A Study of the Function of Visual Memory and the Abilities of Subjective Reasoning in the Students with Dyscalculia

Omid Shahryari¹, Afsaneh Khajvand Khoshli²

¹Post Graduate Student in Educational Psychology-Sari Islamic Azad University
²Assistant Professor, Department of Psychology, Gorgan Branch, Islamic Azad University, Gorgan, Iran

ABSTRACT: The aim of the study is the function of visual memory and the abilities of abstractive and subjective reasoning in the students with dyscalculia with normal students; the total students are 50 (25 normal and 25 dyscalculia students) who participate in a casual-comparative design. For identifying dyscalculia, key math test was given to the students. The students were selected through the method of clustering samples among primary school students in Gorgan City. The students of each of these two groups are matched according to their ages, education, parent's education and their social-economical status. To measure visual working memory, visual memory subtest of Wechsler (W.M.S) memory scale was ability of subjective and abstractive reasoning and also Wechsler intelligence test for children was used. The results were analyzed through descriptive and inferential statistics (independent T test). The result showed that there are meaningful differences between the function of visual working memory and the ability of objective and abstractive reasoning in the students with and without dyscalculia. Therefore students with dyscalculia are act weaker in working of visual memory and ability of objective-abstractive reasoning than normal students. According to the finding of the research can be resulted that the lack of ability in visual memory and the function of objective and abstractive reasoning are the main reasons in the development of dyscalculia in the elementary schools.

Keywords: Dyscalculia, Visual Memory, Abstractive and Objective Reasoning, Learning Disabilities.

INTRODUCTION

Nowadays more attention focused on student's defects and deficiencies in mathematics. Student's difficulties in math attract more attention day by day and this attention specially related to the students with learning disorders (Karimi, 2010). However this group of children and teenagers don’t have less intelligence than their classmates and they look normal but they have difficulties in reading, writing, talking, understanding math and doing their homework (Zahed, 2012). According to the definition of America Association for children with learning disabilities, special learning disorders is a chronic mood with neurotic roots which create disorder in growing, harmonizing and appearing of verbal and nonverbal abilities. Special learning disorders exist as a person's handicap status and it is variable from its pretention and severity measure and this status affects person's self-esteem, education, job, sociability and daily life abilities all around his life (Karimi, 2010).

Without any doubt one of the subjects in which several students have difficulty with it is mathematics. Because mathematics is based on abstractive concepts and most of the students despite their physical growth and age increase they haven’t reached the abstract understanding phase, frequently they have difficulty in understanding math concepts in the other hand no one can deny the importance of math
in our daily life (Karimi, 2010). The term which used for severe mood of this status is called dyscalculia or disorder in calculation and understanding math concepts. This group of students usually has severe difficulty in understanding of spatial relations. In math difficulties scrutiny of this group of children we should attend to their problems in sight understanding and memory abilities (seif Naraghi, 2005). One of the variables which probably exist in children with learning disorders is their memory abilities. Memory performs fundamental role in all learning. Memory is related to the power of information reservation which instructed through sense and cognition and also related to reusing this information in our need time. Memory discussion describes with a collection of expressions and skills which can name: auditory memory, visual memory and sequence memory [3]. Visual memory alludes to the ability to review the information that is kept visual in mind (Slavin, 2006).

Anderson (2008) in a research related to the math quality in children with different types of learning disorders, experiments the math revenue of 182 third and fourth elementary students in 8 math districts. This study is based on a fact that the retrieval defect of one main token of these students are with math disorders. The other problem that students with math disorders encounter with it is the infirmity in ability of reasoning and understanding subjects. Students by studying math not only instruct calculation but also learn how to reason and how to use reasoning for solving problems in their real life [6]. reasoning is a conclusion method based on "doctrines" result from "thinking" and "intellectual thought"; therefore in reasoning, mind make connections in some objects and resolution comes out from their link. Thorndik believes that intellectual behavior consist of three types of abilities; social intelligence, mechanical intelligence and abstract intelligence which this type of intelligence derives from thought and character. Understanding the relation of components and phenomenon and also math understanding ability is related to this type of intelligence.

Mesterson and Evans (2008) in a general study scrutinize the injured function in children with learning disorders. They believe that most of the children with learning disorders, in one or more traits of visual and auditory, speech, memory, reasoning, processing and organizing show different levels of weaknesses. Janeh and partners (2011) in scrutiny of reasoning executive functions, schematization, organization and work memory in students with math disorders present that, these children in this executive functions have meaningful difference rather than normal children. Kajbaf and partners (2010) in memory profile comparison between normal children and children with math disorders show that there is a meaningful difference between memory profile of these children with normal ones, also students with math disorders have a weak revenue in homework and routine remembrance and they don’t use retrieval guidelines effectively. Rosseli and partners (2007) in scrutiny of memory abilities in students with meth disorders show that these children got lower grades than testimonial group in work memory. Mazzocco and Hanich (2010) scrutinize three type of math learning disabilities consist of defect in meaning, procedural and visual-spatial memory in which disability in meaning memory described as a problem in retrieval of math fundamental realities from meaning memory and disability in procedural memory is related to low-speed processing and calculation mistakes in doing homework and the third type of disability which called visual-spatial memory appears with math errors. Students learning difficulty in math less studied and scrutinized in comparison to other special disorders such as reading and writing dictation (seif Naraghi, 2005).

To study the main reasons in math learning disabilities of children may create a way for the children and their teachers through which they can promote their learning surface and revenue with an appropriate schedule. According to this, The Aim of the recent research is to comparison the abilities of visual memory and the abilities of abstractive and subjective reasoning in the students with dyscalculia with normal students. In other words posed questions in this research is as below:
1. Is there any difference between the revenue of visual memory in students with and without dyscalculia?
2. Is there any difference between the ability of objective-abstractive reasoning in students with and without dyscalculia?

**METHODOLOGY**

According to main goal of this research which based on revenue comparison of students with math learning disabilities with normal students in Wechsler visual memory test and similarities subtest from
Wechsler intelligence test (to study objective-abstractive reasoning ability), the method of this research is causal-comparative.

**Society, Sample and Sampling Method**

With the use of multi-phase clustering random sampling method which elected 50 students in two group which consist 25 normal students and 25 students with dyscalculia which are matched according to their ages, education, parent's education and their social-economical status. At first they select the students with dyscalculia among elementary girlie school of Gorgan city in which they choose two schools and among these two schools, classes are selected randomly and they ask teachers to introduce the students which they are suspicious to have dyscalculia in third, fourth and fifth grades. Then by doing Key Math test and Wechsler intelligence test dyscalculia sample was selected and normal students also selected from the same classes.

**Research Tools**

**Key Math Test:** This test provides and searches norms by Connolly (1998) and has great usage in recognizing dyscalculia students. For this test four usages are suggested such as: educational schematization, student's comparison, evaluating educational progress and evaluating schedule. This test measures the knowledge, concepts usages and math important skills in people from 5 to 22 years old. Its given time is about 30 to 50 minutes and because this test needn’t reading abilities it can be usable for a large number of students. Justifiability of this test in Iran calculates through justifiability of content, detachment and foresight and its simultaneous justifiability is from 55% to 67% and its perpetuity is reported by Cronbach's alpha from 80% to 84% (Esmaeel, 2001).

**Particle Measure of Visual Memory from Wechsler Memory Test (WMS)**

Wechsler memory test is used as an objective measure to evaluate memory. This test consists of 7 particle measures like: personal awareness about routine and private subjects, awareness about time and place (navigation), mind control, rational memory, numbers repetition, visual memory and idea remembrance and each of these particle measurements allocates to evaluate a subject in memory. Orkut (1995) has reported the perpetuity of this test about 67% according to Cronbach's alpha. In this test they give three cards which consist of numeral pictures to the person in 10 seconds and ask him to depict them with the use of his visual memory and then the pictures are evaluated according to quality and coordination, accuracy scale and completed pictures. And the majority score is 14 for all pictures in this test.

**Particle Measure of Similarities from Wechsler intelligence evaluation test (WISC-R)**

Wechsler in 1949 provided children intelligence measurement (WISC) to evaluate children's intelligence. This test contains some subtests which sequence from hard to easy. 25 years after its codification (1974) it is reconsidered and after that it is named as children intelligence measurement (WISC-R). total measurement creates from 12 subtests which are divided into two groups according to verbal and nonverbal traits. Wechsler intelligence measurement for children is like an analytic test and its score is based on person's success. coefficient validity of this similarity subtest in American children with 7.5 and 10.5 years old is announced about 66% to 81% (Ganji, 2001). reevaluation perpetuity of this test is reported from 44% to 94% (average 73%) and its bisectional perpetuity is from 42% to 98%(average 69%). its simultaneous justifiability with the use of scores correlation with the scores of practical section for Wepsi pre-school students is 74 percent. Relation between intelligence with age, social-economical class and average are reported as meaningful measurement criterions. Correlation coefficients of verbal, practical and total intelligence in sequence are 84%, 76%, 80%. Correlation coefficients of verbal, practical and total intelligence with educational average in sequence are 52%, 40%, 53% which are meaningful and shows further correlation of verbal and total intelligence with educational average (Shahim, 2006). In this research is used particle measure of similarities to evaluate objective-abstractive
reasoning because one of the important goals of particle measure of similarities in Wechsler test (WISC-R) is to evaluate the ability of objective-abstractive reasoning (Nazari, 2012).

**Resolutions**

For processing gathered data in this research it is used descriptive methods (average and standard deviation) and deduction statistics (independent "T" test). In table 1 it is presented the distribution frequency of descriptive indices of children's with and without dyscalculia in visual memory test.

**Table 1.** Abundance dispense of children with and without dyscalculia in visual memory test

<table>
<thead>
<tr>
<th>Max</th>
<th>Min</th>
<th>Amplitude</th>
<th>Variance</th>
<th>Criterion Deviance</th>
<th>Chart</th>
<th>Medial</th>
<th>Average</th>
<th>Abundance</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>8</td>
<td>6</td>
<td>2.72</td>
<td>1.65</td>
<td>13</td>
<td>12</td>
<td>12.08</td>
<td>25</td>
</tr>
<tr>
<td>12</td>
<td>5</td>
<td>7</td>
<td>3.61</td>
<td>1.90</td>
<td>11</td>
<td>12</td>
<td>9.68</td>
<td>25</td>
</tr>
</tbody>
</table>

As it is deduce from table 1, the gained average scores in visual memory test for students with dyscalculia is lower than students without it, which shows more weakness in the function of visual memory of students with dyscalculia rather than students without this disorder.

In table 2 it is presented the distribution frequency of descriptive indices of children with and without dyscalculia in objective-abstractive reasoning test (Wechsler similarities).

**Table 2.** distribution frequency of descriptive indices of children with and without dyscalculia in objective-abstractive reasoning test

<table>
<thead>
<tr>
<th>Max</th>
<th>Min</th>
<th>Amplitude</th>
<th>Variance</th>
<th>Criterion Deviance</th>
<th>Chart</th>
<th>Medial</th>
<th>Average</th>
<th>Abundance</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td>8</td>
<td>13</td>
<td>8.29</td>
<td>2.88</td>
<td>10</td>
<td>10</td>
<td>12.44</td>
<td>25</td>
</tr>
<tr>
<td>14</td>
<td>7</td>
<td>7</td>
<td>7.34</td>
<td>2.07</td>
<td>9</td>
<td>9</td>
<td>10.04</td>
<td>25</td>
</tr>
</tbody>
</table>

weakness in the ability of objective-abstractive reasoning in students with dyscalculia than students without this disorder. To scrutinize the first question of this research that is about the comparison of visual memory function in students with and without math learning disorder used Wechsler memory test through "T" test method and its result is presented in table 3.

**Table 3.** The Result of Independent "t" (Test for Visual Memory)

<table>
<thead>
<tr>
<th>Sig</th>
<th>Df</th>
<th>T</th>
<th>Criterion Deviance</th>
<th>Average</th>
<th>Number</th>
<th>Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>0/000</td>
<td>48</td>
<td>4/7</td>
<td>1/656</td>
<td>12/08</td>
<td>25</td>
<td>Without Dyscalculia</td>
</tr>
</tbody>
</table>
As it is shown in table number 3 with the attention to the "t" gained (t=4/748, df=48 in p≤0.05), there's a meaningful difference between the average of two groups of children with and without dyscalculia. This is realized that students with math disorder gained weaker revenue in Wechsler visual memory test which shows that this group depicts the related pictures to Wechsler visual memory test with more errors. The research result about question two is based on ability difference of objective-abstractive reasoning of children with and without dyscalculia which is presented with the use of Wechsler intelligence similarities test in table 4.

Table 4. The Result of Independent "t" Test for Objective-Abstractive Reasoning.

<table>
<thead>
<tr>
<th>Sig</th>
<th>Df</th>
<th>T</th>
<th>Criterion Deviance</th>
<th>Average</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>0/001</td>
<td>48</td>
<td>3/377</td>
<td>2/888</td>
<td>12/44</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2/071</td>
<td>10/04</td>
<td>25</td>
</tr>
</tbody>
</table>

As it is shown in table number 4 with the attention to the "t" gained (t=3/377, df=48 in p≤0.05), there's a meaningful difference between the average of two groups of children with and without dyscalculia in their objective-abstractive reasoning ability. This is realized that children with dyscalculia attain weaker revenue in Wechsler intelligence similarities test that shows this group has a weaker ability in objective-abstractive reasoning rather than normal children and act weaker than them in this particle test.

DISSCUSSION AND CONCLUSION

This research is done with the goal of revenue comparison of children with and without dyscalculia in the function of visual memory and ability of objective-abstractive reasoning. According to the gained resolution from the first question of this research which based on revenue comparison of children with and without dyscalculia in the function of visual memory, as it was expected there is a meaningful difference between the average of children with and without math learning disorder; it means that children with dyscalculia shows weaker revenue and make more mistakes to depict pictures which are related to visual memory (from Wechsler memory test) than normal children which this resolution is the same as Janeh and partners(2011), Rosseli and partners (2007) and Mazzocco and Hanich investigations in 2010. to making this resolution clear we can say that the errors in depicting numeral pictures of Wechsler memory test it may be the result of disorder in the function of visual memory. Kajbaf and partner (2010) announced that there's a meaningful difference between the memory profiles of these children with normal children, also students with dyscalculia had weak revenue in educational and routine remembrance and didn’t use retrieval guidelines effectively. The general resolution is that, the weakness of these children's revenue in doing numeral assignments and the assignments which need to remember and imagine numeral figures and math formulas may due to their disorder in the function of visual memory. And it is good to use visual memory reinforcement assignments to decrease their disability.

According to the gained resolution from the second question of this research which based on revenue comparison of children with and without dyscalculia in the ability of objective-abstractive reasoning, as it was expected there is a meaningful difference between the average of children with and without math learning disorder; it means that children with dyscalculia shows weaker revenue in ability of reasoning. This group got lower scores in answering the questions of Wechsler particle similarities test. To prove this conclusion Janeh and partners (2011) shows that the reasoning of practical functions in students with...
dyscalculia than normal students consist meaningful difference. Investigations are about whether the reasoning functions in students with and without dyscalculia which is different or not is not much. In a research which had scrutinized the relation between children's practical function with reasoning, reading and mathematics, they conclude that there's a meaningful connection between being update and renewal daily schedule with reading, mathematics and nonverbal reasoning, also there's another meaningful connection between change with reading and nonverbal reasoning (Janeh, 2011). Mesterson and Evans (2008) in a general study scrutinize the injured function in children with learning disorders. They believe that most of the children with learning disorders, in one or more traits of visual and auditory, speech, memory, reasoning, processing and organizing show different levels of weaknesses.

Anderson (2008) in a research related to the math quality in children with different types of learning disorders, experiments the math revenue of 182 third and fourth elementary students in 8 math districts. This study is based on a fact that the retrieval defect of one main token of these students are with math disorders. Students with dyscalculia have fundamental problems in solving math formulas. The general conclusion is that their weakness in ability to answering math formulas in these children may due to their weakness in objective-abstractive reasoning ability. This is better instead of giving different formulas to these students to remove and promote this defect, try to increase their ability in reasoning because these students somehow have the ability to perform numeral calculations and transact four major math operations but during solving the math formulas they didn’t have the ability to grasp which of these four operations should be used and of course it's due to their weakness in the ability of abstractive reasoning.

This research has some limitations that we can mention some of them here. At first the genuine math disorder hardly finds in students and most of these students have synthetic learning disorders which consist of reading and writing ones. This factor causes the research resolution not to show genuine ability difference of visual memory and the function of objective-abstractive reasoning of students with and without dyscalculia. However the researcher tries to have genuine sample but this is impossible in action. At second we should attention to this point that examined students are just girls with dyscalculia and its generalization to boys should act cautiously. It is recommended to education and training experts with the cooperation of specialist create rich training environments along with purposeful educational games till students can use their extreme to promote and improve math training prerequisites such as: ability of visual memory and reasoning. And it is also suggested teachers to recognize the reason of math learning disorders of elementary school students in their educational classes and to train methods to improve student's memory especially visual memory and their ability of reasoning.

REFERENCES
