

## Original Article

**Comparison of the Effectiveness of Fernald's Sensory Method and Educational Games on Writing Disorder in Elementary School Students**

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**Key words:**Learning Disabilities,  
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Fernald Multisensory Method**ABSTRACT**

The present study used a quasi-experimental research method with pretest-posttest research with a control group to show the effectiveness of Fernald's multisensory method and educational games on writing disorder in elementary school students. The statistical population of this study consisted of all students with writing problems in Shabestar in the 98-99 academic year who were studying. 30 people were selected as the sample (the first 10 people in the experimental group of Fernald's multisensory method, the second 10 people in the experimental group of educational games and the third 10 people in the control group) who were randomly selected from among students with writing difficulties in three (First experimental group, second experimental group and control group) were included. Data collection tools included Fernald's multisensory method and educational games and the Colorado Learning Disabilities Questionnaire. Covariance analysis method was used to analyze the research hypotheses using SPSS.23 software. According to the results of analysis of covariance, Fernald's multisensory educational method has the greatest effect on students' writing disorder.

**INTRODUCTION**

Childhood is the first and most sensitive period of human life. The importance and position of this period is such that psychologists and education experts often refer to this period as the most prominent stage in the development of human personality. The role and position of childhood in the future of children has led to the formation of institutions and systems of children's education in the world. The goal of education in this course is the growth and development of children in all dimensions. Therefore, this stage should include situations, activities and experiences that are in line with the comprehensive upbringing of children. Today, the term learning disability is familiar to well-known teachers. Special learning disability is diagnosed when there are specific deficiencies in a person's ability to receive or process information correctly and efficiently. Learning is the most fundamental process as a result of which, a helpless and helpless creature over time and in interaction with physical growth, becomes a transformed person whose cognitive abilities know no boundaries. There is a great variety of human learning time spans that despite the many similarities that humans have with each other, some people have problems in the process of learning and education (Graham, Haris., & Chorzempa, 2015.) Children with special learn-

ing disabilities have many problems due to the improper functioning of different areas of the brain in information processing. These children learn language and phonology skills, naming objects and separating phonemes and loss, computation and perceptual-motor coordination, visual and auditory processing, sensory-motor and spatial coordination, memory and attention, working memory and executive functions; They have more disabilities compared to normal children (Berninger, 2014). Neuroscience has shown that learning takes place during a change in the functional organization of the brain, and therefore education is a kind of brain change art that creates new links between motivation, experiences, and inclusive behavior (Jensin, 2008). Writing Disorder was first introduced as a type of psychiatric disorder in the revised form of the Third Edition of the American Psychiatric Association's Statistics and Diagnostic Guide, and with Developmental Disorder in Expressive Writing, the main clinical features of these students Grammatical norms are age-appropriate. Also, their written or oral sentences contain a large number of grammatical errors and weaknesses in paragraph construction. The most common components of spelling disorder are spelling. Spelling problems may indicate fundamental problems in phonological processing. These children will most likely not be able to combine letters and make words accurately. (Brina, 2018.)

some psychologists categorizes the problems of written language into three categories:

**Handwriting** - Although even the best students do not have a complete handwriting, students with learning disabilities have more difficulty, their handwriting is often illegible. In addition to reading problems, they are very slow to write. **Spelling** - Spelling is the ability to match sounds and letters to be written. Matching between consonants and characters is a skill that does not develop well in children with learning disabilities. **Composition** - Although a number of children's teachers People with learning disabilities point out their poor performance in writing, there is not much research in this area. This field shows that the range of problems of these children varies from grammatical errors to syntactic defects (Arthure, 2015). Causes of learning disabilities can be caused by a range of factors, including genetic defects, injuries or diseases. All disabilities have a physical counterpart, meaning that they occur due to abnormalities in the physical or biochemical structure. Students may appear physically incapacitated, emotionally disturbed, and emotionally and mentally weak. Interventions for written language deficiencies depend on the accurate classification and assessment of students' specific deficiencies. When problems are related to the child's age or educational background, age-specific restorations and imperfect skills are recommended. Adverse strategies may be helpful. When dyslexia is the result of several disorders, it becomes more difficult to recover and overcome the problem. To teach writing, it is to teach movement patterns to the child, so that he can feel the letters while writing, not to be guided to copy what he sees. The pattern is placed at a distance, so that the child can look at it easily. To reproduce (regenerate). The movement pattern sometimes includes exercises that must be done with the eyes closed. Even the hand automatically produces the movement patterns of the letters without visual control. Fernald introduces a multi-sensory approach that stimulates the four senses of sight, hearing, movement, and hearing at the same time as learning. Applying the multisensory method, because it simultaneously considers auditory attention, seeing, correct pronunciation, reading, fingerprinting and word details, also includes the phonological and phonological awareness skills of the word, also if this method effectively If used, it will solve children's spelling problems radically and their spelling weaknesses will not return, and in this regard, effective and sustainable learning will be created. Fernald's (1990) method focuses on visual, auditory, kinetic and Touch emphasizes teaching spelling and reading. The word the child intends to learn is written in capital letters on paper and the student traces it with the finger. This process continues until the student can write the word without looking at the word and memorizing it. Eventually the student is able to generalize the words and can create new words. Multisensory learning is the most efficient way to solve Students' problems have special learning disabilities and significantly improve the learning of reading and writing (handwriting and spelling) of students in the first to fifth grades of elementary school, according to the results of experimental research, if information and concepts instead of one or Two senses (visual and auditory) are received through several senses, learning becomes easier for students and they learn better. Teaching

in a multi-sensory way is approved and supported by the results of experimental research. According to Lloyd, James, Hallahan, and Martinez, the student learns more if he or she engages more than one sense in the learning experience. In spelling training, the multi-sensory method has achieved the best results, because in this approach, the child sees, hears, touches and writes (Gersten, R., & Woodward, J, 2011). Recently, effective approaches have been proposed to link different dimensions of neuroscience and educational sciences. Accordingly, the new method of play therapy is a structured approach based on therapy theory that establishes the child's normal learning and communication processes. In fact, play therapy is a method that helps the child control his emotional pressures. Play therapy is often used to treat maladapted children and children with learning disabilities. Play therapy is the relationship between a trained therapist and young clients with behavioral or emotional problems that lead to a variety of play-based activities. Making therapeutic changes in clients. Landers et al. Believe that play is a world of activity and action, and that therapist can use play to discover the child's world. Therapists teach children more adaptive behaviors through play to children with poor social or emotional skills. According to Baezat, one of the methods used to improve children's learning disabilities is play therapy. Little research has been done on the effect of play therapy on the treatment of learning disabilities. In a study by Baezat and Izadfar, they showed that the spelling errors of subjects in the experimental group who received phonological awareness training were significantly improved compared to the control group. These results were confirmed by Abdi and Karami. One of the important approaches in the field of play therapy for children with special learning disabilities is the linguistic approach. The reason for paying attention to linguistic ability in designing games is related to the mediating role of these skills in people's cognitive ability and academic performance. Considering the role of computers and computer games in today's life and its power to influence people, especially children Multidimensional and multidimensional linguistic effects of computer games in the lives of children with learning disabilities can be used to solve their problems and shortcomings. Cognitive-behavioral play therapy includes interventions based on cognitive-behavioral approach in the form of play. The basis of this theory is based on the course of sensory evolution. Accordingly, the game is used as a verbal and non-verbal method in solving problems. This approach is different from indirect play therapies, such as link therapies that avoid any direct discussion. Cognitive play therapy leads to the growth of adaptive thoughts and behavior. (Mohammad Ismail Beigi and Pirzadi, 2017). Based on the research in this field, the researcher of this study decided to evaluate the "effectiveness of Fernald's multisensory method and educational games on the writing problems of primary school students in Shabestar city". has it?

## METHOD

In the present study, in order to show the possible consequences of the effectiveness of Fernald's multisensory method and educational games on students' writing problems, a

quasi-experimental research method with pre-test-post-test with a control group was used.

The statistical population of this study consisted of all students with writing problems in Shabestar in the 98-99 academic year who are studying. 30 people were selected as the sample. (The first 10 people in the experimental group of Fernald's multisensory method, the second 10 people in the experimental group of educational games and the third 10 people in the control group) who were randomly selected from the students with writing difficulties. Was placed in three (first experimental group, second experimental group and control group).

Data for this study were collected through the Colorado Learning Disabilities Questionnaire (CLDQ). This questionnaire was prepared by Wilcott et al. (2011) and standardized by Hajloo and Rezaei Sharif (2011). The present questionnaire is designed to screen and identify children with learning disabilities and classifies learning disabilities into five basic factors: reading and writing, arithmetic, social cognition, social anxiety, and spatial functioning. It is desirable to be self-sufficient. This questionnaire consists of 20 items and is completed by students' parents. The answer to each phrase on a 5-point Likert scale is from (1) to forever (5). The validity of this questionnaire and its components have been reviewed by the authors of the questionnaire by internal consistency and retest methods and have obtained acceptable dimensions (Wilkat et al., 2011). The convergent validity of the components of this questionnaire with the standard questionnaires of academic achievement has been reported as follows: reading 64%, mathematics 44%, social cognition 64%, social anxiety 46%, spatial problems 30% (Wilkat et al., 2011). (Wilcott et al., 2011) In the original form, they reported the internal consistency of all questions by calculating Cronbach's 95% alpha. In Hajloo and Rezaei Sharif (2011) study, 90% of the validity is reported by Cronbach's alpha. The relationship between the Colorado Learning Disabilities Questionnaire and the subscales of reading and writing was 81%, social cognition was 78%, social anxiety was 76%, spatial problems were 70%, and mathematics was 60% (Hajloo and Rezaei Sharif, 2011). Descriptive and inferential statistics were used to analyze the data. To describe the data, parameters such as central orientation (mean, median), dispersion size (amplitude of changes and standard deviation) were examined. The results of the questionnaire (pre-test-post-test) were presented as a frequency table and graph at the beginning of the analysis and in the inferential statistics section to analyze and interpret the data from the analysis of covariance and MANOVA (MANOVA) using SPSS program.

### Structure of Training Sessions

At first, all the sample (30 people) took the test as a pre-test, which at the end of the sessions, the same test was performed as a post-test. Fernald's multisensory method was performed in 8 sessions of 45 minutes. Meetings were held individually for each student as follows: Table 1: Session topic Session number Familiarity and communication with the student and his evaluation based on the first textbook Write problemat-

ic words on paper - read by the tester - see and hear at the same time by the student - write with the index finger on the word - write that word in the air and sand tray (strengthen the sense of touch) Second Writing letters on sandpaper and cutting them - touching and writing with the index finger by the student - putting the letters together and forming a third word Repeat the exercises of the previous fourth sessions Reading Writing words with chalk or colored magic on a blackboard/ whiteboard First by the examiner then by the student - Then writing the same words without a pattern by the fifth student Helping the student to make sentences and write stories with words that were difficult to read and write. Sixth Presentation of the text by the examiner to the student in order to solve the possible seventh problems Dictation first by looking at the word then without the eighth pattern (At the end of each session, the student was given homework assignments) Educational games This method was performed in 8 sessions of 45 minutes for the second group. Meetings were held individually for each student as follows: Table 2: Session topic Session number Familiarity and communication with the student - Strengthen fine motor skills by using games such as crumpling paper and play dough - Strengthen visual perception by games such as finding differences and similarities between images and. First Strengthen fine hand movement skills with advanced games - Strengthen visual memory by using the game to find and find and... Second Making a word with letter cards by showing the word - strengthening auditory memory and auditory sensitivity using storytelling cards, guessing the names of objects according to their sound and. Third Making a word with letter cards without showing the word image - Making words with letter combinations - Enhancing the accuracy and concentration of the fourth child Making multi-part words - solving the problem of inverting the child using a mirror and... fifth Writing problematic words on colored cards and looking and reading them by the student and then writing them without looking - Repeat the exercises related to strengthening the sixth visual and auditory memory Sentencing with colored cards - punctuation of letters in the text - repetition of exercises related to accuracy and concentration seventh Re-examine problematic words and letters for the student and fix possible problems if needed (Homework was provided for practice on concentration and concentration, visual and auditory memory after each session.)

### RESULTS

Hypothesis 1: Fernald's multisensory teaching method has an effect on students' writing disorder.

According to Table 1, because the significance level (0.000) of the F test in the post-writing disorder test is less than 0.05, so it can be concluded that the effectiveness of Fernald's multisensory method has a positive effect on writing disorder. The research hypothesis is confirmed with 95% confidence. On the other hand, according to the ETA parabolic square, it can be said that education based on Fernald's multisensory method can explain 99% of the variance of students' writing disorder.

Also, according to Table 2, after adjusting the pre-test scores, there was a significant factor effect between the sub-

**Table 1.** Univariate analysis of covariance analysis on writing disorder

Eta coefficient	Sig	F	Mean squares	df	sum of squares		
0.990	0.000	813.70	296886	2	5937.72	factor	Fernald's Multisensory
			3.64	17	62.02	E	Method/Writing Disorder

jects ( $F = 813.70$   $S = 0.000$ ,  $P_{\text{partial}} = 0.9902$ ). The adjusted mean scores show that students who passed the post-test They have been trained in Fernald's sensory method (experimental group). They experience less writing disorder compared to the control group. As a result, Fernald's sensory training among students has been able to reduce the amount of writing disorder.

Hypothesis 2: Educational games have an effect on students' writing disorder.

According to Table 3, because the significance level (0.000) of the F test in the post-writing disorder test is less than 0.05, so it can be concluded that the effectiveness of educational games has a positive effect on writing disorder, so with 95 The percentage of certainty of the research hypothesis is confirmed. On the other hand, according to the squares of ETA paradigm, it can be said that educational games can explain 98% of the variance of students' writing disorders.

Also, according to Table 4, after adjusting the pre-test scores, there was a significant factor effect between the subjects ( $F = 694.23$   $S = 0.000$ ,  $P_{\text{partial}} = 0.998$ ). The adjusted mean scores show that the students who were behind They have experienced the test of educational games (experimental group) compared to the people in the control group, they experience less writing disorder. As a result, educational games have been able to reduce the rate of writing disorder among students.

Hypothesis 3: There is a difference between Fernald's multisensory method and educational games on students' writing disorder.

Table 5 lists the four multivariate tests of covariance analysis: "Pillay effect", "Wilkes lambda", "Hotling effect" and "Largest root on". As can be seen, the significance level ( $s = 0.000$ ) of all four tests is less than 0.05, which indicates the minimum difference between the dependent variable (writing disorder) in the experimental and control groups. Therefore, the research hypothesis is confirmed with 95% confidence.

## DISCUSSION

The results showed that Fernald's multisensory educational method has an effect on students' writing disorder. The results also showed that educational games have an effect on students' writing disorder. On the other hand, there is a difference between Fernald's multisensory method and educational games on students' writing disorder.

Results of research findings with the results of Rouke (2019), Eisenberg and Kaisenbury (2002), Dopppe Voyant (2006), Morvas (2008), Ray, Shuttle Croob (2009), Nedomuscat (2009), Wilkes, Gilan, Bondi, Cordier, Lincoln (2014), Eisenberg and Kaisenbury (2002), Wilkes, Gilan, Bondi, Cordier, Lincoln.(2014), Yilmaz, Alton and Alcon

**Table 2.** Modified means based on Fernald's multisensory method training on improving students' writing disorder in post-test

0.95% confidence		M	E	M	Group error
H	L				
84.67	82.05	0.621	83.36		Control
50.16	47.52	0.626	48.84		Experiment

(2015), Richards, Et, Al (2016) and Reynolds (2016) are consistent. In explaining this issue, it can be said that Fernald method is a multi-sensory method that is used to teach reading and writing to students who have difficulty learning and memorizing words and their vocabulary is limited. He believes that students' learning is different. Some students learn by looking at the word and creating a mental image for it, and some students learn by repeating the word. Fernald's method is more complete than other multisensory methods because he tried to create a balance for the use of different senses, and the finger-following method, which is a kinetic sense, was added for learning. This method is also called VAKT for short because it involves different senses of sight, hearing, movement and touch. Fernald started his work in a school which was attached to the university. California was established in Los Angeles, and a group of faculty and students taught and studied students with a variety of disorders. He selected students for his laboratory work who had moderate or higher intelligence but had difficulty in one or more subjects, especially reading and spelling. Finally, in 1943, he published his research paper explaining his multisensory method. Becomes. Although some authors consider this method as a motor method, but in fact it is a multisensory system and a methodological. Because words are learned through the four senses of sight, hearing, movement and touch. The child looks at the word (sight) and reads each word aloud (hearing), then traces it by touching his or her fingertips (kinetic) and touches each part of the word (touch). Multisensory programs that show seeing, hearing, drawing, and writing are often referred to as visual, auditory, sensory, kinetic, and tactile programs. In explaining the effective role of play, it can be said that children's play is one of the most important learning mechanisms for children. Because most children's experiences, especially in preschool, are summarized in their play and play can be considered the latest work or experience of children. In addition, the child uses his physical and mental forces while playing and learns various skills; In playing with other children, the person learns how to communicate with them. He knows others better and also gains a better understanding of himself. Play is one of the most important factors in physical, social, emotional, moral and intellectual development. The child's skills and experiences develop through play. It is also supported by

**Table 3.** Univariate analysis of covariance analysis on writing disorder

Eta coefficient	Sig	F	Mean squares	df	sum of squares		
0.98	0.000	694.23	2784.47	2	5574.95	F	Educational games
			4.01	17	68.25	E	factor/writing disorder

**Table 4.** Modified averages based on educational games on improving students' writing disorder in post-test

0.95% confidence		E	M	Group error
H	L			
84.79	82.02	0.656	83.40	Control
49.04	51.79	0.651	50.42	Experiment

**Table 5.** Multivariate tests of analysis of covariance

Eta	Sig	D.F	D.F	F	D	Tests
		Error				
0.983	0.000	12	7	114.667	0.983	Pilay effect
0.983	0.000	12	7	114.667	0.024	Wilkes Lambda
0.983	0.000	12	7	114.667	55.667	Hotling effect
0.983	0.000	12	7	114.667	55.667	Largest root on

a variety of tools, materials, adults and experienced educators who consider play to be the best way for a child to learn and grow. It should be noted that many things that can not be taught to the child, can be done with play (Voyant, 2006). Play has a great role in the life and development of the child. The game depends to a large extent on the skill of the coach and teacher and his familiarity with the spirits and age characteristics and characteristics of children, correct leadership and in accordance with the style of various games (Geldard, Geldard & Foo, 2013).

To explain the greater effectiveness of Fernald's method, we can say that Fernald's method is a multi-sensory method that is used to teach reading and writing to students who have difficulty learning and memorizing words and their vocabulary is limited. Fernald began his clinical career in 1921. He believes that students' learning is different. Some students learn by looking at the word and creating a mental image for it, and some students learn by repeating the word. Fernald's method is more complete than other multisensory methods because he tried to create a balance for the use of different senses, and the finger-following method, which is a kinetic sense, was added for learning. Play is one of the basic needs of children and their most important activity, which has other important functions as well as fun. has it. Each of these functions is related to aspects of the child's life and prepares him to enter adulthood (Gapin Watner, 2010). Brings it to him. Psychologists believe that the child should be released in spontaneous activities. During play, the child's mental and physical forces develop along with accuracy, imagination, order and agility. In addition, play is a stimulus and motivation that is used to gain social experiences. In this way, the child can realize his talents, abilities, desires, weakness-

es and positive and negative points, and by recognizing his characteristics, he can strengthen his personality structure (Morvas, 2008).). Among the basic academic skills, writing is the most tangible because it leaves a written record. In addition to being a basic skill and a prerequisite for academic and school success, writing is also a basic and required skill in everyday life. Because in today's literate world, a person who has basic reading and writing skills If there is a problem, F will be in an unfavorable situation. Recognizing the symptoms and early detection of the disorder and subsequent restorative interventions will minimize its adverse secondary consequences. It is widely believed that most people are lazy in writing and often prefer things that are empty. From the task of writing, it can be said that the written form of language is the highest and most complex form of communication. In the language skill hierarchy, writing is the last step to be learned (Fletcher and Et Al, 2017). Basic learning and useful experiences of language skills in listening, speaking, reading are, in fact, a prerequisite for writing. Strong listening skills and proficiency in using written language require other skills as well. The ability to store an idea or speech in the brain of auditory memory. Transform that thought and speech into words and pattern it appropriately, design the correct drawing form of each letter and word in the visual memory mind, and use writing tools to draw letter shapes. The unification of complex eye-hand relationships, visual memory, and adequate motor skills are all essential to the act of writing or the act of writing (McLaffin Wallace, translated by Tusi, 2014, Kerry, Swan, DC and Ray, 2014).). According to the results of this research, it is suggested that the education organization think about compiling and gathering extensive resources of educational games and Fernald's multisensory method for exceptional school teachers.

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