

# The Impact of the Brain Keys Training Program in Developing the Cognitive Abilities among the Lower Basic Stage Students in Jordan

Dr. Eman Saeed Al-Bourini<sup>1</sup> Ihab Ahmed Mashaal<sup>2</sup>  
Dr. Nisreen Bahjat AL-Shamaileh<sup>3</sup> Taghreed Adel Qarqash<sup>4</sup>

## Abstract

The present study aimed to investigate the effect of the brain keys training program in developing a group of cognitive abilities among lower basic stage students in Jordan, their ages vary between 6-8 years, their number is (15) male and female students at Al Amal association summer club in Zarqa, Jordan, the sample was randomly selected from all the lower basic students participating in the summer club. Leiter International Performance Scale –Revised cognitive abilities test (LIPS-R) was used before the implementation of brain keys program. They were then given (15) training sessions, and their cognitive abilities were measured after the application of the program for two months. (Meshal, 2011)

According to the study, the application of the brain keys training program, which consists of a set of mental games for this age level of students, is effective in the development of a cognitive abilities group at the statistical significance level ( $\alpha \leq 0.05$ ).

The researchers recommended the need to conduct further research and studies when applying the brain key program to the higher and secondary levels students and at different cultural environments, because of its positive role in the development of cognitive abilities of students in the lower basic stage.

**Keywords:** Brain keys program, cognitive abilities, lower basic stage students.

## Introduction:

Since the beginning of the twentieth century, the subject of cognitive abilities has earned great attention in general and has been used in measuring the cognitive abilities in particular.

Psychologists, in general believe that cognitive abilities reflect a range of possibilities and processes possessed by the individual to understand the relationships between things and events, to make judgments and to evaluate life situations. It helps the individual to learn, acquire knowledge, solve problems, control the environment and adapt to the conditions, of that environment.

Specialists in this field also believe that modern school should be interested in cognitive learning, which takes into account the growth rate of the child's knowledge and experiences in addition to strengthening and organizing the knowledge resources that help him/her in learning and solving the problems inside and outside the school, as well as the treatment strategies that are considered according to the cognitive psychologists, as being more important than the output of the response or the degree which the individual achieves in the IQ or mental abilities test (Bolte, & Poustka, 2002)

The modern academic education has been focusing on the possession of learners of these skills, through which they are equipped with facts and knowledge, concepts and positive attitudes towards different sciences. There is no doubt that the lower basic school stage is the first educational institution in the development of thinking skills, and is crucial in shaping the personality of the child in all its different aspects, according to the psychologists and educational scientists.

There have been many names and terminologies used by psychologists in terms of the clarification of cognitive abilities, some have named it cognitive methods and another group named it the cognitive control methods, the cognitive strategies or patterns of cognitive processes, due to the difference in the philosophical

<sup>1</sup> Associate Professor, Educational Psychology – Cognition, Princess Alia University College - Al-Balqa Applied University.

<sup>2</sup> Patented of Brain Keys product that is deposited with the National Library under the number 1622/4/2015--A member of the US National Institute of Geriatrics of the US Department of Health (NIA).

<sup>3</sup> Assistant Prof, Educational Psychology –Princess Alia University College- Al-Balqa Applied University

<sup>4</sup> Academic Assistant, Psychologist, & Head of Assessment and Diagnostic –Modern Montessori School

view or the scientific theory rather than differences in explanation or interpretation of the phenomenon (**Allam, 2006**).

The cognitive abilities are models that can be taken from the environment and processed by the human. They are based on the unity of experience and abstract images and they form the content of human consciousness and its mechanisms (analysis, synthesis, abstraction, design, thinking, perception, memory, recall ..) which allows the formation of tangible models about the individual's environment and the recalling and visualizing of such models, and creating distinct models of the individual's experience in his environment (**Taha, 2000**).

### **The Study Problem:**

The contemporary educational systems seek to exploit the mental abilities of the learners in the learning and educational stages, starting from the stage of kindergartens and the lower basic stage, through the development of educational programs that develop their various mental abilities and abilities, including the basic knowledge that can be developed in these two stages through the various mental activities.

Some aspects of children's cognitive abilities can be seen through the acquisition, recycling, and treatment of things in many ways. Many children in early childhood also exhibit a great deal of excellence and are capable of creation and innovation (**Lord & Schopler, 1989**).

The new academic programs are no longer focusing on filling up the learner's mind with facts and knowledge, but they also emphasize the importance of acquiring the child's or student's scientific skills and research in addition to the thinking skills by means of scientific activities that organize and plan in a manner that stimulates their abilities. The world is considered a great and interesting field for the child, because it provides him with the practical experience related to the environment in which he lives that raises his curiosity and pleasure. So the child becomes more aware of the relationships between the components and objects and gradually becomes willing to know everything that is real (**Sattler, 2001**).

The idea of the program depends on the fact that it classifies the brain as a neurogenic organ that needs continuous stimulation to maintain its activity and fitness. The brain key program is a tool that helps to open new neurotransmitters between human brain cells, and also helps to look at the image in a complete manner and then go to the details of that picture.

The aim of the program is to help the student to better focus his mind, improve the memory strength and enhance the intelligence, develop early problem solving capacity, develop the hyper-thinking ability, develop fine motor skills, improve the synergy and hand-eye coordination, develop the child's temper control, reduce the negative impact of excessive use of smart technology, and develop planning and ordering processes.

Therefore, the current study seeks to uncover the impact of the training of the brain key program in developing the cognitive abilities of the students of the lower basic stage in Jordan by testing the following null hypotheses:

1. There are no statistically significant differences at ( $\alpha \leq 0.05$ ) in the level of cognitive abilities among students in the lower basic stage in Jordan according to training on the brain key program.
2. There are no statistically significant differences at ( $\alpha \leq 0.05$ ) in the level of cognitive abilities among students in the lower basic stage in Jordan after two months of training on the brain keys program.

### **The importance of the Study:**

The importance of this study comes from the importance of the topics of thinking in general and cognitive abilities in particular, being the focus of research interest in recent times. Most of the current studies focus on thinking and meta- thinking methods, methods of solving problems that are concerned with the study of human thinking process that distinguish it from other people. The study also seeks to focus on the processes that take place within the individuals without neglecting the apparent behavior he makes.

Moreover, the study is important because it focuses on an important segment of the society by designing an innovative training program (**Meshal, 2011**), the application of which is expected to improve students' mental and cognitive abilities and enhance their positive behaviors. This will be reflected on the level

of their academic, cognitive, cultural and social performance, which will consequently increase their thinking and enhance their self-confidence.

### **Theoretical Framework:**

The study of cognitive abilities is one of the psychological developments of the twentieth century. Psychometric methods were introduced to measure these abilities at the beginning of 1904 with the invention of **(Binet & Simon)** scale of intelligence and other standards of intelligence and mental development **(al -Rusan, 2006)**.

The scales used to measure intelligence were based on various definitions of cognitive abilities presented by psychologists; (Spearman) was one of the first to define them. He defined intelligence as "the ability to perceive relationships and attachments" and summed up intelligence factors in two factors: the (General Factor), which indicates the common ability of all manifestations of mental activity, and the (specific factor) which indicates some mental activity implemented through specific skills and tasks with limited abilities (Abu Hammad, 1992).

The International Performance Scale-Revised (LIPS-R) is one of the culture-free intelligence tests prepared by **(Russell Leiter)** in (1927), revised by (Grace -Arthur) in (1952). It was further revised by **Miller and Roid (1995-1996)**, who define the "cognitive abilities" as the complex non-verbal mental processes related to the ability to infer, perceive, observe and recall. It includes sensory and spatial perception, non-verbal problem solving "**(Miller, & Roid, 1998, p: 109)**."

Cognitive abilities can also be defined as the basic capacity that enables individuals to handle mental information accurately and appropriately across a wide range of cognitive tasks and are closely linked to the individual's mental performance and represent the individual's potential for learning and problem solving **(Bradley, 1998)**.

"Cognitive Abilities" are defined as the basic ability to enable individuals to accurately and appropriately address mental information across a wide range of cognitive tasks, closely linked to the individual's to the individual's mental performance, and to the individual's ability to learn and solve problems ", **(Carroll, 1993)**.

According to Leiter-Revised the cognitive abilities "is a complex non-verbal mental processes related to inference, perception, attention and memory, including perception and spatial perception, and solving non-verbal problems" **(Satter, 1990)**.

The results of the studies have shown for a long period of time the predictive capacity of these abilities to the extent to which the individual succeeds in performing his or her functions, regardless of the nature of the function. These abilities reflect cognitive processes of a general nature based on **Cattell-Horn-Carroll** theory of mental capacity classification, which consists of four major capacities **(Kuschner, Bennetto & Yost, 2007)**:

- Verbal ability: which expresses the understanding of the meanings of words and use them effectively and understand the relationships between them, and the meanings contained in a sentence or paragraph or written text.
- Numerical Ability: which expresses the handling of quantitative information processing.
- Logical Reasoning: which expresses logical thinking by applying the rules of deductive reasoning and inductive data or abstract or moral information to reach conclusions.

Spatial Ability: Visual adaptation using images and geometric shapes, and the ability to visualize 2D graphics and shapes as three-dimensional objects.

### **Previous Studies:**

The researchers examined a number of studies on cognitive abilities, thinking programs and brain, and the following is a presentation of some of these studies.

A study aimed at investigating the effectiveness of language games in developing the skills of speaking and creative thinking in pre-primary school children was conducted by **Musa & Salameh (2004)**. The study

sample consisted of 40 male and female children, randomly divided into experimental and control groups, and used the following tools: (List of speaking skills for pre-school children, a program of language games to develop language skills, "talking to pre-school children", and a note card to measure speaking and creative thinking skills for pre-school children). The results showed statistically significant differences between the mean scores of the of teachers' degrees on the note card in the post-application among the children of the control group and the experimental group in the language skills (speaking) in favor of the experimental group and the absence of statistically significant differences in the pre- application. This indicates the similarity between the experimental and control groups in creative thinking skills before the experiment, and presence of statistically significant differences between the mean scores of the teachers' degrees on the note card in the post-application of the control group and the experimental group in creative thinking skills in favor of the experimental group.

**Mansoor (2005)** conducted a study to investigate the effectiveness of a problem solving program on the development of creative thinking skills. The researcher designed a training program to teach a set or a system of thinking skills related to solving problems, verifying the effectiveness of the program and verifying the effectiveness of the program used in developing each skill associated with problem solving. The sample of the study included the six grade students taken from two schools in Damascus Governorate. The study sample was divided into two groups, one experimental and the other control, about (50) male and female students in each group. In order to achieve the objectives of the research, the following tools were used : Problem solving test, The study showed the effectiveness of the program used in the development of thinking skills related to problem solving, and improved the performance of the sample in the tests of problem solving and thinking skills in favor of the experimental group.

**(Ahel, 2009)** conducted a study aimed at investigating the effectiveness of a proposed program for the development of creativity among children in Gaza Governorate. The study sample consisted of (10) children (female) as control group and 10 (children) (female) as experimental group. The sample was selected randomly. A pre-test of the creative thinking scale prepared by Torrance was applied.

There were statistically significant differences in the level of creative thinking between the experimental and control groups after applying the program to the favor of the experimental group. There were statistically significant differences in the level of creative thinking among the members of the experimental group after the application of the program and in the follow-up application in favor of the follow-up.

**Method and Procedures:**

- **Study Methodology and Design:** The current study used Quasi Experimental Design for study purposes. The impact of the brain key training program on the development of a range of cognitive abilities among students in the lower basic stage in Jordan was examined before and after the application of the program by using Leiter Scale.

The researchers translated the scale and verified its psychometric properties. Sample members were divided according to the design shown in Table (1):

**Table (1): Design of the study according to the application of the two scales and treatment**

---

E R (15)	O	X	O	O
----------	---	---	---	---

---

- **Study Sample (Participants):** The study sample consisted of (15) male and female students aged between 6-8 years in Al Amal association summer club in Zarqa', Jordan. The study sample was randomly selected and it included students of the lower basic stage participating in the summer club. Those students were considered members of the experimental group in the study.

**- The Study Tools:**

**There are two study's tools as follow:**

First: **(Leiter-R) scale for measuring cognitive abilities.** Leiter International Performance Scale Revised is a tool to measure the cognitive abilities. It is applied individually and includes ages (2-21) years. It can be applied to different minorities belonging to different cultural backgrounds because it is a culture-free scale, applied individually to measure the cognitive ability of ordinary individuals belonging to different ethnic groups, as well as groups with special needs (language disorder, poor communication, the hearing impaired, the mentally

retarded, etc.) In addition to its ability to distinguish the gifted students. Scale consists of two batteries : battery of reasoning and perception and battery of attention and memory.

The researchers used the scale by following these steps:

- Translating the scale into Arabic

- Studying the analytical descriptive study of the scale, the study of the theoretical foundations on which the designers of the scale relied, and the method of calculating the psychometric characteristics through the validity and reliability used in the original study of the scale, and methods used in calculating the scores of the examinees and interpretation in light of the standards of the scale.

- Applying the scale to a survey sample of the students of the lower basic stage outside the current study sample, in order to ensure the clarity of the instructions and the items and difficulties that may face application, correction and interpretation.

- **Scale Validity:** The validity of the scale was verified by presenting it to a group of arbitrators from the teaching staff specialized in educational and cognitive psychology, education, measurement and evaluation in the Jordanian universities, where they were asked to express their opinions in the formulation of the paragraphs of the scale and its relevance to the objectives of the study and the targeted category. However, the arbitrators did not indicate any observations to delete or add paragraphs, but some changes were proposed in the language formulation only.

- **Scale Reliability:** The reliability of the cognitive ability scale was verified in two ways:

\* **Method 1:** application and re-application of the test (Test-retest), where the test was re-applied after two weeks on a group of students from outside the sample of the study comprising (20) examinees, and then Pearson correlation coefficient between their estimates in both times on the study tool was calculated as a whole, where it ranged from (0.63 - 0.73).

\* **Method 2:** The reliability coefficient was calculated in the internal consistency method according to the equation of Cronbach's Alpha, it ranged as a whole between (0.71 - 0.78).

The results of Table (2) show the stable reliability and internal consistency coefficients of the (Leiter-R) scale cognitive abilities test with two batteries after applying it to the survey sample:

**Table (2): Stable Reliability (Test-retest) and Internal Consistency Coefficients (Cronbach's Alpha Coefficient) of the cognitive abilities test two batteries**

The Reliability Dimension	(Test-retest) Reliability	Cronbach's Alpha Coefficient
Battery of inference and visualization	0.64	0.76
Battery of attention and memory	0.69	0.72
<b>Leiter scale as a whole</b>	<b>0.74</b>	<b>0.79</b>

It is noted that the previous values in Table (2) are statistically significant and suitable for use in the present study.

Second: **Brain Keys Program:** Meshal's Brain Key Training Program (2011) can be described as an integrated program based on scientific principles aiming to achieve a comprehensive and balanced change of the traditional thinking patterns through the development of higher thinking skills and raising the efficiency of the right half of the brain which is the least used, where the left part of the brain is often responsible for the skills of daily life, therefore we need to activate the right part of the brain.

The training program consists of a cardboard cube box with 25 cubes in it and a guide that contains a variety of mathematical, engineering and environmental forms and designs. The integrated program consists of

four boxes for the brain key program, depending on the developmental levels of the individual: early childhood (3-5) intermediate and late childhood (5-12), adolescence (12-20), and adulthood, which measures high-level performance skills that require above-average intelligence for analysis, synthesis, and application.

Each level consists of several drawings and forms, each drawing or shape is drawn for a short period of time. The examinee is asked to apply what he saw in the cube box, noting the performance of the examinee through the cameras and observers, in addition to measuring the time needed to complete the work. The graphics and shapes in each level are ranging from easy to hard, and ends with the last level, the fourth with graphics, shapes and missions of a high degree of difficulty.

#### **Program Goals:**

- Helps focus better.
- Improves memory strength and enhances intelligence level.
- Develops the ability to solve problems at an early age, through the development of planning and arranging in problem - solving thinking.
- Develops the creative and diverging thinking (outside the box).
- Develops the fine motor skills, and improves the skill of synergy and coordination between hand and eye.
- Develops control and control of the characteristics of the individual mood (such as apathy, impulsivity, impatience, speed and lack of concentration).
- Reduces the negative impact of excessive use of smart technology.
- Increases the individual's ability to see errors.

**Program Validity:** To verify the validity of the training program, it was presented after its completion in its initial form to an arbitrators group experienced and specialized in the field of educational psychology, in order to ascertain the appropriateness of the program and the validity of its objectives and strategies, as well as the number of sessions and the time needed and to carry out the necessary updates, either in addition or deletion, after the arbitration. The researchers applied three training sessions taken from the program to ascertain the appropriateness of the concepts included in the program for the sample of the study, the timing of the sessions and the appropriateness of its application, and the appropriateness of the strategies and tools used to achieve its objectives, a series of updates have been made accordingly

#### **Study Procedures:**

The study was carried out through the application of the cognitive ability scale on the experimental group to measure their pre-performance. The (15) training sessions program were then applied to the experimental group by one researcher for all the training sessions. The cognitive ability scale was then applied to experimental group to measure their post –performance. The study results were unloaded and rushed to the program of Statistical package for social sciences (SPSS) to be processed to extract the results.

#### **The study Results:**

**The results of the first hypothesis:** "There are no statistically significant differences at the level of significance ( $\alpha \leq 0.050$ ) in the level of cognitive abilities among students of the lower basic stage in Jordan according to training on the brain keys program."

In order to test this hypothesis and to examine the differences between the pre- and post-measurements in the level of cognitive abilities, the arithmetical averages and standard deviations of the students' responses were presented on the cognitive abilities scale according to differences between the two scales. The T- Test was used for the paired samples to examine the differences between the two measurements for the overall degree of cognitive abilities, and Table (3) illustrates this:

**Table (3): T-test of paired samples to examine differences between pre-measurement and post-measurement of the total degree of cognitive abilities of the study sample.**

Dimension	Level	Arithmetical Averages	Standard Deviation	Correlation Coefficient between the two scales	T-Test Value	Degrees of Freedom	Statistical Significance
Cognitive Abilities	Pre-Measurement	101.00	5.64	0.47	3.42	14	0.00
	Post - Measurement	106.00	5.37				

The results of Table (3) indicate statistically significant differences in the total degree of cognitive abilities, which means that the performance of students has been improved on cognitive abilities scale after the application of the brain key program.

**The results of the second hypothesis:** states that "There are no statistically significant differences at the level of significance ( $\alpha \leq 0.050$ ) in the level of cognitive abilities of students in the lower basic stage in Jordan after two months of training on the brain keys program."

In order to test this hypothesis and to examine the differences between post-measurement and follow-up measurement at the level of cognitive abilities, the arithmetical averages and standard deviations of the students' responses to the cognitive abilities scale were presented according to the difference between the two measurements. The T- Test was used for the paired samples to examine the differences between the two measurements for the cognitive abilities and the overall degree of the scale, and Table (4) illustrates this:

**Table (4): T-Test of the paired samples to examine the differences between post-measurement and follow-up measurement of the cognitive abilities and the total score of the study sample scale.**

Dimension	Level	Arithmetic Averages	Standard Deviation	Correlation Coefficient between the two scales	T-Test Value	Degrees of Freedom	Statistical Significance
Cognitive Abilities	Post - Measurement	106.00	5.37	0.96	1.740	14	0.10
	Follow up - Measurement	105.47	5.10				

The results of Table (4) indicate that there are no statistically significant differences in the total degree of cognitive abilities, which means that the performance of students has maintained its level on cognitive abilities scale after two months of application of the program.

#### Discussing the Results:

The results of the study showed that the students' performance on the post -measurement of the Leiter scale for cognitive abilities showed significant and statistically significant improvement after the application of the training program called brain keys. The results also indicated that the students maintained their performance after two months of application of the program and this indicates the effectiveness of the program at the long term.

This may be attributed to the fact that students training on problem-solving skills provides them with structured frameworks to help them analyze their thinking in an unconventional way to be able to solve problems and adapt to complex situations with all determination, responsibility and efficiency.

This can be explained by the fact that students in this age group (6-8) are in urgent need to learn the thinking methods and skills in order to practice good thinking. These skills can be mastered by special training in an independent, non-curricular manner. These skills can be learned through the course content in classroom situations and accompanying activities, where the program is based on a vital activity carried out by the human being, and practiced at various levels of complexity, whenever he is required to perform a duty, or asked to make a decision on a subject or to find appropriate and logical solutions to the problems facing him in life.

The program's training skills are characterized by placing the learner or the student in a real situation in which the mind works in order to reach a state of balance of knowledge, which the learner seeks to achieve, and this situation occurs when he reaches a solution or answer or discovery, so the motivation of the individual works to maintain his mental activity to reach the goal of understanding or solving, by completing the incomplete knowledge related to the problem.

### **Recommendations:**

In light of the above findings, the study recommends the following:

1. The application of the program of the brain keys at students of older stages and different classes and various cultures.
2. Further studies and researches that measure the impact of the brain key program in other variables.
3. Developing similar programs and transferring the impact of their experience to different learning situations.

### **References:**

- Abu Hammad, Nasreddin (2007). *Intelligence Tests and Personality Standards*, Irbid, Jordan: Alam Al Kotob Al Hadith.
- Ahel, Amani (2009). *The Effectiveness of a Proposed Program for the Development of Creativity among Children of Gaza Governorate*, Unpublished Master Thesis, Islamic University, Gaza, Palestine.
- Al Rusan, Farouk (2006). *Methods of Measurement and Diagnosis in Special Education*, Ed (2), Amman, Jordan: Dar Al Fikr for Printing, Publishing and Distribution.
- Allam, Salaheddin (2006). *Educational and Psychological Measurement and Evaluation - Basics, Applications and Contemporary Directions*, Cairo, Egypt: Dar Al Fikr Al Arabi.
- Bolte, S. & Poustka, F. (2002). The relation between General Cognitive Level and Adaptive Behavior Domains in Individuals with Autism with and without Comorbid Mental Retardation. *Child Psychiatry and Human Development*, 33 (2), 165 - 172.
- Bradley-Johnson, S. (1998). Test Reviews: Leiter International Performance Scale - Revised. *Psychology in the Schools*, 35 (2), 195 - 197.
- Carroll, J. B. (1993). *Human Cognitive Abilities: a Survey of Factor- Analytic Studies*. New York: Cambridge University Press.
- Farah M. J. (2000). *The Neural Bases of Mental Imagery: The New Cognitive Neurosciences*, (2<sup>nd</sup>) Ed. Cambridge, MA; MIT press.
- Kuschner, E.S., Bennetto, L., & Yost, K. (2007). Patterns of Nonverbal Cognitive Functioning in Young Children with Autism Spectrum Disorders. *Journal of Autism and Developmental Disorders*, 37, 795 –807.
- Lord, C. & Schopler, E. (1989). The Role of Age at Assessment, Developmental Level, and Test in the Stability of Intelligence Scores in Young Autistic Children. *Journal of Autism and Developmental Disorders*, 19 (4), 483 - 499.
- Mansoor, Ghassan (2005). *The effectiveness of a program for the development of thinking skills related to problem solving "A quasi -experimental study on a sample of the sixth grade students in the schools of Damascus Governorate"*, unpublished doctoral thesis, Education College, Damascus University, Damascus, Syria.
- Meshal, Ehab (2011). *Brain Keys Program (practical applications in the form of exercises, mental games)*, patent holder and intellectual property rights under No. (1622/4\2015), [www.mental-aerobics.com](http://www.mental-aerobics.com).
- Miller, L. J. & Roid, G. H. (1998). *Miller: Roid T.I.M.E. Miller Test*, Elsevier Health Sciences, San Antonio, United States.

- Musa, Mohammed; & Salama, Wafa (2004). The effectiveness of language games in developing the skills of speaking and creative thinking in preschool children, *Journal of Reading and Knowledge*, Issue 36, Cairo.
- Sattler, Jerome M., (1990). *Assessment of Children*, (3<sup>rd</sup>) Ed, Revised Reprint, San Diego, Jerome M. Sattler, Publisher, Inc.
- Sattler, J.M. (2001). *Assessment of Children: Cognitive Applications*, (4<sup>th</sup>) Ed. La Mesa CA: Jerome M. Sattler, Publisher, Inc.
- Taha, Faraj (2000). *Origins of Modern Psychology*, Cairo, Egypt: Dar Kebaa Publishing and Distribution.