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The Influence of Mindfulness on Self-regulation of Students with Dyscalculia

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ABSTRACT

This paper attempts to investigate the influence of a curriculum based on mindfulness upon the self-regulation of students with dyscalculia. The population is the primary school students of the fourth and the fifth grade with dyscalculia who were in Rehabilitation Centers for Learning Disabilities in Sanandaj city. Thirty people were chosen as a sample and were randomly divided into two groups of test and control, each one of which had fifteen members. For the test group the education was based on mindfulness. Before and after the application of the curriculum the self-regulation questionnaire of Ryan & Connell (1989) was provided for both groups. The statistical analysis of covariance was used to analyze the data. The result depicted that the curriculum which was based on mindfulness was quiet effective in educational self-regulation (P<0/05). Generally the result strengthens those studies which have demonstrated the role that the behavioral-cognitive curriculums play to lessen the psychological problems of the students with learning disorder.

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INTRODUCTION

Learning disorder is a general term which signifies a group of heterogeneous disorders in the form of listening, speaking, reading, writing and calculation problems. One of the main disorders is dyscalculia which is between 1-11 percent [4]. Based on the diagnostic and statistical manual of mental disorders in dyscalculia the performance of the individual in standard math tests must be lower than the expected one. It also must make problems in the education or the daily life of the person. Moreover the dyscalculia should not be due to the physical, emotional and eyesight problems or an inappropriate cultural or educational context [26].

Although the effect of learning disorders is primarily on educational domains, the children with learning disorders have problems in social and psychological abilities [9]. One of the variables which are less abundant in kids and teenagers with learning disorders is self-regulation. Based on Bendora [3], self-regulation includes the abilities of self-guidance, self-control, and self-autonomy. In his view, these abilities are affected by the individual's view about self-efficacy. Self-regulation is defined as a mental attempt to control the inner status, processes and functions to achieve higher goals [8]. Generally Zimmerman (1990) has defined learning self-regulation as the active participation of the learner (behavioral, motivational, cognitive and meta-cognitive) in the learning process to increase the level of the learning process. Behavioral self-regulation is the optimization of different sources which increase learning. Motivational self-regulation is the active application of motivational methods which enhance learning and lessen the fear and anxiety. Cognitive self-regulation is the active application of cognitive methods (specifically for assignments), and meta-cognitive self-regulation is the active application of meta-cognitive methods (which are observing and managing methods) which increase the learning. The way self-regulation is managed is a key element in kids, teenagers and adults' success in learning [7]. The result of this research shows that the students with learning disorders have so lower a level of self-regulation than normal students [32,17].

Many of the attempts concerning the involvement on children with learning disorders have mostly focused on learning problems rather than psychological ones. A way which is recently used to lessen the psychological and social problems of people with various kinds of disorders is the use of plans that are based on mindfulness. The interventions (involvements) which are based on mindfulness have shown their role [1]. For instance the

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prevention of recurrent depression [28] and addiction [19] and the reduction of cognitive and physical negative responses in case of stress [16] and attention deficit hyperactivity disorder ADHD [36]. Mindfulness is to notice the present time in a special way, purposeful and non-judgmental [16]. Mindfulness is to be at the moment with whatever that exists without judging or telling your opinion about whatever that has happened; to experience the real without explanations. The basis of mindfulness goes back to the meditation in Buddhism which increases the attention and the continuing awareness capacity (that is beyond thought). Meditation and mindfulness practices strengthen the self-awareness and the self-acceptance of the patients. Mindfulness is neither a method nor a technique, still to be fulfilled it requires many techniques and methods. Mindfulness can be defined as a way of being or a way of understanding that needs to perceive personal feelings [1]. Mindfulness needs behavioral, cognitive and meta-cognitive strategies to get the noticing process focused [28].

Haydicky (2010) in a research, Teaching Mindfulness to Teenagers with Learning Disorders, tried to show the influence of teaching mindfulness based on martial arts, on external and internal behaviors and social skills on teenage boys with learning disorders. The result illustrated that the students in the test group made a great progress in practice and solving problems in comparison to the control group. The students with a high level of anxiety in the test group lessened their anxiety better than those in the control group. In another research, Mindfulness an Innovative Cure for People with Learning Disorders and Their Accompanying Psychological Disorders, Milligan, Badali &Philips (2010) the attempt was to know if teaching mindfulness has any effects on the self-awareness and the self-regulation of the students with learning disorders. The result showed the positive role of teaching mindfulness on self-regulation and self-awareness of people. And both the students and their parents were satisfied with its positive influence.

Due to the fact that there is a large number of children with dyscalculia and the importance of noticing the psychological problems beside the educational ones, the present paper attempts to investigate if an interventional curriculum that is based on mindfulness has any effect on the self-regulation of these students.

Methodology:

This research is an applied one in terms of its purpose and it is a semi-experimental study, with pre and post test on the control group, in terms of its practice. The population of this research is the boy students with dyscalculia in the fourth and the fifth grade of primary schools in Sanandaj in 1392-93 who were in Rehabilitation Centers for Learning Disorders. The sample was thirty students, divided randomly into two groups of test and control with fifteen members each. It should be noted that to recognize the disorders in these children Wechsler Intelligence test and Key Math test were taken and none of the subjects showed a problem in the IQ while in the math diagnostic test they showed a deviation, at least one and a half lower than the average of the society.

Research Tools:

Wechsler Intelligence Test: to test the IQ of the students with dyscalculia Wechsler Intelligence Scale-Revised was used. The reliability coefficient in split-half method and Cronbach Alpha are respectively 93/0 and 83/0 and its validity is 79/0 [30].

Key Math Diagnostic Test: this test is highly used for students with dyscalculia and regarding its content and continuation includes three phases; basic elements, operation, and practice. This test was normalized by Mohammad Esmaeel & Hooman in Iran in 1381. The validity of this test was between 55/0 to 67/0 according to content, discriminate, predictive and concurrent validities. The reliability of this test was shown by Cronbach Alpha as 80/0 to 86/0 [22].

Self-Regulation Questionnaire: the academic self-regulation questionnaire was designed by Ryan & Connell (1989) and has four subscales. Since answering such a long questionnaire is a bit difficult for children with learning disorders, Desi, Hobbes, Pierson & Thomason (1992) provided an easier and shorter questionnaire for children with learning disorders which has 17 items, multiple choice and in Likert-scale in a way that 'always' gets 4, 'often' gets 3, 'sometimes' gets 2, and 'never' gets 1. For instance the first question is, "I do my homework so that my teacher does not get angry." The providers of this questionnaire have depicted an acceptable validity and reliability for this scale. Because the Persian version of this questionnaire was not available the English one was translated by a professor of English faculty then it was translated again into English by another professor to be compared with the original version. Then it was applied on ten students with learning disorders as a preliminary study and to find the possible problems. The reliability of the final version was 69/0 according to Cronbach.

The Curriculum Based on Mindfulness: it was performed in 10 sessions, 90 minutes each. In table 1 the synopsis of this program which is based on Hooker and Fodor [13] is provided.

Table 1: The synopsis of the curriculum based on mindfulness.

The first session: introduction, making parents familiar with mindfulness in education, pre-test stage	The sixth session: the awareness of the body Goal: to increase the attention on the body Practice: mindfulness on breathing
The second session: awareness of the environment Goal: to increase the attention of the subjects towards the objects Practice: the awareness of an object	The seventh session: the meditation of mindfulness Goal: the awareness of the effect of thought on senses and actions Practice: noticing the process of thinking
The third session: the awareness of the environment Goal: to guide the awareness of the subjects towards the personal experience of the environment Practice: the awareness of the self in the environment	The eighth session: the performance of the 3rd stage' "mindfulness meditation" Goal: to observe the thoughts and to relieve them without judgment Practice: mindfulness on the bubble
The fourth session: the awareness of the body Goal: to increase the attention on the body Practice: noticing the senses, raisin meditation	The ninth session: the performance of the 3rd stage, "mindfulness meditation" Goal: to encourage creativity and daydreaming Practice: mindfulness of visualization
The fifth session: the awareness of the body Goal: to increase the attention on the body Practice: the awareness of the movement	The tenth session: persuading the subjects to continue the practices, post-test

Results:

In tables 2, 3 and 4 the average and the standard deviation of IQ, Key Math test and self-regulation for the test and the control groups, and the analysis of covariance, are provided to compare the groups.

Table 2: The average and the standard deviation of IQ and Key Math test for the test and the control groups.

	Test Group		Control Group	
	Average	Standard Deviation	Average	Standard Deviation
IQ	94/44	6/65	95/22	7/12
Key math test	72/05	8/65	76/46	9/31

As depicted in table 2 the subjects are normal concerning their IQ and are similar in Key Math marks.

Table 3: The average and the standard deviation of self-regulation for the test and the control groups.

The Groups	Test Group				Control Group			
	Pre-test		Post-test		Pre-test		Post-test	
	Average	Standard Deviation	Average	Standard Deviation	Average	Standard Deviation	Average	Standard Deviation
Self-Regulation	39/8	4/31	44/46	3/62	40/73	2/96	41/53	4/03

The information in table 3 shows the average and the standard deviation in the pre-test and the post-test of self-regulation. Based on the information of this table the average for the test group has increased after the interventions.

Table 4: The result of the analysis of covariance to investigate the difference of the test and the control groups in the self-regulation post-test

Sig	F	MS	Df	SS	Source Index
0/033	5/033	72/640	1	72/640	Group
0/230	1/509	21/780	1	21/780	Self-regulation Pre-test
-	-	14/433	27	389/687	Error
-	-		29	476/000	Total

The Argument and the Conclusion:

This research was done to investigate the effect of the education that is based on mindfulness upon the self-regulation of students with dyscalculia. The analysis of the covariance depicted that teaching mindfulness has a great effect on the self-regulation. The findings of this study are consistent with Haydicky [12], Zylowska *et al* [25], Berthelot & Crowley (2000), O'Shea & O'Shea [23] and Brown & Palinskard [6]. According to Bandura [3] self-regulation is the application of self-guidance, self-control and self-autonomy [33]. In Zimmerman's (1990) view, learning self-regulation is the behavioral, motivational, cognitive and meta-cognitive active participation of the learner. Pintrich [24] believes that self-regulation is an active and organized process through which the learners arrange their goals in learning and try to supervise their cognition, motivation and behavior. Also in Lemos' [18] view self-regulation includes the individual's ability in organizing his/her behaviors to accomplish the goals and the self-management of different learning processes. Mindfulness emphasizes the supervision and the management of thoughts and feelings; therefore it can have an effect on the enhancement of meta-cognitive self-regulation.

The basic strategies of meta-cognitive self-regulation are planning, control, supervision and regulation [27]. In the techniques and practices of mindfulness, these strategies are specifically noticed. In this program the individual supervises the thoughts and the feelings. The thoughts, behaviors, feelings and emotions are

controlled and planning and discipline are tried to be taught in the individual's process of thought. For instance in the awareness of the senses, the individual is asked to control each of thoughts, feelings and behaviors, s/he is also needed to notice the order of the behaviors in an action (like eating raisin). Or in the awareness of the movement the individual is asked to supervise his/her thoughts and feelings and to focus only on the present and to do the breathing with a specific continuation and order. Therefore mindfulness is actually a self-regulating program for thoughts, feelings and behaviors.

It also seems that mindfulness helps people to internalize their self-regulation style. In the internalized style of self-regulation the individual does something only for inner pleasure, excitement and enthusiasm [25].

On the other hand for self-regulation people ought to control their attention. Mindfulness is a specific and targeted method in the present which is free from judgment [15]. In fact one of the main problems of children with dyscalculia is the defect in the attention. The attention is a group of mental actions which include concentration, being alert and the shift of the concentration from one target to another [29]. The studies of Meltzer [20] and Mocklovsky, Perkinz & Dioner (2009), have depicted that children with dyscalculia have problem in the attention. Therefore the curriculums that strengthen the attention and the concentration can lessen the problems of these children and enhance the self-regulation. The enhancement of the self-regulation in the test group can be result of the reinforcement of the concentration and the attention. In fact in this program, practices like the awareness of an object, the awareness of a self in the environment, the meditation of the raisin, the awareness of the movement and breathing are designed to increase the attention.

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