The Effectiveness of Metacognitive Strategies of SQP4R on Decreasing Impulsiveness of Students with Mathematic learning Disability

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Abstract
Objective: Aim of This study was to investigate the effects of Metacognitive Strategies of SQP4R on decreasing Impulsiveness in Students with Mathematic learning disability. Method: To accomplish the stated aims, 30 male students with Mathematic learning disability from elementary schools were chosen in the city of Shiraz. The research design of the study was Pretest – Posttest Randomized Group Design. The instruments used in this study included Key Math Mathematical Test (Key Math), and Barrat Impulsiveness Scale (BIS). To analyze the data, multivariate analysis of covariance (MANCOVA) has been used. Results: The results showed significant Effectiveness of Metacognitive Strategies of SQP4R in decreasing Impulsiveness (No planning, Motor Impulsiveness, Cognitive Impulsiveness) of experimental group. Conclusion: Metacognitive Strategies of SQP4R is effective on increasing Cognitive Variables (look like Metacognitive Awareness and Reading Comprehension) and decreasing Impulsiveness in Students.

Keywords: Metacognitive Strategies of SQP4R, Impulsiveness, Mathematic learning disability.
Introduction

Today mathematic learning disability has focused to itself the attention of specialists and experts in education more than ever. Based on the definition of individuals with disabilities education act, learning disability is impairment in one or more of the basic psychological processes which it includes understanding the language and its application. This disorder shows itself as inability to listen, thinking, talking, reading, writing, spelling or math calculations. But, it is not included those learning problems which basically is result of visual, audio or motion disabilities, mental retardation, emotional disorder, unfavorable situation of environmental, cultural or economical (Mcquillan, Coleman, Tucker & Thompson, 2011). The mathematical ability like reading ability has an important role in human’s life, but, researchers believe that done surveys in the field of psychological processes for math competency or underlying insufficiencies, math disability is much less than reading disability (Mazzocco & Kover, 2010).

The prevalence rate of math disability is estimated between 5-8% (Shalev & et al 2000, Hale, Fiorello, Bertin & Sherman, 2003). Students with math disability have the basic problems in cases like solving verbal problems and skills related to it, detection of novel information in issues, using self-regulating and self-monitoring strategies in the process of doing homework and keeping attention by the end of the assignment (Pedrotty, 2010). Eisenberg & Fabes (1998) in a research found students who have problems in reading, writing and mathematics have more emotional disability, poor social interactions, depression, negative affect and aggressive impulsive behaviors compared with their counterparts.

One of these factors which can be effective in the educational process of students with math disability is impulsivity. Today, impulsivity is conceptualized as a cognitive dimension, that's means impulsivity is accompanied with cognitive disinhibition, slow and incomplete process of decision emotional instability in individuals. The review of done studies about impulsivity show that impulsive behaviors make the core of many mental disorders such as ADHD/attention deficit, conduct disorder, impulse control disorder, drug abuse, bulimia nervosa, suicidal behavior, personality disorders and learning disorders (Dawe, Gullo & Loxton, 2012).

Narimani and Rajabi (2005) in a research found that anti-social and aggressive behaviors in students with learning disorders significantly are more than normal students. Various studies show students with learning disorder have defects in processing social information (Bauminger & Kimhi-Kind, 2008), poor interpersonal skills (Wiener, 2004), high levels of social exclusion and loneliness (Estell, Jones, Pearl, Van Acker, Farmer & Rodkin, 2008), mood and depression disorder (Sideridis, 2008), compatibility problems of both inner-outer (Al-Yagon & Mikulincer, 2004; Auerbach, Gross-Tsur, Manor & Shalev, 2008) and low empathy (Presto, Heaton, McCann, Watson & Selke, 2011).

In recent years, it has been investigated the various variables which can be effective in reading and comprehension of students and students with learning disorders. Among these variables and various methods, it has been introduced cognitive and metacognitive strategies which are an important factor to activate the minds of students and the increasing of comprehension ability in them (Flavell, 1979).
Therefore, in determining the skillfully reading features and mathematical ability, often they are accepted an important role for executive strategies and metacognitive knowledge. The surveys show that those who are weak in comprehension have less metacognitive awareness about reading and reading strategies compared with people who are strong in comprehension. If it is given proper training to these students and it is strengthened metacognitive knowledge and using cognitive strategies in them, they can benefit from reading ability fits with other their cognitive and metacognitive and verbal activities (Hammill & Bartel, 2002; translated by Biabangard & Neenian, 2002).

It is various definitions of metacognition, but, first time this word is used by Flavell and Brown. Flavell (1976) has defined metacognition as the individual’s awareness of his cognitive processes and everything which is related to it. Although, the metacognition term is relatively new, skills related to it is identified and introduced by various researchers in the long term. Flavell (1979) calls metacognition the knowledge about its cognitive processes, action process, organizing and the coordinating of a series of steams and also any cognitive knowledge or activity which its subject is cognition or cognitive regulation. This concept is more associated with his name. He explained that the metacognition is called to individual’s knowledge about the cognition processes and everything related to them. In the other words, the metacognition deals with thinking about thinking and learning. To be more closely, cognition is called to identification case and understanding any subject, concept and action. On the other side, metacognition means identification, supervision and control of inner thinking and organizing and evaluating inner knowledge and thinking. Metacognition is the recognizing of how one concept is learned or is understood and conceptualized. Metacognition is a form of cognition which it is high-level thought process and it is included active control of cognitive processes and supervision on them (Kocak & Boyac, 2009).

Among the metacognitive methods, self-regulatory strategies teaching and after conclusion had more efficient in students with learning disorders (Cantu, 2006). It is developed and studied many cognitive and metacognitive strategies by students for increasing comprehension and reducing impulsivity and motivation variables which among them are metacognitive strategies of survey, question, predicting, reading, reflect, recite and review. The SQP4R method is one of the most popular methods of study which it helps to students to understand remember what they read, this method is based on the previous model known as SQP3R which Robinson (1961) was developed it. This method is given from acronyms of pre-reading, asking, reading, thinking, memorizing reviewing (Slavin, 2006; translated by Seyed Mohammadi, 2007).

This process first was included 5 continuous stages. This stages start with survey or pre-reading which in it the students do a general review of subjects is to be read to give the general idea and concept of text. This glancing review can help individual in organizing the contents, for example creating a kind of hierarchy for them. In pre-reading, there are considered introduction or introductory explanations, goals, titles, original and subsidiary titles and so on (Seif, 2007). Then, students pose questions about them by turning the original and subsidiary titles to question. The third stage, is reading stage. In this stage students read the text and they try to answer the questions with attention to the original ideas, revealed details of original ideas and other information which are related to the purpose of reading of individual. The next stage is
memorizing. Students stop after ending each section of it during reading the text and they try to answer the questions without looking at the text. That’s mean in this stage students try to remember its important issues with regard to the raised questions in the previous stages and they tell it for themselves. The final stage is reviewing. Students review questions and idea and the important ideas of the text after reading the text to answer the questions without going back to text and helping from it.

Over the years, researchers have added the stages to this method which one of these stages is P (predicting) and the other is R (thinking) after reading stage which is known as SQP4R method. In predicting stage the individual predict the answers of questions according to his previous information and without getting into the details of the text. In thinking stage the individual links what he read to the subjects he learned before. And he tries to solve contradictions in provided information (Bakhshi, 2011).

Teaching these strategies can improve learning and motivation quality in students. The general idea is that students can promote their learning with notification of their thinking process when reading, writing and solving problems in school. This raising of consciousness causes to transfer homework supervision of learning on teachers to students itself and as well as positive self-perception improves emotion and motivation among students. Thus, the metacognition provides personal insight within one’s own thinking and it fosters independent learning and it causes the increasing of the level of cognitive variables and motivation variables like interest, self-esteem and sense of efficacy and the reducing of impulsivity in students (Kirmizi, 2010).

Many researchers have been done in field of the impact of metacognitive strategies teaching on the increasing of comprehension and reducing of impulsivity of students and students both in Iran and out of Iran which it is expressed the effectiveness of these strategies (for example, Wander, 1996; Eme and et al, 2006; Ekinchi, 2001; Raghebian, 2005, Pakdamani Savoji, 2000). Of course, most of them is executed on normal children and the effectiveness review of these set of strategies has been not studied structurally.

In the outline, in this research it is intended to investigate the impact of metacognitive strategies teaching (training protocol of SQP4R) on the reducing of symptoms of impulsivity of students with math disability.

**Research hypothesis:**

The using of metacognitive strategies teaching of SQP4R method is effective in reducing of impulsivity of students with math disability.

**Conceptual and operational definitions of variables:**

1- **Math learning disability:** Math disability is a diagnostic label which it is used to refer to failure to thrive math skills in general, but, it is not limited to used calculation methods to resolve account issues, representation and retrieval of account statements from the long-term memory. For inclusion in the classification of mathematics disorder, it should be expected individual performance in account basically under the age, intellectual and academic abilities and as well as this disorder should cause problem for achievement or daily life seriously. In addition, the math
disorder should not be due to vision, hearing, somatic, emotion defects and poor conditions of environmental, cultural or academic (Dowker, 2014).

In this research the purpose of math disorder is the score which subjects gain in Keymath’s math disorder questionnaire (1988; quoted from Abedi, Piroz Zeijardi & Yar Mohammadian, 2013).

2- **Impulsivity:** It can explained impulsivity as the preferring of immediate rewards, the desire for adventure, searching new senses, finding simple ways to achieve rewards, lack of perseverance insist on doing things and also short time of someone’s reaction (McCown, Johnson & Shure, 2010). According to what was said sometimes they define impulsivity equal to the reducing of delayed value, that’s mean tend to choose low but fast rewards against larger but delayed rewards (Mathias & et al, 2014).

In this research, the purpose of impulsivity is the score which the subjects obtain in Barrat’s impulsivity questionnaire (1994).

3- **Metacognitive strategies:** The metacognitive strategies are the measures for monitoring of cognitive strategies and their leading (Seif, 2006).

In this research, the purpose of metacognitive strategies is SQP4R. Method or strategy of SQP4R is expanded form of a method which Rabinson (1961) was invented it (SQ3R).

The stages of this method are as follows: pre-reading, asking, reading, thinking, memorizing and reviewing which P (predicting) stage is added to it later (Ghobari Bonab & Raghebian, 2008).

**Methodology**

**Research design:** In this research, it is used random assignment of participants to the experimental and control groups, pre-test implementation on both groups, assigned training interventions on the experimental group and finally post-test implementation on both experimental and control groups of true experimental design, pre-test-post-test with the control group. Pre-test-post-test design with the control group which is the best designs in terms of internal validity controls most annoying factors of internal validity (Homan, 2007). Its symbolic form is as follows:

```
E  R  T_1  X  T_2
C  R  T_3  -  T_4
```

**Statistical society, the sample group and the sampling method:** The statistical society of this research is composed of all boy students between 12 to 16 years old of Shiraz city in academic year of 2015-2016. The research sample is included 100 students of 12-16 years old with math learning disabilities of Shiraz city who are selected after diagnosis by Keymath mathematic test by available non-random sampling. In this way that at first all students of all schools of Shiraz city are identified in schools who got 1.5 lower score in the Keymath mathematic questionnaire and they were in age range (domain) and then among them there were selected 150 boys with math learning disabilities as available. Given that in the pilot researches the minimum sample should be 30 people (each group 15 people) (Delavar, 2001), there were selected 30 people as
research sample due to increasing external validity in this research. As well as it was taken into consideration homogeneity criteria of subjects by using the following entry and exit criteria: A) entry criteria inclusive of receiving recognition of math learning disabilities, having age between 12 to 16 years old and the lack of sensory disability, neurologically; B) exit criteria inclusive of having severe comorbid disorders like attention deficit disorder/ADHD, oppositional defiant disorder and depression having IQ lower than 85 in Raven’s progressive matrices test. Overall this research sample is formed 30 students of different fields of Shiraz city. Of these 30 people there were handed 15 people to experimental group (metacognitive strategies training) and 15 people to control group (without training).

The training of SQP4R method

First stage: Doing pre-reading, investigate

The first step in this method is the overview and transient investigation of contents- glancing investigate. In this stage, it is necessary students pass the text quickly once to obtain general overview from it. This glancing reading or pre-reading can help students in organizing the contents. About a text which was given to students were thought to them. They read original and subsidiary titles, the first sentence of each paragraph and bold words in each paragraph quickly and they put correct sign in front of their self-regulatory card.

Second stage: Asking

Asking means extraction question of text. It is thought to students to raise questions regarding to the purpose they have from study. It is said to them one way to do this work is that they convert titles to question. Also they can use sentences and phrases which are written capital and bold for raising question. Anyway, the question which is risen, their answers should be require an understanding of idea and the main points of the text not minor notes. After doing this stage it is asked the students to write their questions in their self-regulatory card in the section related to this stage.

Third stage: The forecasting of raised answered questions

In this stage, it is asked the students to guess how answer to the raised questions text by using their previous knowledge and without looking at the text. These guesses and forecasting the answers of questions cause the text contents is connected to the previous knowledge of person and it is understood significantly. In this stage also it is asked students to write questions in front of the stage related to third stage after forecasting the answers of questions.

Forth stage: Reading

In this stage it is asked students to read the text accurate and measured and at the same time they try to answer the questions which were raised in second stage and they link the text content with whatever they know from before. For this work they should be attended to main ideas, details about the main ideas. In this stage, it is thought the identification of main ideas, note-taking and summarizing to students. It was asked students to write a summary of text in the self-regulatory card in the section related to this stage after reading text.
The **identification of main ideas**: It is thought to students to read the text exactly and at the same time they try to attend to the important notes and main ideas. It is said to students in some texts, some sentences are written bold and italic. In some texts also the sentences are in the box. These sentences are the main points of learning which it states the main purpose of the author. But, in some texts is not in this way and the reader should find the main points of the text himself. In this case, the reader should ask of himself is this sentence important? Is this sentence including main points and idea?

**Note-taking training**: The purpose of note-taking is selecting and recording of the main and important points while reading a text, so that it can be reviewed the recorded contents after a leisurely (Seif, 2007). It is thought to students which one method of getting the main points of the text is note-taking. For this work it can be used the margins of the text, the margins of the book or a booklet.

**Summarizing**: The purpose of summarizing is writing short phrases which are representative of the main ideas of the studied subject (Seif, 2007). It is thought to students which the ability to summarize text is a skill which to understand it what they read is necessary. It was said to them they should take the following steps for a good summarize of a text:

1- The identification of main ideas of text (which it was explained in the previous sections).

2- The removing of redundant, minor and non-significant information. Therefore, the reader should be asked of himself is this sentence important? Is this sentence include the main pointe and idea of text? Is it put aside damaging the text?

3- Creating a new text. Therefore, the reader should be create a new text by eliminating the minor and non-significant points and finding the important information and picking them together coherently to its own language.

**Fifth stage: Thinking**

In this stage it is thought to students they try to understand the contents by thinking about the text they read and they give meaning to them. For this work they should link what they read to the previous contents, they should link the main points to the main contents, they should answer to the raised questions by using the information they read in text. It was said to students they put the correct sign in front of this stage in their self-regulatory card after doing this stage.

**Sixth stage: Memorizing**

It is thought to students, they try to remember the important contents of text and they tell it for themselves and meanwhile they answer to the questions they raised with this work. This work causes they monitor their perception and it is determined to them what sections they have not learned well.

**Seventh stage: Reviewing**

In reviewing the contents it should be attended the main points of the text again. For this purpose, it was asked students to attend to the sections which is drawn line under them, to the sentences which are written in the margin of the text, to the notes and summaries which are
extracted from text, they attend to the important points and they try to read the important questions related to the text without referring to the text.

Data collection tools:

1) **Key Math mathematic test:** To measure learning math disability was used Key Math mathematic test which Kanoli was prepared and ready to run (1988; quoted from Abedi, Piroz Zeijardi & Yarmohammadian, 2013). This test has 14 sub tests which is included the operational and application content levels. Key Math is performed individually and in the content levels are included enumeration, deduction, geometry and symptoms, in the operational contents are included subtraction, sum, multiplication and division, mental calculation and reasoning arithmetic and in the application levels are included problem solving of error cases, measurement, money and time. Most of the test questions is provided to child visually and verbally and the child should give the answer verbally. This test has both software reference and criteria reference. In this research, there were chosen its three sections that’s mean sum, subtraction and division which each was included 6 questions for using the Key Math Iranian test.

Geary (2010) has reported 0.82 the reliability of test by using the Cronbach’s alpha method in different stages of education. This test is standardized by Mohammad Ismaeel and Hooman in 2002 in Iran. The validity of this test is obtained between 0.55 to 0.67 through its content validity, discriminant validity, the validity of calculation prediction and concurrent validity. The reliability of test is reported 0.80 to 0.86 by using the Cronbach’s alpha method in five stages (Mohammad Ismaeel & Hooman, 2002). Khodami, Abedi and Atash Pour (2010) have reported 0.80 the Cronbach’s alpha coefficient of this scale.

In a research, it is used the test scores to predict the behavior which will happen in the future (Mohammad Ismaeel & Hooman, 2002). There were gathered data for calculation the predictive validity of Key Math test after running the final stage of test and gaining the lessons scores and it was calculate and investigated the correlation of total scores of test with mathematics, science and Persian lessons for each of the class stages. The obtained results showed that there is a positive relation between the scores of this scale and the intended courses individually. And this subject has been true in all education grades. The highest coefficients were related to mathematic course 0.46 and its lowest was related to Persian course 0.30.

2) **Impulsiveness scale:** The impulsiveness scale was made by Barratt (1994). This scale has 30 items and subjects answer to these items as four points (never, sometimes, often, nearly and always). This scale measures three components of disorganization and motor and cognitive impulsivity (Besharat, 2007). Abasi, Dargahi, Begian Kole Marz Bakhti and Dargahi are paid to investigate simultaneous convergent validity of impulsiveness questionnaire, the correlation between impulsiveness questionnaire, sympathy and Zuckerman’s sensation seeking questionnaires, Eysenck’s impulsiveness questionnaire. Abolghasemi (2008) has reported respectively 0.79 and 0.87 Cronbach’s alpha coefficient and the retest reliability coefficient (after one month). Abasi and et al (2014) have reported 0.85 the Cronbach’s alpha coefficient for this scale and interclass correlation coefficient components and the total scale was provided evidences indicative of its structure validity which these coefficients were from 0.72 to 0.78.
variable and all of them were significant. In the Abasi and et al. research (2014) in reliability of questionnaires is used Cronbach’s alpha coefficient, Spearman-Brown’s split-half and Guttman’s split-half.

The procedure and grading in this scale was in this way that students answer to 30 questions of impulsiveness questionnaire as multiple choice. The minimum and maximum of subject’s score will be 30 and 120 in this scale. The higher score represents more impulsiveness.

Findings

This research is done with aim of evaluating the effectiveness of metacognitive strategies training on the reducing impulsiveness of students with math disorder which it is used SPSS22 statistics software in order to respond to research hypotheses after collecting data. In the following the research hypotheses will test individually.

The tested hypotheses of researcher:

I relation to the research hypotheses, it is reported the descriptive index (the mean and standard deviation) of two experimental and control groups in pre-test and post-test in table 1.

Table 1- the mean and standard deviation of experimental and control group in pre-test and post-test of variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>Experimental group</th>
<th>Control group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-test</td>
<td>Post-test</td>
</tr>
<tr>
<td>Variable index</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Disorganization</td>
<td>21/56</td>
<td>1/35</td>
</tr>
<tr>
<td>Motion impulsiveness</td>
<td>25/12</td>
<td>1/54</td>
</tr>
<tr>
<td>Cognition impulsiveness</td>
<td>21/96</td>
<td>1/27</td>
</tr>
<tr>
<td>Overall impulsiveness</td>
<td>68/64</td>
<td>3/64</td>
</tr>
</tbody>
</table>

As table 1 shows there are differences between the mean in pre-test and post-test, but, it is not specified that these differences is or is not higher from the chance and difference limit, in order to test this difference is used multivariate analysis of covariance (MANCOVA) with regard to the a foreign diffraction source with the minimum distance scale which there is not their possibility of direct experimental control (pre-test) and as well as with regard to the several dependent variables which it is outlined the summary results related to it.
Table 2- the summary of multivariable different tests results

<table>
<thead>
<tr>
<th>Test</th>
<th>Value</th>
<th>F ratio</th>
<th>Df</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pillay effect</td>
<td>0/71</td>
<td>4/700</td>
<td>3</td>
<td>0/000</td>
</tr>
<tr>
<td>Wilks Lambda</td>
<td>0/28</td>
<td>4/700</td>
<td>3</td>
<td>0/000</td>
</tr>
<tr>
<td>Hoteling effect</td>
<td>41/77</td>
<td>4/700</td>
<td>3</td>
<td>0/000</td>
</tr>
<tr>
<td>The biggest root</td>
<td>41/77</td>
<td>4/700</td>
<td>3</td>
<td>0/000</td>
</tr>
</tbody>
</table>

Based on table 2 the results of multivariate analysis of covariance show that there is a significant difference and higher than chance and random limit between the experimental and control groups at least in one of the dependent variables. Thus, with considering the pre-test, there is a difference between the post-test of experimental and control groups which represents the effectiveness of metacognitive strategies training plan at least in one of the dependent variables. It is used one-variable covariance analysis in order to achieve more details about each of the dependent variables which it came the results related to each variable with graphic shape related to it separately in the following. Now, due to the dependent variables in research we are paid to test each of the hypotheses:

**First hypothesis:**

The using of metacognitive strategies training method is effective in reducing disorganization of students with math disorder.

Table 3- one-variable covariance analysis for disorganization variable

<table>
<thead>
<tr>
<th>Diffraction source</th>
<th>SS</th>
<th>Df</th>
<th>MS</th>
<th>F</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-test</td>
<td>0/71</td>
<td>1</td>
<td>0/71</td>
<td>0/21</td>
<td>0/653</td>
</tr>
<tr>
<td>Group</td>
<td>440/95</td>
<td>1</td>
<td>440/95</td>
<td>127/500</td>
<td>0/000</td>
</tr>
<tr>
<td>Error</td>
<td>93/37</td>
<td>27</td>
<td>3/46</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The consideration of table 3 shows that there is not a significant difference between experimental and control group in pre-test ($F_{1, 27}= 0.21$, $P> 0.05$), but, there is a significant difference between these two groups in the post-test of disorganization variable ($F_{1, 27}= 127.50$, $P< 0.01$) and it represents the effectiveness of metacognitive strategies training in reducing the disorganization of people of experimental group. This significant difference has been shown in figure 1 objectively.
Second hypothesis:

The using of metacognitive strategies training method is effective in reducing motion impulsiveness of students with math disorder.

Table 4- one-variable covariance analysis for motion impulsivity variable

<table>
<thead>
<tr>
<th>Diffraction source</th>
<th>SS</th>
<th>Df</th>
<th>MS</th>
<th>F</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-test</td>
<td>3/16</td>
<td>1</td>
<td>3/16</td>
<td>8/46</td>
<td>7/007</td>
</tr>
<tr>
<td>Group</td>
<td>132/87</td>
<td>1</td>
<td>132/87</td>
<td>355/50</td>
<td>0/000</td>
</tr>
<tr>
<td>Error</td>
<td>10/09</td>
<td>27</td>
<td>0/37</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

According to the provided findings in table 4, two groups of experimental and control in pre-test have a significant difference, thus, these two groups have a significant difference with each other before any action and intervention training which according to table 1, the mean scores of subjects in the motion impulsiveness test is higher in the people in the experimental group. On the other hand, these two groups have a significant difference in post-test with considering the statistical removing of primary difference in pre-test (F_{1,27}= 355.50, P<0.01). It means the intervention program leads to the reducing of motion impulsiveness in the people of experimental group. This mean increasing has been shown as well in figure 2.
Figure 2- the mean comparison of experimental and control group in pre-test and post-test of motion impulsiveness

Third hypothesis:
The using of metacognitive strategies training method is effective in reducing cognitive impulsiveness of students with math disorder.

Table 5 : ANCOVA for varying cognitive impulsivity

<table>
<thead>
<tr>
<th>Diffraction source</th>
<th>SS</th>
<th>Df</th>
<th>MS</th>
<th>F</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-test</td>
<td>1/34</td>
<td>1</td>
<td>1/34</td>
<td>9/49</td>
<td>0/005</td>
</tr>
<tr>
<td>Group</td>
<td>9/42</td>
<td>1</td>
<td>9/42</td>
<td>66/58</td>
<td>0/000</td>
</tr>
<tr>
<td>Error</td>
<td>3/82</td>
<td>27</td>
<td>0/14</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 5 shows a significant difference between the experimental and control groups in pre-test (F_{1.27}= 9.49, P< 0.01), also in post-test, it has been shown a significant difference between these two groups of experimental and control (F_{1.27}= 66.58, P< 0.01). In other words, there is a significant difference between the experimental groups who have been under the metacognitive strategies training program with control group in the cognitive impulsiveness variable. Figure 3 shows this issue objectively.
Discussion and conclusion

The aim of this research was to investigate the effectiveness of SPQ4R metacognitive strategies training on the reducing impulsiveness (disorganization- cognitive impulsiveness- motion impulsiveness) of students with math disorder. For investigation the training effectiveness in several dependent variables, it was necessary to be measured the performance of control and experimental groups in multiple variables of impulsiveness. The best statistical model to measure the effectiveness of this training is recognized covariance analysis. After doing covariance analysis, the effect of intervention program was significant on the variables of 1) disorganization, 2) motion impulsiveness, 3) cognitive impulsiveness. In the following, it was discussed the researcher’s findings and it will be compared with the previous researches.

It was used covariance analysis to investigate the first hypothesis. As table 3 shows there is not a significant difference between the experimental and control groups in pre-test ($F_{1,27}= 0.21$, $P>0.05$), but, there is a significant difference between these two groups in the post-test of disorganization variable ($F_{1,27}= 127.50$, $P< 0.01$) which represents the effectiveness of metacognitive strategies training program in reducing the disorganization of people of experimental group. This finding is consistent with the findings of researchers like Safer and et al (2010), Mc Callen and et al (2010). Docherty and et al (2004) point out that the students should be trained the strategic reading skills to better understand contents and promote reading. It should be learned them to specify their aim from reading before reading activity and they monitor their performance after reading. Students should be learned to ask questions of themselves about the subject while reading the text, to recognize important and main points and ideas from non-important points and to guess the answers of questions and the end of text. On the other hand, the high level of impulsivity in students with math disorder is prevented in doing mentioned activities. In this research also it is thought learning through metacognitive strategies to students with math disorder. After patterning to students, the researcher ask them to run the stages of this method respectively by using the texts they have and to take notes in self-regulatory card. Using these cards caused students monitor on their work and they evaluate their
performance. The training of SPQ4R set lays out students with math disability from passive mode and it makes them to actively participate in learning activities and it works as a plan to achieve the aim of better understanding the contents and thus as the results of this research show it brought students with math disability to independent learners which they set up their learning activities as autonomous and most importantly they know when they do not understand. In general, SPQ4R strategies training cause that these category of students follow continuous program by showing the fallen level of disorganization.

Gerkin and et al (2009) have brought some reasons for effectiveness of SPQ4R strategies method. First, the observance of the stages of this method makes more familiar students with the organization of contents of chapter which they read. Second, the observance of SPQ4R strategies method makes the learner to learn information part to part rather learning all information; also designing questions about the contents which is read and answering to them makes students to understand contents of course deeper and wider. Wutoh and et al (2002) in their research which is done on normal children for trial showed that the people who are used SPQ4R strategies method are not received the higher scores in comprehension compared to people who are used the traditional method of learning. This finding is contrary to what which this research shows. As well as Teremond (203) has noted to the failure of Grant and Sleeter’s study (2007) which they were concluded of their study: “SQP4R strategies method has not a better effect in recalling information by students and they know the cause of failure of this study defect in exact patterning of teacher and monitoring on the using of strategy.

To investigate the second hypothesis also was used covariance analysis. According to the provided findings in table 4 two groups of experimental and control have a significant difference in pre-test, that’s mean these two groups have a significant difference with each other before any training action or intervention which according to table 1, the mean in the people of experimental group is higher. On the other hand, there is a significant difference in post-test between two groups by considering the primary difference in pre-test (F(1,27)= 355.50, P< 0.001). That’s mean the intervention program leads to reducing motion impulsiveness in people of experimental group. The research results of Waxman (2011), Zouk and et al (2008) and Bellani and et al (2012) is lined with the result of this research.

The cognitive activity when happening which the learner has his learning strategies meanwhile problem solving and targeted thinking and when reading under his supervision consciously. But, one of the most important aspects of impulsiveness is doing momentum and untimely activities which it is prevented from following of instructions in mathematics education. In this research, students also were taken work responsible gradually after modeling the stages of step and their learning and they avoided from unrelated activity. So that, in the final sessions the researcher only tries take responsible to students as far as he could which students can use strategies more or less as self-regulation and they monitor their learning activity. SQP4R training subsequent it increasing metacognitive knowledge allowed students become aware of their motion activities level and take it under their control.

Holt (1982, quoted from Seif, 2007) is told about the importance of metacognitive knowledge; it may be student (here student with math disorder) is a good person who says I do not understand,
because monitors on his level of understanding always. The weak student is a person who is not aware about his understanding and often he doesn’t know when he understands and he does not understand.

To investigate this hypothesis which is effective in using SQP4R training method on reducing cognitive impulsiveness of students with math disorder was used covariance analysis.

The observation of table 6 shows that in pre-test the difference between two groups is not significant statistically ($F_{1.27} = 9.49$, $P > 0.05$). But, on the other hand, there is a significant difference between these two groups in post-test ($F_{1.27} = 66.58$, $P < 0.01$), in this way that based on table 1 the mean of experimental group is higher than the mean of control group and itself represents the effectiveness of learning course of SQP4R in reducing the cognitive impulsiveness in the people of experimental group. This finding was lined with the findings of researchers like Dawe and et al (2009), Doran and et al (2009) and Fossati and et al (2007). SQP4R strategies are included that slow reading and yet accurate, pause for thought and in other words be accurate on issue, re-read, guessing the meanings of hard words and phrases and so on which training method in this research consisted of most of these strategies and it caused the increasing of metacognitive knowledge of subjects from problem solving strategies.

In explaining these results it can be said that the cause of decreasing of impulsivity and self-destruct symptoms is the programs content of this approach. Why so in this method the behavioral element has effect on the normalizing the impulse behaviors including (physical vulnerability, overeating and anorexia, drugs, alcohol, disease and physical pain, sleep health, stress and physical pressure, prodigality, sexual relations and dangerous driving). Therefore, the main body of SQP4R focus is around the learning, deployment and the generalization of specific adaptive skills which it is taught in this method and its ultimate goal is helping to student for breaking and overcoming this vicious cycle of impulsive behaviors and emotional instability (Bornovalvo & Daftres, 2007).

In the outline, it can be concluded such that as many of the researchers have noted (for example, Guskey, 2010), learning (in general) and math learning (in particular) always are affected by type of adopted training methods by organizations and people involved in education. The results of this research as well show that SQP4R training as a modern and comprehensive training style can meet many implications of effective learning (including high comprehension and desirable metacognitive awareness) and it causes the reducing of impulsiveness in students with math disorder.
References


