by the right hemisphere and in the advanced

stages by the left hemisphere. Due to its function in spatial thinking, the right hemisphere is initially responsible for extracting the visual-spatial aspects of the written word. At the beginning of reading, the brain must analyze the written word in terms of its spatial form, and then this spatial form must be understood with its sound and meaning. Studies on evoked potential by other researchers confirm the existence of these stages (45).

Therefore, the evolution of reading involves the transition from the right hemisphere to the left hemisphere of the brain. While in some of these children this transfer does not take place. Failure to perform this transfer in dyslexia seems to be related to the presence of failure in the right hemisphere. As a result, it leads to dyslexia. This type of dyslexia occurs when the reader uses left hemisphere language strategies prematurely in the early stages of reading development. Or from the very beginning of the reading process, the left hemisphere plays a key role. Excessive reliance of these children on left hemisphere strategies leads to high reading speed and due to the lack of use of right hemisphere strategies, children become oblivious to the perceptual features of the text. Thus, dyslexic children read fast but lack in reading accuracy, which leads to fundamental errors in reading (44).

The results of the present study also showed that treatment based on rhythmic movements has an effect on improving reading disorder. Payne and Isaac (25) showed that teaching rhythmic movements improves learning disabilities in dyslexic children. Blassing et al. (26) believe that characteristics such as rhythm, harmony, and music that exist in rhythmic games provide the ground for children to practice and master reading skills. Davis and Barnes (46) showed in their research that by using rhythmic movements and rhythmic poems and words, it is possible to increase the concentration and perception of dyslexic children on words, syllables and sounds, and thus improve reading and comprehension in They became.

In the field of the effectiveness of cognitive empowerment therapy, many studies including the effect on executive functions (focused attention, ability to organize and plan and auditory and visual working memory) (28), executive functions of self-regulation and reading performance (29), reducing cognitive impairment and cognitive avoidance Students (30), Improving executive functions in students with special learning disabilities (31), Reading and comprehension of students with reading disorders (32), cognitive functions (attention, problem solving, memory, arithmetic) of disabled children Learning (33), executive functions (working memory and attention) and students' academic achievement (34), improvement of learning disability (35) and decoding, phonological awareness, comprehension (36) were approved by researchers.

In the discussion of cognitive empowerment, computer games, due to their high attractiveness, make users interested in it and see it as a pastime and the possibility of playing the game many times can help to strengthen the child's skills while creating skills in the game, because these programs are prepared and produced for therapeutic purposes and can improve functional defects such as problems related to visual and auditory perception (47).

Also, providing encouragement to the game provided to the child by the software as a kind of positive reinforcement motivates children and makes them interested in continuing to play, which is also one of the benefits of using computer games. It is a kind of goodness compared to formal education (48).

According to Holmes, computer games, by increasing the level of perceptual awareness and enhancing visual processing, enable children to use their senses to learn more and actively participate in the learning process and take steps towards academic achievement, especially in the field of reading, and accordingly, the power of learning their reading and writing materials is strengthened (49).

Ethical considerations:

Ethical considerations in this study included: written information about the research to participants, reassuring students and parents about the confidentiality of information and using it only in research, voluntary participation of students in study and obtaining Written consent of students and parents.

Research Limitations:

The impossibility of random sampling of the study may affect the results of statistical analysis and thus have adverse effects on the internal validity of the research. Therefore, in generalizing and relying on research results, this limitation should be considered in some way. Another limitation is that the statistical population of the study consisted of female students in the first grade of elementary school in Torbat-e Jam, and therefore the generalization of the results of this study to other communities should be done with caution.

Application of research:

Finally, according to the research results and the effective influence of neuropsychological on improving reading and comprehension of students with special learning disorders with reading difficulties, it is suggested to use this method in learning disabilities centers and counseling centers to improve reading problems of these students. .

Conflict of interest:

There is no conflict of interest between the authors.

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