Evaluation and comparison of metacognition effectiveness of teaching methods & teaching of fine motor skills on reading functions of male dyslexia students at 3rd grade of elementary schools

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ABSTRACT

The main aim of this research is evaluate and compare methods of meta-cognition teaching & teaching of fine motor skills on reading functions of male dyslexia students at 3rd grade of elementary schools, Ab-e-Yek City. Research plan is experimental and with pre/after tests type with two test groups and one control group. The population of this research includes all male dyslexia students at 3rd grade of elementary school through academic year 2012-2013 at Ab-e-Yek city. Research sample includes 45 dyslexia students who were elected on random basis and replaced in test & control groups. The applied tools include Karami Nouri & Moradi (NAMA) dyslexia and reading test and also Children's Wechsler Intelligence test. Upon replacement of both groups testing factors, one group received meta-cognition teachings for 8 sessions of 1-hour. The other group received fine motor skills teaching for 8 sessions of 1-hour while there was not any interfere in control group. Upon the end of interfere, all three groups performed reading & dyslexia test. The statistical method of Covariance analysis and also Bonferoni Post Hoc test were applied for data analysis. According to the result, both methods of meta-cognition & fine motor skills were effective in betterment of reading in dyslexia students. From among both mentioned methods, meta-cognition teaching was more effective on reading function of dyslexia students as well.

Key words: Dyslexia, Meta-cognition teaching, Fine motor skills teaching, Karami Nouri & Moradi (NAMA) dyslexia and reading test
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INTRODUCTION

The learning disorders are one of the most common and challenging issues related to the process of the education. In this regard, one of these dysfunctions is subjected to the reading disability or dyslexia. According to British Dyslexia Association, dyslexia is subjected to a one particular problem at learning including a one or more basic problem in background of reading, spelling, language and writing [16]. Dyslexia, spelling problems, spelling weak skills, problem in memory are the other problems of this dysfunction [23]. The most fundamental tool for students is learning and the hugest part of information and learning happens through reading skill [11]. Having the ability of reading is an essential pre-requisite of many lessons [31]. Some researchers believe that more than 25% of educational drop off is originated from the dyslexia in primary students. Shafiee et al (2010) reported 10% of the dyslexia occurrence. Also, in the whole languages, about 5% of students are with dyslexia in the world [17]. Ritern

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(2007) believes that every three child with dyslexia, two ones has aggressive, opposition, solitude and secondary urination incontinence and insomnia disorders; also, they have low self-esteem, anxiety and depression due to the lack of progression at learning [22]. In the other hand, studies have shown that if these dyslexia students get recognized at early years of the school time and referred to therapeutically centers, about 85% of these students can be reached to the norm level; in addition, the lack of recognition of these students can make deepest problem in these low ages students; hence, the diagnosis and prognosis of these students is very crucial issue for the whole related students timely [29]. Researchers have called many different reasons for dyslexia as following:

Dyslexia students have many various problems. Delrosurio et al (1992) found that the dyslexia is coming along with visual perception and motor skills as well as neurological problems related together. Reid (2009) also believes that dyslexia people have some problematic issues in terms of motor skills, memory, cognitive and meta-cognitive subjects; one of these common issues is subjected to dyslexia students' inefficacy of the meta-cognitive approaches. Today, the importance of the meta-cognition process is acceptable in high level of learning and problem-solving issues [36]. Flavell (1988) as a pioneer of meta-cognitive issues defines the related process as following:

The meta-cognition points to the processes about considering people's knowledge as well as cognitive achievements; for example, I do based on meta-cognitive affairs; if I find that I have problems in learning the word ''A'' more than ''B'', I will face with difficulty; if I feel that I have to review the word ''S'' before accepting it as a reality, I will check it out again.

The meta-cognition points to any activity of knowledge organizing the related processes. Flavell has defined the meta-cognition as a process of adjusting and regulating any aspects of the cognitive approaches. According to Flavell, this process has been defined as the meta-cognition due to its root meaning about the cognition and recognition subjects. Panoura and Philip (2007) also define the meta-cognition as a process that people think of themselves developing and expanding approaches about their problem-solving issues. These approaches are targeted-base being provoked and motivated consciously and increasing students' struggles in this regard. Pennington (2009) believes that students with learning disability have considerable problems than healthy students in relation to cognitive and meta-cognitive skills. In the other hand, researchers have found that if the meta-cognition level of the students gets recovered, the performance of the learning will also become better [4]. In addition to this, dyslexia students have some other problems in motor skills. Some researchers believe that more than 70% of dyslexia students are with these terrible motor problems [3]. One of these motor skills is related to the fine motor skills relating to those skills that they can be moved by the motion of small muscles and sensory arrangements particularly in eyes and hands [4]. The ability of eye motions assists to the reading skill among students. The unusual movement of eye is also eminent during reading into the dyslexia students [1]. They show some problems at their visual system referring to their eye instability fixation particularly in the left hemisphere; hence, they have weak visual concentration. To-eyes instability and visual instable perception of dyslexia people make them to observe the letters complex [36]. The fine movements in children lead to increase their handy skills. These handy skills are related to the rapid transformation of information between the brain cortex and neck spinal node providing the connections between channels of information as well. Fulfilling these fine movements also depend on the cerebellum function and circumferential nerves [2]; in the other hand, there are certain observation about the importance of cerebellum in the language [1] representing the significant role of the cerebellum in reading skills. Even it has been shown that patients having cerebellum trauma indicate symptoms of deficiency in attention, active memory and dyslexia. The hypothesis of cerebellum deficiency is at biologically level being represent able in cognitive level [5], Various studies [12] have emphasized on the role of the fine movements importance in developing the process of learning and increasing the power and ability of learners and considering the high potential attention towards the movement skills for supporting the learning process. There have been suggested many different methods for treating and curing the dyslexia. However, there have been few studies done in this field unfortunately. In addition, carried out studies have been pointed to the students' dysfunction at mathematics and or healthy people with learning disorders happening at old ages. Also, there have been few studies fulfilled in relation to training of motor skills in Iran. In the present study, the test of reading and dyslexia of Karami NOuri and Moradi has been applied in this regard. This test has this advantage than other similar studies in country that it can evaluate about 10 fields of the students' reading skill; hence, it makes the researcher to evaluate and compare the effectiveness of the interventions in these various fields. In the other hand, due to the complexity of the man and different diversities represented about the mankind, the methods about the viewpoints have fundamental differences together and the determination of these superior therapeutically and educational methods is becoming increasingly important in this regard. According to what stated, the main aim of the present study is to evaluate and compare the effectiveness of the different educational methods in relation to the meta-cognition affairs and the fine motor skills on different circumferential performance among students' dyslexia of third grade primary school. In the present study, the following hypotheses have been represented:

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1- The scores of reading various environments among students with dyslexia under training of meta-cognitive affairs are increased in compare to the control group.
2- The scores of various reading environments of dyslexia students under the fine motor skills are increased in compare to the control group.
3- There is a difference between the scores of different reading environments of dyslexia students and the fine motor skills.

MATERIALS AND METHODS

The present study is of an applied type. The research planning is an experimental and of pre and post test along with control group. The statistical community of the study is including the whole dyslexia students of third grade at primary school during 2012-2013 in Abyek City including 45 students at the same grade. The sample of the research is also 45 students of third grade of primary school. These were also selected as accidental among the students of Abyek City that they have received test of dyslexia and diagnostic criteria of the US Psychology institution. It should be mentioned that Wexler intelligence test was fulfilled to diagnose the lack of mental retardation of the whole students and only students with moderate intelligence level (higher 90) were considered as dyslexia people. After accidental selection of the subjects, they were substituted for experimental and control groups equally. Then, one of these experimental groups was become under the meta-cognitive trainings in 8 sessions for 60 minutes. In another experimental group, training of fine motor skills was achieved in 8 sessions for 60 minute. While in control group, no any interventions carried out. The therapeutically sessions were achieved one session at a week. It must be mentioned that the carried out interventions by researcher were fulfilled at schools. In addition to the familiarity of parents to this intervention and tending them to assist students, a session was completed with mothers in this regard. Meanwhile, they were asked to cooperate with their ultimate struggle in completing the related tasks after every treatment session as written.

After the completion of the sessions for both groups of experimental and control, the pre and post tests were achieved for both related groups by the same researcher. The obtained results were analyzed by the use of SPSS18 software and multi variance analysis statistical method as well as follow-up and Boneferroni tests in this regard.

Research tools:
1- Reading test and pseudo-dyslexia:
This test as been normed by Karami Nouri and Moradi (2005) for girl students of 1st to 5th grades of mono-language primary school and bi-language students of Sanandaj-Tabriz including 10 minor tests. The whole alpha coefficient of the test is 0.82. [20].

2-Amended scale of WISC-R:
The amended intelligence scale of Wexler includes 12 sub-tests, 6 verbal tests and 6 non-verbal (practical) sub-tests. This scale has been normed by Shahim in 2006 in a 1400 people sample [33]. The validity of the retesting test is 0.094.44 (moderate 0.73) to its description 0.42 to 0.98 (0.69) were reported in this regard. The reliability of the test using score correlation of the practical part in Wexler scale for primary school children was 0.74 obtained [33]. The independent variable of the present study was subjected to the training of meta-cognitive and fine motor skills that its impact on the dependent variable regarding to different environmental scores in reading of boy students of dyslexia students were evaluated potentially. The variables of gender, intelligence and educational grade were also controlled.

RESULTS

The multi variable covariance analysis was applied to evaluate the differences between both groups in sub-scales of reading in pre-test and post test for control group. According to the normalization of the data distribution, the assimilation and homogeneity of the variances and covariances of the groups are related to the main hypotheses of the multi variable covariance analysis before achieving the covariance analysis test that in this case, Smirnov-Kolmograph test was also used for assessing the normality of the data distribution and M-Box Test, equality of covariance matrices as well as Leven's test of equality of error variance for studying the equality assumption of the covariance; the obtained results represent that there was required a necessary conditions for completing the covariance analysis test.

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Table 1: results of covariance analysis and total differences of the groups in post test of dependent variables

Variable / indicators	Critical statistics	Statistics value	F ratio	Hypotheses df	Error df	P
Group	Pillai	1.595	9.64	20	48	0.001
	Wilkis	0.012	18.64	20	46	0.001
	Hotelling	30.967	34.06	20	44	0.001

The data of the above mentioned table indicate that every three indices of the test criteria have been significant in relation to the differences of the groups and their variables. This subject represents that these three groups have got significant difference at least in a one variable.

Table 2: results of covariance analysis of variables difference among groups

Dependent variable	Sum square	Df	Mean square	F	Sig level
Reading words	1765.1	2	882.05	77.58	0.001
Sequences of words	595.9	2	297.98	63.38	0.001
Rhyme	106.1	2	53.05	22.79	0.001
Naming picture	7	2	3.5	3.45	0.044
Understanding the text	183.3	2	91.65	56.66	0.001
Remove sounds	45.3	2	22.66	6.07	0.006
Reading non words	56.4	2	28.19	19.26	0.001
Signs letters	23.51	2	117.57	42.33	0.001
Signs category	35.155	2	17.58	3.164	0.06

The results of multi covariance analysis show that the groups except the sub-scale of the symptom have significant difference together. In the present study, Boneferroni follow-up test has been applied to specify the details of the differences and pair comparison. The results of this test have been given in table 3.

Table 3: pair comparison of groups in pre test of dyslexia

Variable	Reference group	comparison group	Mean group	Criteria group	Sig level
Reading words	Meta cognition	Fine motor skills	3.61	1.34	0.034
		Control	15.54	1.32	0.001
	Fine motor skills	Control	11.93	1.31	0.001
Sequences of words	Meta cognition	Fine motor skills	1.20	0.86	0.518
		Control	8.71	0.85	0.001
	Fine motor skills	Control	7.50	0.84	0.001
Rhyme	Meta cognition	Fine motor skills	-1.18	0.61	0.182
		Control	2.70	0.59	0.001
	Fine motor skills	Control	3.88	0.59	0.001
Naming pictures	Meta cognition	Fine motor skills	-1.03	0.40	0.046
		Control	-0.31	0.39	1
	Fine motor skills	Control	0.71	0.39	0.232
Understanding text	Meta cognition	Fine motor skills	1.53	0.51	0.015
		Control	5.11	0.5	0.001
	Fine motor skills	Control	3.58	0.49	0.001
Understanding words	Meta cognition	Fine motor skills	0.68	0.77	1
		Control	2.52	0.75	0.006
	Fine motor skills	Control	1.84	0.75	0.059
Remove voices	Meta cognition	Fine motor skills	2.03	0.48	0.001
		Control	2.87	0.47	0.001
	Fine motor skills	Control	0.84	0.47	0.25
Reading non words	Meta cognition	Fine motor skills	4.1	0.87	0.001
		Control	9.33	0.85	0.001
	Fine motor skills	Control	5.24	0.85	0.001
Sign letters	Meta cognition	Fine motor skills	3.52	0.66	0.001
		Control	5.97	0.65	0.001
	Fine motor skills	Control	2.45	0.65	0.002

The obtained results of the table will be the study of research hypotheses. According to the mentioned results, we like to carry out the research hypotheses now.

Research first hypothesis:
The environmental scores of dyslexia students' reading under meta-cognitive trainings are higher than control group. The results of the research showed that meta-cognitive trainings lead to the increase of dyslexia students' function in pre-test than control group. For the reason, the meta-cognition interventions in the sub-scale of reading words, chain of statements, rhyme, text comprehension, elimination of sounds, reading non-words and letters signs is very effective and there is a significant difference between the function of subjects with meta-cognitive education and

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control group in the sub-scales with 99% confidence level and the function of the meta-cognitive education is better in this case. The meta-cognitive interventions cannot make recovery only in both sub-scales of calling pictures and process sign of dyslexia students; hence, it can be concluded that the research hypothesis has been confirmed in this regard.

Research second hypothesis:
The scores of dyslexia students with different fields under fine motor skills are higher than control group. The results of the second hypothesis showed that training of the fine motor skills lead to the increase of dyslexia students' performance in different fields of reading words, chain of words, rhyme, comprehension, reading non-words and letter sign so that the performance of the subjects in the related sub-scales has been increased with 99% confidence level in compare to control group. In the sub-scale of reading words, the group of fine motor skills has been increased but its significance level was obtained 94% in this case. For the reason, this degree is not considered as significant. Also, training of the fine motor skills in the fields of calling name, eliminating sounds and process of sign is not also effective; hence, it can be concluded from the obtained results that the second hypothesis is also confirmed in this regard. And the fine motor skills have been led to the recovery of dyslexia students' function.

Research third hypothesis:
There is difference between the scores of dyslexia students' reading fields under training of meta-cognitive methods and fine moor skills. The results obtained from different researchers showed that generally interventions based on meta-cognitive skills are effective than the fine motor skills training. Because, dyslexia students under training of meta-cognitive skills have better function in compare to the group of the fine motor skills in the related sub-scales of reading words and so forth. Thus, these groups performance in pre-test is better than the group of fine motor skills while the group of fine motor skills have better function in the field of calling pictures than the meta-cognition group. Hence, the hypothesis of the research has been confirmed due to the effectiveness of two methods in this regard.

DISCUSSION AND CONCLUSION

Different studies such as Flavell 1988, Garner 1990, Dembo 1994 and Pennington 2009 have shown that students with disability in learning and totally students without suitable educational progression never learnt how to learn; in fact, they are out of meta-cognitive approaches and are not able to challenge in learning process actively. In the other hand, the meta-cognitive approaches are teachable and learnable. The results of the present study showed that the meta-cognitive trainings can increase the performance of dyslexia students in different fields of reading. Among the under-study sub-scales, the reading words and non-words reading, chain of words, sign of letter and eliminating sounds have fairly common sides together. The meta-cognitive interventions can recover the conscious of people supervising themselves as well. These may increase their task-based achievements in this case. They can also get familiar and accept their mistakes potentially. In the other hand, one of the most essential and effective factors of learning is subjected to the attention concentration; students with enough familiarity with these controlling methods can have better function in the related fields. Different researchers [17] believed that the ultimate target is reading comprehension. Reading words is one of the most basic pre-requisites of the reading comprehension test; hence, as long as students have reading words problems it cannot expect that they can understand the written comprehensions. So, it can expect that the recovery of reading word ability can automatically lead to the recovery of dyslexia students reading affairs. In the other hand, the approach of meta-cognitive training using approaches such as text supervision, training questioning and self-ego, self-regularity and bilateral method as well as the determination of reading purposes can lead to the recovery of students' reading comprehension. In the sub-scale of calling picture, training of meta-cognition issues has not significant difference; the most interesting point is that among three groups of under-study, the best function is subjected to post test control group. The evaluation of the mean dyslexia students in post test indicated that the scores of meta-cognition trainings are 37.7, the fine motor skills group 36.8 and control group is 37.7; due to the highest score in calling picture test with 40 pictures, it can be stated that this sub-scale does not have a relationship with students' reading practically; in other words, dyslexia students basically do not have weak performance in this sub-scale. Other researches [18] carried out similar studies in the field of the lack of effectiveness of the related interventions at the calling picture sub-scale. This finding is coincident with the findings of Gheisari (2010) and Heidari et al (2012); the performance of students in this test sub-scale has been originated from facing the stimulants and environmental experiences that these do not have any connections to the meta-cognition method. Now, the comparison of the present study results represent that some parts of the meta-cognition trainings can influence on the dyslexia students' reading performance. Along with studying other studies in this field we will have following terms:

Yaghoubi and Ahadi (2004) found that training of meta-cognition approaches can lead to the recovery of dyslexia students' reading affairs. Dehghani et al (2007) also showed that training of meta-cognitive approaches lead to the

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healing of dyslexia students' reading issues. Majidi et al (2010) also found that training leads to the recovery of dyslexia students itself. Malone et al (1992) found that training the process of summarizing and self-regulation is influential on the function of dyslexia students' learning. Digoret (2001) found that the meta-cognition has a positive correlation with students' educational function. Sen (2009) also reached to this conclusion that the meta-cognitive approaches have impacts on students' comprehension. Hadadia et al (2012) also found that the meta-cognitive approaches, self-training can be effective on recovering students' performance and reducing their stress in this regard. Other results of the present study are related to the training of fine motor skills recovering the dyslexia students' function in the whole fields of reading except sub-scale of calling the picture, eliminating sounds, understanding words and process sign. In order to represent the obtained results, it should be mentioned that based on various studies, dyslexia students face with deficiencies in motor skills and the related fields [2]. Different researchers such as Getman, Barsch, Kepart and Piaget believed that motor skills are the origin of other skills leading to the recovery of mental superior abilities [2]. There is a lobe in the brain conducting the learning process; indeed, this lobe is subjected to the cerebrum playing as essential role in this case. Hence, the motor and learning have bilateral reaction together forever [19]. The delay and interruption in the brain's maturity leads to the destruction among students' learning process. For example, studies have shown that the lack of brain maturity is effective in the attention deficiency [27]. Many dyslexia students have problems in the field of attention. The process of attention is one of the most crucial necessities of the brain superior actions. It is one of the most manifested aspects of the cognitive structure playing in the structure of the intelligence, memory and perceptions [5]. Therefore, any deficiencies make the process destructed; since the motor skills recover the brain function, it can also increase the performance of the whole students recovering the process of learning in this regard. In addition to this, the study of dyslexia students shows that the main part of their problems is subjected to the visual issues including mistakes such as eliminating and adding letters, displacement of the letters, losing the lines. Also, the existence of some problems in visual perceptions is very common problem among these students [29]. Because they have some problems in fixing their two-eyes in this case; in the other hand, fulfilling continuous and target-based issues related to the fine motor skills can remove their problems in this regard. Along this, special practices can help them to eliminate any destructive affairs regarding into their problems [34]. According to the importance of the visual and eye arrangement issues, it is stated that these can be more effective in the whole sub-scales as pointed before; in other words, if these students are not able to read the recent words in a context, it cannot be expected the ultimate target of semantic perception in this regard. as it mentioned before, in the other hand, the regular basis fulfillment of these actions can assist on dyslexia students' recovery in terms of the memory potentially. In the sub-scale of the word perception, the subjects showed acceptable function although the confidence level was obtained 94% and the differences were not significant in this regard. In the sub-scale of calling the picture, these students also showed significant difference than control group. As dyslexia students had got suitable function in pre-test and no any relationship between the calling picture and the ability of word reading, the carried out therapeutically interventions are not roughly effective in this regard. The results of Gheisari (2010) and Heidari et al (2012) researches have also represented the same subject as well. And again it can be stated that according to the lack of direct relationship of this sub-scale with the reading skill, it can be concluded that the sub-scale of the process sign and the calling picture are not effective in this case. The performance of dyslexia students under the fine motor skills in the sub-scale of eliminating the sounds is not significant and according to these interventions based on the fine motor skills, the performance of students is not enough effective in this case. The results of the present study are coincident with Mirzakhani (1999), Karghar Shooraki et al (2010); these studies showed that training of the motor skills is effective on the mathematic function of students. Farid (2007) also found that the motor-perceptional activities can lead to the increase of educational affairs. Mathis and Fax (1999) also found that fulfilling the motor activities can be more effective in students' educational progression. All these represent the effectiveness of the interventions based on the motor skills on the students' educational progression. In addition to this, the results of the studies showed that the meta-cognitive approaches have more effectiveness on dyslexia students' function so that these dyslexia students received the interventions in compare to the fine motor skills in the sub-scale of reading words, comprehension, eliminating sounds, reading non-words and the letter sign functions while, the fine motor skills have only better function in the calling picture sub-scale. In the representation of the above mentioned findings, it can be stated that since the meta-cognitive interventions have direct relationship with the navigation training, it is specified that dyslexia students are not beneficent of this process. In fact, in this method, the indirect method has been carried out in terms of the mental superior functions; therefore, it can be stated that direct training of the navigations and approaches and reading skill interventions is very effective in the recovery of the brain function in compare to the indirect interventions.

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