

Effect of computer games (puzzle game and Simulation game) in working memory and space visual perception in student with specific learning disorder (reading, writing, math)

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Abstract

The purpose of this research was Effect of computer games (puzzle game Moument Valley and Simulation game SimCity) in working memory and space visual perception in student with specific learning disorder (reading, writing, math). Survey in this research was semi-experimental research pretest and post with lone group and statistics method was mix Anova. the statistics population was whole 216 people of students in third base fourth 'fifth 'sixth grade was in primary school of girl Maad in the four Tehran resurrection 'that 10 people of that selected for example that measure by random sampling and available sampling. To gather the information used the(Susan pickering Working Memory test , Visconsin card sorting test and Frostig test). Result showed that there were different between students with specific learning disorder (reading, writing, math) and normal student in variable level (working memory and space visual perception) and computer games (puzzle game Moument Valley and Simulation game SimCity) was effect in working memory and space visual perception in student with specific learning disorder (reading, writing, math).

Keywords: working memory, space visual perception, learning disorder, computer game

INTRODUCTION

Specific learning disabilities refer to a heterogeneous group of disorders characterized by significant differences in the acquisition and use of speech, reading, writing, answering, or mathematical skills. Learning Disabilities is a meaningful disorder in one or more the use of spoken or written language and appears defective in the ability to listen, think, speak, read, write, spell or perform mathematical calculations. Specific learning disorder is a problem that affects a child's ability to receive, process, analyze, or store information. This disorder can make it difficult for the child to read, write, spell or solve math problems [1]. The main Property of specific learning disorder in students include: natural intelligence proficiency, lower than expected academic performance, low learning speed, cognitive development, repetition of educational bases, differences in learning levels from disparate learning, lesson learning. There are a significant difference between abilities and skills and the shortness of attention scope [2]. In other words they despite normal intelligence are incapable of learning, although every aspect of growth has a direct relation to biological maturity, but it is generally believed that biological and non-biological factors can play a role [3]. Human learning tools are changing with the environment. If today's children and adolescents who

have complex thoughts and developments cannot learn well, then they cannot live well. Since the pace of change at early age is almost unpredictable, educators are often reluctant to give preschoolers the impression that they have learning disabilities. They prefer to call these children by nicknames, motor delays, speech delays and so on. [4]. Many studies of poor performance in children show specific learning disabilities in executive functioning, Executive functions are skills that help a person decide what kind of activities or goals to consider, which to choose, and how to organize and plan behaviors. Totally, executive functions have two prominent roles in behavior. Therefore, the importance of using

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interventional programs to eliminate or reduce problems with executive functions is highlighted in this Background. Educational problems should not be limited to cases such as intellectual disability, hearing, visual impairment, other mental and neurological disorders and psychological problems. Lack of mastery of the language and literature of education and training as well as inadequate education at school can be reasonable. One of the problems of children with specific learning disorder is impaired in working memory. Research has shown that working memory is a component of other higher level processes and is closely related to academic and learning progress. This component's ability to anxious for other higher level cognitive processes is closely related to academic and learning progress. This index consists of the following: 1- Numeric memory or numbers of digits 2- letter and number sequence 3- Calculus ^[5]. Another problem of these children is visual-preception problems. It means the ability to coordinate visual information and motor planning. Visual-motor perceptual theory has been Various hypotheses have suggested the context in a specific learning disorder due to visual-motor deficits. group of these theorists view learning disruption as the central nervous system because of the perceptual problems caused by impaired brain function. the central nervous system. Visual-spatial plan is one of the most effective factors in math learning and reading, and among the working memory components it has the most to do with math learning and reading. Swanson (2007) has also shown that children with learning disabilities are Lower performance than normal students, especially in working memory and Visual- spatial memory ^[6]. Evidence from people with learning disabilities reading, physiological information, and physiological studies has shown that it may be possible to differentiate space due to the development of unusual brain cells in these studies. A review of previous studies on the important role of the spatial-wall design in children's learning ability is notable. What causes memory and visual objects to be stored in memory, and the mechanism for storing numbers, words, or any other stimulus. There are two mechanisms of visual-spatial explainable this .It is a facilitating process to pay attention to the stimulus and to select the information needed and the inhibition process for irrelevant stimulus and non-selection of that information. Over the decades, many scholars and psychologists have used it to treat a wide range of disorders and have confirmed its effectiveness of the games. that has attracted the attention of researchers today is computer games. For them, it is intended as a computer application, educational value as well as entertainment inmeant. While computers are transferable in the training scheme, Things to learn in the future. But the potential educational, potential of video games may be manifested in the development of certain cognitive skills. This relationship of computer game-based cognition plays a significant role in enhancing children's attention. Studies show that there are a positive relationship between playing and improving attention, planning and writing skills, and thinking and emotional organization, and play is essential for basic cognitive skills. Findings by Johnson (2000) illustrate the importance of play in childhood ^[7]. The active brain

provides important neurological connections for learning .While active, these cognitive junctions provide a stable and essential nerve. Researchers noted in their research report that computer games are effective in Relative improvement the learning disorder. The purpose of this research was to determine the effectiveness of computer games (Monument Valley puzzle and SimCity simulation) on enhancing working memory and visual-spatial perception in children with specific learning disorders (reading, writing, math). In this study, the question is whether computer games (Monument Valley puzzle and SimCity simulation) affect the reinforcement of working memory and visual-spatial perception of children with specific learning disorder (reading, writing, math)? This hypothesis will be further investigated Computer games (Monument Valley puzzle and SimCity simulation) have an impact on enhancing working memory and visual-spatial perception in children with specific learning disabilities (reading, writing, math)..

RESEARCH METHODOLOGY

The present Similar-experimental method was performed in the form of pretest-pass test

Done with followup period. The variable under study that is reinforced by the attempted experiment is working memory and visual-spatial perception among children with specific learning disorders (reading, writing, math). Computer games that have been studied in the above mentioned simulation and puzzle genres and selected from a variety of game SimCity simulation games and Monument Valley puzzle games. In this research, we tried to test a sample of ten people from 216 statistical population of children in Girls' Primary Maad School in Twelve sessions for forty-minute to help advance research goals that are to improve the variables in study. In this project, by researching and obtaining relevant authorizations from children with specific learning disabilities (reading, writing, math) in a pre-test, they will measure the working memory test and the Wisconsin and Frostig tests that represent the actual score of the variables before test ^[8]. All of these students have normal intelligence but some of these students have a specific learning disorder (reading, writing, math). They were determined According to the entrance exams Education Were diagnosed learning disorder (reading, writing, Mathematics) and all had normal intelligence. diagnosed Almost Hundreds. they are same gender in terms of age and IQ.

This adds to the uniformity and advantage of the statistical community. The sampling method is actually available in a clustered sample, Session were planned for this test. Session one to Twelve: For Forty minutes of playing the Monument Valley puzzle game and SimCity simulation game. every twenty minutes. The following data were used to collect the data: working Memory Test: Gathercole, Pickering and (2004) To measure the working memory of 5 to 15 year olds .It is instruct based on a three-component model of baddy working memory and hech ^[9]. Collection Working memory test includes three Index Function of central administrator,

four Functional index, two Functional Visual-spatial working memory index ^[10]. The relationship between working memory and other abilities in children (vocabulary, length, word, consciousness, phonology, and two auditory memory tasks, number Expand by comparing ,three variables of reading comprehension and mathematical ability) was compared to those predicted in the working memory test. It is a good indicator of perceptual skills ^[11]. Coefficients of validity of this regression were reported from 45 to 83 percent and also Reliability collection test with the retest method In the Arjmand Nia and Seif Naraghi research, 95% were reported. ^[10]. Wisconsin Test: Wisconsin Card Sorting Test (WCST). This test was first Preparation by Grant and berg, assessing the ability to abstract and modify cognitive strategies in response to changing environmental feedbacks, and requires planning, organized searching, and ability to use Feedback is the environment for cognitive change, but it was Milner who first introduced it as a test to the experiment the functions of the frontal lobe. Miyake et al They came to the conclusion that The ability to change result an important role in this test. Therefore, this test was used to evaluate the change factor in this study. Wisconsin is one of the main and most application used neuroscientific tools that assess and evaluate the performance and capabilities of concepts, abstract thinking, cognitive flexibility, and the ability to modify cognitive apparatus. This test to check the Collection change, flexibility, problem solving, and concept formation and the ability to overcome repetition and To put in place that are considered executive functions of the brain. The test has four subscales, including categories of achievement, persistence error, other errors, and total error. Finally, calculate the total of errors and error of continuity and the performance of the triable subject will be evaluated ^[12]. In calculating the results of this test three main variables are considered. A) Number of cards packed during the test: The maximum value of this variable is six and the minimum is zero. This variable indicates the extent of one's progress during the test and discovery of a series of six rules. B) Persistence Error: This error belongs to selection that the person after changing the test law after ten times the correct answer to the Again insists on the previous law. This error is the main indicator in showing cognitive inflexibility. That's the specifications spinal -Lateral Prefrontal cortex .C) General Error: Indicates the wrong number of times other

than insisting on the correct selection of card categories ^[13] It is noted that working memory can also be effective in the Wisconsin test. This role is identified when a specific pattern is discovered by the subject to arrange the classes. Because the pattern should be kept constantly active in the mind, it is under supervision working memory. The validity of this test for measuring cognitive deficits after brain injury is 0.68 percent. Validity of this test based on the coefficients of agreement of the evaluators in Spearman's study was reported to be 0.83 percent. In Iran, Naderi has estimated the validity of this test in the Iranian population obtained a retest method 85 percent ^[14]. Frostig test: This test was made in 1963 to identify children with visual-spatial cognitive the lesion neurodegenerative learning disorders delay in process growth. This test is for children from four to eight years old and up to ten years old. The test is individually between thirty to forty minutes. The whole test consists of five parts: Coordination: Context, Status Shape, Stability, Spatial Relationships. For each test a row of tables is provided where each table is numbered or part of the test matches an option. According to this score you get a raw score that, according to the standardized tables equivalent to each child's age and scale score, You can determine the child's score based on the scale score (child age: chronological age) multiplied by ten = scale score. The scores on this test with first grade reading progression are typically forty-fifty percent. Reported reliability coefficients for frostig test by regression method for total score ranged from 69 to 98 Percent and for third sub-test between 29 and 80 and split-half method for total score 78 to 89 percent and for sub-test 35 to 96 Percent and highest the coefficients for the sub-tests and the lowest coefficient were for the fourth sub-test. The coefficient of validity of the correlation coefficient between the test scores and the teachers' scale of motor coordination class compatibility was reported as 44 and 50 respectively ^[15]. The Plan was again performed on the mentioned sessions from the test subjects and the statistical and analytical results were as follows.

RESULT

Statistical reasoning methods were used for data analysis. The method of this design is to perform pre-test and post-test with one group. The statistical method used is mixed-variance analysis (M-Anova).

Table 1. Inferential statistics indices for the significant scores of Chlorogronf smirirnof test examination group and control groups

test	Variable	group	Kalmogronov Smirnov	Significant
Wisconsin	Working memory	Experiment	0/18	0/10
		Witness	0/20	0/01
Working memory	Working memory	Experiment	0/21	0/06
		Witness	0/22	0./02
frostig	Spatial visual perception	Experiment	0/22	0/09
		Witness	0/17	0/02

From the above table and comparing the Chlorogronv smirnov test scores and their significance in the two experimental groups and control groups, It is understood that That the control group scores are generally not significant

therefore The test does not have the Assumption multivariate anvoa test in the Control group but examination Group has this requirement Condition.

Table 2. Inferential Statistics indices Box test related for working Memory and Visual-Spatial Perception Scores

test	Variable	Mean	F	Degrees of freedom1	Degrees of freedom2	Significant
Wisconsin	Working memory	6/33	0/86	6	234/47	0/51
Working memory	Working memory	16/14	1/21	10	1549	0/64
frostig	Spatial visual perception	20/05	0/92	15	1304/52	0/54

According to the above table, there is not much difference between the scores of the two experimental groups. The control group was not To be investigated for the lack of Assumption parametric statistic in the Chlorogronv smearnov

test. The homogeneity of the variances was found in both of experimental groups and Obtained F and significance level greater than 0.05, hypothesis was rejected.

Table 3. Inferential statistics indices Multivariate Anova test And estimate the measure of the effectiveness Related to the scores on the working memory test And visual-spatial perception

Test And Effect variable	Statistical index	Value	F	Degrees of freedom Hypothesis	Degrees of freedom Error	Significant	Partial Squared Eta
Wisconsin (Working memory)	Pillais Trace	0/94	109/95	3	16	0/00	0/94
	Hotelling Trace	0/20	109/95	3	16	0/00	0/94
	Wilks Lambda	21/02	109/95	3	16	0/00	0/94
	Roys largest Root	21/02	109/95	3	16	0/00	0/94
Working memory (Working memory)	Pillais Trace	0/92	78/70	4	15	0/00	0/094
	Hotelling Trace	0/05	78/70	4	15	0/00	0/94
	Wilks Lambda	21/07	78/70	4	15	0/00	0/94
	Roys largest Root	21/07	78/70	4	15	0/00	0/94
Frostig (Spatial visual perception)	Pillais Trace	1	144/115	14	14	0/00	0/98
	Hotelling Trace	0	144/115	14	14	0/00	0/98
	Wilks Lambda	146/04	144/115	14	14	0/00	0/98
	Roys largest Root	146/04	144/115	14	14	0/00	0/98

According Meaningful statistics above 0/5 and effect size in Squared Eta It can be said that the independent variable of research has a great effect on the dependent variables.

CONCLUSION AND DISCUSSION

According the result of this study showed that computer games (Monument Valley puzzle and SimCity simulation) have an effect on enhancing working memory and visual-spatial perception in children with specific learning disorders (reading, writing, math). This is in Conformity with the findings of Arjemandnia *et al.* (2014), who in their research examined the impact of cognitive computer practice on students' visual-spatial working memory performance with specific learning problems. It is also in line with the findings of Poor Mohseni *et al.* (2004) who examined the impact of computer games on adolescent mental rotation and spatial perception and found that computer games played an important role [16]. Pakketchi and *al.* (2012) The effects of

computer games training on the visual memory performance of dyslexic students have been studied [17]. The findings of this study are in line with these results .also Abdi *et al.* (2014) investigated the effect of cognitive computer games on working memory, attention and cognitive flexibility in overactive children [18]. Which confirmed role of them in improving working memory. These results confirm previous research and findings. Bavelier's (2004) studies showed that computer games affect visual perception and reinforcement in children [19]. The present study is consistent with the findings of Bavelier's (2004) study of the impact of computer games on visual perception. In his research, he tried to improve the visual perception of children with learning disabilities by playing computer games. The result was that computer games led to enhanced visual perception. Dorval and Pepin (1996) examined the impact of computer games on spatial imagery that they found needed strong spatial perception [20]. According to the findings of Toll *et al.* (2011),

the use of computer games plays a role in memory **IMPROVEMENT** [21]. therefore The findings of this study are consistent with previous research in this area. Fisher et al. (2005) Mares et al. (2007) found that computer games affect executive functions including working memory [22, 23]. The effect of computer games on improving working memory illustrates the important role played by children and its impact. The present study was able to prove this hypothesis and it was concluded that computer games (Monument Valley puzzle and SimCity simulation) reinforce working memory and visual-spatial perception of children with specific learning disorder (reading, writing, Math). Jannah Ebrahimi Ghavam and Alizadeh (2012) Comparing the Executive Functions of Organizing Planning and working Memory Reasoning in Elementary Students with and without Learning Disorder found that they differed in executive performance, reasoning, planning, organizing and working memory functions with normal group [24]. There was a difference between the performance of working memory reasoning and normal planning and organization with impairment. This results are consistent with the results of the present study. Executive functions in children with learning disabilities are impaired, and effective planning and practices such as computer games and their roles can improve the performance of executive functions in these children. So computer games could have an impact on this component. Research limitations include lack of previous research by other researchers and research background, lack of virtual teaching spaces in schools, and lack of computer technology with children in the home and school environment, suggesting further study resources. Qualitative research on computer games and understanding its nature and creating educational spaces for research in schools and working with computers.

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