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The Effectiveness of a Training Program Based on Mental Imagery Among Jordanian Students

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Abstract

Research has focused on mental imagery and its relation to many psychological and educational factors. However, few studies focused on training students to improve their ability to manage mental imagery. The present study aimed at exploring the effectiveness of a training program based on Mental Imagery. A sample of 80 seventh grade Jordanian students were chosen and distributed randomly into the experimental and control groups. To achieve the objective of this study, the researchers had constructed a training program to develop students Mental Imagery. In addition, the researchers developed the Mental Imagery scale and obtained good validity and reliability indicators. The results showed that there was a significant statistical difference in the post-scores of all Mental Imagery domains in favor of the experimental group. In addition, there was no statistical difference between the post-scores and the delayed scores in the experimental group indicating the continuity of the effectiveness of the training program.

Keywords

Mental Imagery, Training Program, Jordan

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1. Introduction

The human mind has the ability to see events, scenes and experiences in a way that is different from the way others scenes them. This is one of the most distinguished characteristics of human experience (Crisp, Birtel, & Meleady, 2011). Mental imagery is one of the most important processes in which information is represented in the cognitive system of the individual by representing the events that are presented to the individual at the time of perception. This supports the hypothesis of the spatial representation of visual stimuli, which explains the ability of the individual to represent mental images in its original form; and adapt these images with high accuracy (Atoum, 2014)

The nature of the experiences that take place in mental imagery and how to make them aware (attentive and responsive) and measurable experiences has been controversial. Research in the fields of philosophy, psychology, cognitive psychology and modern neuroscience used the terms of mental images or mental imagery to express any sources that come from sensory inputs such as auditory images, olfactory images, etc. However, the vast majority of scientific research has focused on mental visual images (Reisberg, 1992; Bensafi et al., 2003).

Mental imagery can be used to develop learning skills since the aim of learning is not to retain information or acquire knowledge, but to achieve active and effective learning. The use of mental imagery helps in the success of learning motor skills, so there is a positive relationship between mental imagery and acquisition of new skills (Bensafi et al., 2003). Mental imagery helps students to understand and perceive symbols in different ways (visual, auditory, etc.) and to make

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them meaningful learners and relate them to the cognitive content of the individual (Awn and Al-Attar, 2014). The development of the mental Imagery capacity also helps students to understand events related to narrative texts, improves their ability to understand and learn vocabulary, helps students draw images of sensory stimuli that link past experience with new learning, make reading comprehension easy for students, and improve self-efficacy and self‐Continuity (Jenkins, 2009; Blouin‐Hudon, & Pychy, 2017; Zach, Dobersek, Filho, & Tenenbaum, 2018).

The Concept of mental imagery expresses the process in which the individual constructs images and attitudes that reveal their understanding of the current situation, whether those images are visual, auditory, sensory, olfactory, or others and mental images reflect the output that follows their process. Hardy, Jones and Gould (1996) defined mental imagery as a symbolic sense passes through the individual in a way that helps him to stimulate the sense of seeing, hearing, tasting and touching. Thomas (2003) thinks that mental imagery expresses an individual's experience of events in a way that is somewhat similar to perceiving faces, events or scenes.

Zugol and Zugol (2011) define it as a reflective image of things that are sensually experienced through the senses. In addition, Eysenck (2012) define it as the process of representing the individual in the physical world outside his mind. Atoum and Bond (1994) also defined it as a process to represent events, things and attitudes that are presented to the individual at the time of perception in a form similar to the real images. Mental images that are the product of mental imagery are formed from the representation of sensory imagery created by the process of encoding and storing information in memory rather than information recorded by the senses at the present moment. Images originate as they are based on the type of mental images stored and not based on the image received by the individual in the present (Kosslyn, Thompson & Ganis, 2006).

Moran, Holmes & MacIntyre (2012) suggested that there are a number of key characteristics of mental imagery that can be summed in three main features:

1. Mental imagery is multi-sensory and draws its sources from the five senses (sight, hearing, smell, touch, taste), which can be classified into multiple types.
2. Mental imagery is shared with some neural foundations, which refer to the role of biological and brain bases in its composition.
3. Various cognitive and mental processes affect mental imagery.

Mental Imagery, as explained earlier, reflects a cognitive process of the ability to create, manipulate, and develop mental images. Therefore, Pylyshyn (2002) suggested that mental imagery could be expressed through a set of dimensions:

1. Scanning mental images: this reflect the ability of the individual to represent the actual experience in their minds without the present of the stimuli (visual, auditory, olfactory, taste, tactile), and can be inferred through the vividness of the mental image that the individual poses. This process is linked to the memory system of the individual as it is related to his awareness of the events (Kosslyn, Thompson, & Ganis, 2006; & MacIntyre, 2012). Scanning mental imagery includes:

a. Visual Imagery: It represents the characteristics of the shape such as circle, square, triangle, oak tree, height, width, depth and others.

b. Auditory Imagery: It represents the characteristics related to the intensity of the sound such as its intensity, strength, and its distinction from other sounds.

c. Kinesthetic Imagery: it represents the characteristics of the texture such as softness, coarseness, hardness, expandability, etc.

d. Gustatory Imagery: It represents the characteristics related to taste such as sweetness, saltiness, bitterness and acidity.

e. Olfactory Imagery: It represents the characteristics of smells such as odors and harmful or attractive smells.

2. The “size” of mental images: It refers to the skills of the learner in the installation of mental images and strategies or methods that help to change the size of the object.
3. Mental “paper folding”: This skill is an advanced skill in mental imagery, indicating the ability of the individual to develop the mental image and its unique characteristics such as analysis, folding, matching and manipulation.
4. Mental Rotation: Mental rotation as part of the spatial capacity can enables an individual to perform a mental imagery of an exciting appearance after being rotated at certain angles of rotation and to provide appropriate judgment by matching or a capacity that can be developed by training.

The researchers did not find many studies that directly trained students on mental images, meanwhile, many studies aimed at studying the relationship between mental imagery and other psychological and educational factors (Schirmer, 1995; Schauer, 2005). Jenkins (2009) conducted a study aimed at investigating the impact of mental imagery on reading and understanding the texts of interpretive science.

Results showed improved performance of students in the experimental group studied texts through the development of mental images compared to the control group.

One study conducted by Besiktas & Bicer (2013) aimed at investigating the effectiveness of training on Mental Imagery and its impact on athletes. The study showed that there were statistically significant differences between the tribal and post-tribal measurements Training on Mental Imagery. Also, Gaggioli et al. (2013) conducted a study aimed at investigating the effectiveness of combining mental image training with real training to develop the complex motor skills of basketball players. To achieve the objectives of the study, the researchers trained a group of students using mental imagery on complex motor skills in basketball. The results of the study showed that training in motor images helped to improve complex mechanical movements.

Recently, Yusuf (2016) conducted a study aimed at examining the impact of training on creative mental images of students on reading comprehension in basic schools in Nigeria. The experimental group members were subjected to a 16-session training program distributed over eight weeks. The experimental group was trained to create creative mental images, and the two groups underwent two tests in reading comprehension (tribal and post-traumatic). The results of the study indicated that members of the experimental group who studied with creative mental images outweighed the members of the control group in the reading comprehension test.

1.1. Problem of the Study

Based on personal experiences of the researchers through working with students at various schools and universities in Psychology and Counseling, they have noticed that students lacked skills in mental imagery, which emphasizes the need for training students on mental imagery. The researchers interviewed some students to make sure of the need for training. The aim of this study was to train students to develop their mental imagery skills and to measure the effectiveness of training in mental imagery. Based on that, the present study attempts to test the following hypotheses:

Hypothesis 1: There are no statistically significant differences (.05) between Mental Imagery total and dimensions' post-scores of the experimental and the control groups.

Hypothesis 2: There are no statistically significant differences (.05) between Mental Imagery total and dimensions post-scores and delayed scores of the experimental group.

1.2. Significance of the Study

Research studying the effect of training programs on mental imagery is very limited while most research published worldwide or in the Arab region addressed the issue of mental imagery and its relation to learning and perception. In Jordan and the Arab world, no single study attempted to design a program to train students on mental imagery. Practically, the study provided a training program based on mental imagery and developed a scale measuring mental imagery in Arabic for the first time. Providing a training program and a scale on Mental Imagery will be of value for further research in the Arabic region and can be used by school counselors to develop and measure mental imagery on special students.

2. Methods

2.1. Participants

A sample of 80 male Jordanian students from the 7th grade of a basic public school has been chosen. Subjects were randomly assigned either to the experimental group (n = 42) or the control group (n = 38).

2.2. The Study Tool

To gather scores of mental imagery, the researchers reviewed previous studies and scales (Sheveland. 1992, Blajenkova et al, 2006, Williams et al, 2012) and developed a new scale for this purpose. The new mental imagery scale consists of 28 self-report items using 5-point Likert-type responses that range from always, often, sometimes, rarely, to never. The items were distributed equally into the seven dimensions (Visual Imagery, Auditory Imagery, Kinesthetic Imagery, Gustatory Imagery, Olfactory Imagery, Movement Imagery, Feelings Imagery) based on the classification of Sheveland (1992).

2.2.1. The Validity of the Scale

The scale was presented to a panel of 10 psychologists (educational and cognitive psychologists) who volunteered to judge the scale in term of goals, dimensions, and language. Based on the request of 80% of the judges, five items were modified. To ensure construct validity of the scale, the new scale was distributed to a sample of 45 students. Correlations between item scores and subscales scores were calculated. These correlations ranged between .29 to .69, which indicates a good, construct validity of the scale.

2.2.2. The Reliability of the Scale

To ensure the reliability of the scale, the researchers used data from the validity sample and repeated the test after 2 weeks. Two measures were calculated, domains' Cronbach alpha for internal consistency and Pearson correlation equation for stability reliability. Cronbach values ranged from .67 to .83 and Pearson values ranged from .60 to .88 that are considered good indicators of reliability of this scale.

2.2.3. The Training Program

The program intended to train students to develop students' mental imagery skills such as rotations, scanning, controlling, and modifying (Borst & Kosslyn, 2008). A number of training strategies were adopted such as discussion, opening Questions, feedback, cooperative learning, sharing, problem solving, brain storming, and storytelling. Audio–visual aids such as blackboard and projector (Data Show) to provide slides containing the stories and themes were used. To ensure the appropriateness of the content of the program, the program was judged by five psychologists and a number of modifications were carried out in the light of the suggestions and instructions of the judges.

2.3. Procedures of the Study

The researchers administered the mental imagery scale to both the experimental and control group (pre-test), while the program was administered to the experimental group only. The mental imagery scale (post-test) was administered again after training to both the experimental and control group. After 40 days of the training, the mental imagery scale was administered to the experimental group as a delayed test.

2.4. The Design of the Study

The study employed an experimental method that used two groups pre–post-delayed design with the mental imagery scores as the dependent variable and group was the independent variable (training on mental imagery in the experimental group vs. control group).

3. Results

3.1. The First Hypothesis

To test the first hypothesis that stated "There are no statistically significant differences (.05) between mental imagery total and dimensions' post-scores of the experimental and the control groups", means and standard deviations for mental imagery total scores (pre-test and post-test scores) for the experimental and control groups were calculated and shown in Table 1.

Table 1. Means and Standard Deviations of mental imagery Scores for the Experimental and Control Group.

Group	N	Pre-test		Post-test	
		M	SD	M	SD
Control	38	2.60	0.46	2.64	0.40
Experimental	42	2.71	0.37	3.43	0.37
Grand Total	80	2.65	0.42	3.06	0.55

Results of Table 1 shows that there are apparent differences between the means among the overall score of mental imagery on the post-test and pre-test based on group. To detect statistical significance of these differences, one-way ANCOVA was used, as shown in Table 2.

Table 2. ANCOVA on the Scores of mental imagery scores Based on Group.

Source	Type III sum of squares	df	MS	F-test Value	Sig
Pretest	4.651	1	4.651	* 53.940	0.00
Group	10.199	1	10.199	* 118.282	0.00
Error	6.639	77	.086		
Corrected Total	23.690	79			

Results of Table 3 shows that there are significant differences at the level of (.05) due to training on the overall score of mental imagery and the difference was in favor of the experimental group with a mean of 3.43 while the mean of the control group was 2.64.

Means and standard deviations for mental imagery dimensions (pre-test and posttest scores) for the experimental and control groups were calculated and shown in Table 3.

Table 3. Means and Standard Deviations of mental imagery Dimensions' Pre-Post Scores for the Experimental and Control Group.

Dimensions	Group	N	Pre-test		Post-test	
			M	SD	M	SD
Visual Imagery	Control	38	3.18	0.67	3.23	0.67
	Experimental	42	3.16	0.59	3.74	0.70
Auditory Imagery	Control	38	2.52	0.56	2.60	0.59
	Experimental	42	2.53	0.68	3.43	0.69
Kinesthetic Imagery	Control	38	2.51	0.63	2.55	0.61
	Experimental	42	2.55	0.73	3.38	0.75
Gustatory Imagery	Control	38	2.52	0.66	2.57	0.67
	Experimental	42	2.65	0.73	3.36	0.73
Olfactory Imagery	Control	38	2.50	0.72	2.49	0.62
	Experimental	42	2.73	0.74	3.33	0.64
Movement Imagery	Control	38	2.58	0.63	2.60	0.59
	Experimental	42	2.83	0.85	3.20	0.82
Feelings Imagery	Control	38	2.36	0.57	2.45	0.64
	Experimental	42	2.51	0.73	3.57	0.69

Table 3 shows that there were apparent differences between the means among the seven dimensions of mental imagery on the post-test and pre-test based on group. To test for statistical significance of these differences, the one-way MANCOVA was used, as shown in Table 4.

Table 4. MANCOVA results for differences in mental imagery scores based on group.

Source	Dependent Variable	Type III sum of squares	df	M2	F-test Value	Sig
	Visual Imagery	.577	1	.577	1.236	0.27
	Auditory Imagery	3.578	1	3.578	* 9.583	0.00
	Kinesthetic Imagery	3.785	1	3.785	* 8.795	0.00
Pretest	Gustatory Imagery	7.551	1	7.551	* 18.856	0.00
	Olfactory Imagery	5.204	1	5.204	* 15.688	0.00
	Movement Imagery	12.695	1	12.695	* 35.461	0.00
	Feelings Imagery	3.517	1	3.517	* 8.631	0.00
	Visual Imagery	4.593	1	4.593	* 9.834	0.00
	Auditory Imagery	11.833	1	11.833	* 31.694	0.00
	Kinesthetic Imagery	11.554	1	11.554	* 26.847	0.00
Group	Gustatory Imagery	9.754	1	9.754	* 24.356	0.00
	Olfactory Imagery	11.413	1	11.413	* 34.404	0.00
	Movement Imagery	4.657	1	4.657	* 13.008	0.00
	Feelings Imagery	21.979	1	21.979	* 53.940	0.00
	Visual Imagery	35.965	77	.467		
	Auditory Imagery	28.747	77	.373		
	Kinesthetic Imagery	33.139	77	.430		
Error	Gustatory Imagery	30.837	77	.400		
	Olfactory Imagery	25.543	77	.332		
	Movement Imagery	27.565	77	.358		
	Feelings Imagery	31.376	77	.407		
	Visual Imagery	41.687	79			
	Auditory Imagery	46.263	79			
	Kinesthetic Imagery	50.612	79			
Corrected Total	Gustatory Imagery	50.862	79			
	Olfactory Imagery	44.622	79			
	Movement Imagery	47.387	79			
	Feelings Imagery	59.805	79			

Table 4 shows that there are significant differences at the level of (.05) due to training on all the dimensions of the scale of mental imagery, where the results had shown a statistically significant differences (.05) on visual imagery (F = 9.834), aauditory Imagery (F = 31.694), kinesthetic Imagery (F = 26.847), ggustatory imagery (F = 24.356), oolfactory imagery (F = 34.404), mmovement imagery (F = 13.008), ffeelings imagery (F = 53.940). The difference were in favor of the experimental group (as shown in Table 3) which indicate the improvement of student's scores in the experimental group because of training.

3.2. The Second Hypothesis

To test the second hypothesis that stated "there are no statistically significant differences (.05) between mental imagery dimensions postscores and delayed scores of the experimental group", an independent t tests were conducted and the results are shown in Table 5.

Table 5. Independent-Samples T-Tests for the differences between the posttest and delayed test on the experimental group.

Dimensions	Level	M	SD	T-test Value	df	Significance
Visual Imagery	Posttest	3.74	0.70	0.696	41	0.49
	Delayed	3.67	0.77			
Auditory Imagery	Posttest	3.43	0.69	0.802	41	0.43
	Delayed	3.35	0.83			
Kinesthetic Imagery	Posttest	3.38	0.75	1.010	41	0.32
	Delayed	3.24	0.82			
Gustatory Imagery	Posttest	3.36	0.73	2.958	41	0.01
	Delayed	3.07	0.87			
Olfactory Imagery	Posttest	3.33	0.64	1.223	41	0.23
	Delayed	3.18	0.72			
Movement Imagery	Posttest	3.20	0.82	0.467	41	0.64
	Delayed	3.25	0.61			
Feelings Imagery	Posttest	3.57	0.69	1.526	41	0.14
	Delayed	3.41	0.62			
Overall Scores	Posttest	3.43	0.37	1.484	41	0.22
	Delayed	3.31	0.33			

Results of Table 5 show that there are no statistically significant differences between the two measurements of post-tests and delayed-tests of the experimental group on scores of all mental imagery dimensions and overall scores, except for the fourth dimension (Gustatory Imagery) where the performance of students decreased in the delayed test. This indicates the stability of improvement in the experimental group and, consequently, the effectiveness of the program to develop mental imagery among students.

4. Discussion

The results revealed a significant difference in the mean scores between the experimental and control groups on mental imagery overall post-tests scores and its dimensions in favor of the experimental group that was trained in mental imegery. These results indicate that students adopt mastery goals due to the training program that encourage students to discover and increase curiosity and the proficiency required for the tasks (Atoum, and Abo Hilal, 2017). In addition, it can be interpreted through the way of the program was designed, and its activities that focused on the adoption of goals of proficiency, which the individual seeks to challenge and make the effort to increase their achievement. This may also be due to the fact that training in mental perception, such as training in mental rotation, can be achieved especially those who prefer images and visual symbols more than other as concluded by Besiktas & Bicer (2013).

The researchers feel that the students were positively active during the training sessions and students have expressed satisfaction and happiness to attend the sessions and all activities presented to them in the experimental group. In addition, students expressed verbally while evaluating each session that they felt they were learning new strategies to improve their memories and solve problems.

Further evidence of the effectiveness of the training program comes from the results of testing the second hypothesis, which showed no statistically significant differences ($\alpha \leq .05$) between post-test and delayed tests of the mental imagery scores. These results confirm the continued effectiveness of the training program in the experimental group and its impact on developing mental imagery after 40 days of the training program.

5. Conclusions

results have revealed that students can be trained on mental imagery with prober training by teachers. Mental imagery can be of great important to students' learning and achievements. The present program can be used as a whole or partially to train students. Therefore, the researchers recommend the following:

1. Testing the program on other grades or educational levels.
2. Educate teachers about mental images and how to develop them due to their significant and positive impact on academic achievement.
3. Conducting a similar study in the Arab region including demographic variables such as age, gender, and specialization stream to test the effectiveness of this training program in the light of these variables.

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