

## Impact of Brain Gym Training on Cognitive Performance of Undergraduate Nursing Students

Rasha Fathy Ahmed Dawood<sup>1</sup>, Hamida Ahmed Mostafa Darweesh<sup>2</sup>, Hamda Ahmed ELdesoky<sup>3</sup>

<sup>1</sup>Ass Prof .Medical Surgical Nursing Department, Faculty of Nursing, Alexandria University-Egypt.

<sup>2</sup>Lecturer of Nursing Education, Faculty of Nursing, Alexandria University-Egypt.

<sup>3</sup>Lecturer of Medical-Surgical Nursing, Faculty of Nursing, Alexandria University, Egypt.

### Abstract

**Background:** Brain Gym is an innovative new approach to learning that was drawn from a comprehensive body of research from developmental specialists focused on the role that physical movements played in improving learning capacities. **Aim:** the study aimed to evaluate the impact of brain gym training on cognitive performance of undergraduate nursing students'. **Hypothesis:** Undergraduate nursing students who receive the brain gym training exhibit more improvement of their cognitive performance than those who did not receive it. **Design:** the study followed a quasi-experimental design. **Setting:** the study was carried out in El-Hadara Traumatology and Orthopedic University Hospital, Alexandria University/Egypt. **Subjects:** Convenience sample of sixty undergraduate nursing students who agreed to participate in the study were randomly assigned and divided alternatively into two equal groups 30 patients in each group. **Tools:** two tools were used to collect the necessary data **Tool I:** Undergraduate nursing students structured interview schedule **Tool II:** Undergraduate Nursing Students' Cognitive Performance assessment schedule clinical evaluation tool. **Results:** After brain gym training for one month the majority of students in study group show significant improvement in all cognitive abilities assessment criteria. **Conclusion** after brain gym training for one month the majority of students in study groups showed significant improvement in all cognitive abilities assessment criteria. **Recommendations** of this study included that the brain gym technique should be integrated in nursing theory and clinical training to improve the level of students' knowledge and performance.

**Key Ward:** Brain Gym- Cognitive Performance.

### Introduction

A healthy and sharp mind is the origin mantra of a fruitful and happy life. A series of artless exercises can boost the brain function in a better way which makes individual; think sharper, smarter and more assertive. These exercises are recognized as brain gym exercises It comprises of some really relaxed body movements, which helps to coax the two hemispheres of the brain while making them work in synchronization (Stephen ., 2016 & Rehab., (2017). Brain gym exercise is intended to remap or generate neural pathways through positive self-talk, exercise, repetition, and stimulation. Stress is a big problem when trying to acquire a new skill or override an old pattern with a novel skill so prior to training breathing relaxation exercises that are suggested. These exercises are really simple and can be done by people of all age groups (John et al.,2014& Simons et al.,2016).

Mostly children and young adults actively perform brain gym exercises. But now, even adults and aged people too practice these exercises. There are various profits associated with brain gym exercises. The major benefits associated with brain gym exercises are as follows: it makes students learn anything faster & more easily, be more focused & organized, overcome learning difficulties, reach new levels of excellence and start & finish projects with affluence (Ocampo et al.,2017).

Brain Gym is a widespread marketable program appealing that adherence to its regimen will result in more competent learning in an almost miraculous manner. Brain Gym program marketed in more than 80 countries that has received a considerable amount of attention in the press, with many individuals claiming that it provided the necessary stimulation needed for effective learning (Gözüyeşil & Dikici ., 2017).Brain Gym, also known as educational kinesiology,

was developed in the 1970s by Dennison and Dennison (**Hallahan.,2015**) and consists of a series of movements that supposedly activate the brain, promote neurological repatterning, and simplify whole brain learning.

The program is based on the notion that learning problems are triggered when different sections of the brain and body do not work in a harmonized manner, thereby blocking an individual's talent to learn. To overcome this learning block, the program recommends a variety of simple movements that are intended to expand the integration of specific brain functions with body movements. In fact, Brain Gym is described as a process for re-educating the mind and body that would result in learning any skill more competently and easily (Harper K. L., 2017) .

The theoretical basis on which brain functioning is conceptualized, according to Brain Gym literature, is relatively simplistic and designated along three dimensions: laterality, focusing, and centering. Laterality denotes the coordination between the right and left hemispheres of the brain and is viewed as essential for reading, writing, listening, speaking, and the ability to move and think at the same time ( **Grabe ., 2014**). Focusing refers to the ability to coordinate information between the front and back portion of the brain and is related to comprehension as well as attention-deficit/hyperactivity disorder. The final element, centering, refers to the coordination of the top and bottom halves of the brain, which is termed as necessary to balance rational thought with emotion (**Sigman.,et al.2014**)

The Brain Gym Technique includes four simple movements that are used to stimulate a person's cognition, increase their attention, fine tune synchronization, organizational skills and theoretical standing along with building relationships, self-esteem and confidence. These four movements are part of a larger curriculum .The precise first activity is drinking water, a "positive", drinking water is part of their 'positive category'. The second activity is called brain buttons, which is part of their dynamic category. And the way brain buttons in the Brain Gym world to wake up the brain. Put one hand over the belly button or just below the belly button. (**Constantinidis et al., 2016**)

The other hand, bellow collarbone, which are the long bones here where the neck arises, and rub and crack in there, perhaps pretty sore on most of the body. That's ok, it will go in time and just rub on this and there are a lot of reasons this is done, one is it's on Kidney 27, the end of the Kidney channel in Chinese medicine, it helps wake up the brain. This is brain buttons, can be done most anywhere. The third activity is called Cross Crawl, basically connecting any part of the right arm with any part of the left leg and visa versa. There are many ways to do this, tai chi style where it's all 'flowy-like'. The technique not to do it is to just kind a wimping through it. It really wants to cross over the midline. This is important because it stimulates the spine by engaging the cross crawl reflex. If the spine stimulated it, that will stimulate the brain as well (**Moustafa et al., 2016 &Aldabas .,2020**).The fourth activity is called Hook-ups or Cook's Hook-ups. This is called pretzel time because it looks like a pretzel: a great way to describe it to students, they get it. How to do pretzel time? Put arms out in front of the body, cross wrists over each other, point thumbs down, clasp and pull in. This is very calming and very effective, especially with children who are acting out or nervous, uncomfortable, or distressed. This is the first half of pretzel time, where everything crosses midline. The second half is where uncross the ankles and uncross everything at the finger tips. The channels of Chinese medicine begin and finish (half of them anyway begin and end) on the fingers. This is the second half to help complete that movement cycle (**Ruhaak & Cook ., 2016**).

In order to evaluate the brain gym technique impact on the undergraduate nurses' student cognitive performance a clinical evaluation tool was developed and consists of nine essential competencies with specific performance criteria. The performance criteria for each competency include , all domains of learning especially cognitive domains which provide a complete evaluation of an individual student's clinical performance (**Oermann et al .,2016 & Uygur et al.,2019**).The use of this clinical evaluation tool makes it possible to see the student's improvement over time as he/she progresses through the specific course, as well as through the nursing curriculum. It also provides standard measures for student, course, and program evaluation <sup>(11)</sup>.The nine essential competencies include the students' abilities to perform following performance criteria: students' abilities to **demonstrate**

**professional behaviors** as they follow university, and hospital policies, practices within the legal and ethical frameworks of nursing, assume accountability for own actions and practices, treat all individuals with dignity/respect, demonstrate cultural sensitivity, protect patients' rights (privacy, autonomy, confidentiality), demonstrate initiative in seeking learning opportunities and resources, and analyze personal strengths and limitations in providing care, incorporate constructive feedback for performance improvement, and maintain professional behavior (Klink et al., 2013).

Students' talents to **collect and analyze comprehensive patients data** as they have the ability to determine relevant information needed, identify appropriate sources for data collection, use correct techniques for assessment, interpret laboratory/diagnostic test results, incorporate data from patients, family/support persons and health care team members. Also, their abilities to develop **appropriate patients care plan** based on analysis of assessment data, accurately determine priorities for care, communicate priorities and rationale for decisions to instructor, as well as ability to establish realistic goals/expected outcomes and identify appropriate resources to inform care planning (Strohman., 2014 & Duman., 2017). **Provide safe patients-centered care within the context of safe behavior criteria:** which is the students' ability to practice professional nursing safely in specific patient-centered situations with clinical supervision (Handy., 2019). Safe behavior is defined as behavior which does not place the patient or students and other professional staff at risk of physical and/or psychosocial harm (Strohman., 2014).

The students must have the abilities to **engage in systematic and ongoing evaluation of the plan of care**, and evaluate nursing interventions based on goals/expected outcomes and involve the patient, significant others, and health team members in the evaluation process. The nursing students must also have the ability to demonstrate initiative to obtain the needed knowledge and **apply knowledge relevant to patient care**, as they have to evaluate sources of data for appropriateness, usefulness, and accuracy, integrate theory from nursing, natural and social sciences to enhance patient care (Ahmed et al., 2021).

The students must have the skills to **communicate effectively** and produce clear, relevant, organized, and thorough writing and

exhibit timely, legally accurate documentation and communicate therapeutically with patients utilizing verbal and nonverbal skills. Also, the students must **use teaching-learning process when providing individualized patient/family/group education** through assessment of learning needs of the patients, families, and groups, assess readiness for and barriers to learning considers appropriate patient characteristics in teaching (e.g., culture, age, developmental level, and educational level (Cengelci., 2019). The students ability to **exhibit caring to facilitate physical, mental, and spiritual health** by demonstrate sensitivity to cultural, moral, spiritual, and ethical beliefs of patients, families, peers, health care team members, and others and recognize barriers to care, such as socioeconomic factors, environmental factors, and support systems (Jarvis., 2018 & Doherty., 2020).

**Aim:** The study aimed to evaluate the impact of brain gym training on cognitive performance of undergraduate nursing students.

**Hypothesis:** Undergraduate nursing students who receive the brain gym training exhibit more improvement of their cognitive performance than those who did not receive it.

## Materials and Method

**Design:** The study followed a quasi-experimental design.

**Setting:** The study was carried out in El-Hadara Traumatology and Orthopedic University Hospital, Alexandria University.

**Subjects:** The subjects in this study were a convenience sample sixty nursing students who represented the entire students enrolled in " medical, surgical nursing " during the third semester of the academic year (2020-2021). The subjects were divided into two equal groups; study and control, each with 30 students. Group (I) the study group, that exposed to brain gym training and Group (II) the control group.

**Tools:** Two tools were used to collect the necessary data.

**Tool I: Undergraduate nursing students structured interview** to identify students' personal and socio-demographic

includes as age, sex, and previous training program.

**Tool II: Undergraduate Nursing Students' Cognitive Performance assessment schedule:** This clinical evaluation tool consists of nine essential competencies with specific performance criteria. The nine competencies were drawn from: terminal outcome objectives for the MSNII program at the Alexandria Faculty of Nursing, and Quality and Safety Education in Nursing (Cronenwett 2011). The performance criteria for each competency cognitive domain, and provide a complete evaluation of an individual student's performance. The use of this evaluation tool makes it possible to see the student's development over time as he/she progresses through the specific course, as well as through the nursing curriculum. It also provides standard measures for student, course, and program evaluation in relation to their abilities to demonstrates professional behaviors, collects and analyzes comprehensive patient data, plans appropriate patient care, provides safe, patient-centered care, engages in systematic and ongoing evaluation of the plan of care, applies knowledge relevant to patient care, communicates effectively, uses teaching-learning process when providing individualized patient/family/group education, and exhibits caring to facilitate physical, mental, and spiritual health.

## Method

### Written approval

-An approval from the Ethical Research Committee and the Dean of the Faculty of Nursing and the Head of the Medical Surgical Nursing Department at Alexandria University after explaining the study's purpose and assuring the privacy, anonymity, and confidentiality of the collected data.

- An official written permission to conduct the study was obtained from the hospital administrative personnel and directors of nursing services department of the chosen setting after explanation of the aim of the study.

### Development of the study tools

Tools I was developed by the researcher after review of recent relevant literature. Tool II was developed by the American Association of Colleges of Nursing

(Cronenwett., 2011).

### Content validity

Tools of the study were tested for content validity by jury of five experts in the field of Medical, Surgical nursing and Nursing Education for substance and validity, and any necessary changes were made.

### Reliability

Reliability of the tools was done using a test retest method. The tools of the study were applied on twenty patients and then it was re applied after one week. The reliability coefficient for the tools was ranged from 0.75 to 1.0

### Student's consent

Each medical, surgical nurse student signed a written informed consent form after explaining the aim of the study and they give the right to refuse the participation in the study. Privacy and confidentiality were ascertained.

### Pilot study

A pilot study was carried out by the researcher on five students to test the clarity and the applicability of the tools and to identify the difficulties that may be faced during the application of the tools.

### Data collection

After securing the administrative approval, data collection was started, and continued for a period of 3 months (from October 2021 to december2021). A convenience sample of sixty students was assigned for the study.

### The study was carried out through four phases:

#### I. Assessment phase :

- During this phase, researchers used proper researcher preparation and procedure to try to find a true meaning for the new concept.

-Researcher preparation: Reading all available evidence concerning brain gym methodology, whether new or old, until the time of data collection from books, digital

libraries, and websites, including national and international study on the subject. Self - training on brain gym technique movements.

-During this phase, the researcher used the tools I and II to assess the students' performance ' before application of the brain gym program, it took a period of 2 weeks.

## II. Planning phase

-Training was arranged along 90 sessions for, 3 sessions for each student. Each session lasted for 10 min after ending the clinical day. Discussion, and demonstration, were utilized by the researcher in training; also the researcher used colored booklet, social media and videos to reinforce the information. The 3 sessions of student training were arranged as follows.

### First session: - Importance of brain gym exercises

By the end of this session the student was able to describe the importance of brain gym exercises and its effect on their cognitive performance.

Contents:-

- Brain gym exercises benefits
- The three dimensions of learning
- Brain gym exercises preparations

### Second session: -preparation for brain gym exercises

By the end of this session the student was able to initiate training.

Four basic “Brain Gym” movements to calm energize and get the mind and body ready to learn

Contents:-

- Water importance
- Pursed lip breathing exercises

### Third session: - brain gym exercises procedure

By the end of this session the student was able to perform the brain gym exercises independently.

Contents:-

- Cross Crawl
- Hook-Ups
- Brain Buttons

## III. Implementation phase

1. The program of brain gym exercises was applied by the student who received training. The student also used colored booklet to strengthen and reinforce their knowledge about the brain gym exercise procedure

2. The implementation phase took a period of one month.

## IV.Evaluation phase

1. The students were re-evaluated by the researcher using tools II after one month of completion training.

### Ethical consideration:

-A written informed consent from students to participate in the study was obtained before data collection and after an explanation of the aim of the study.

-Privacy of the study participants was asserted.

-Confidentiality of the collected data was assured.

-Participant's voluntary participation and their right to withdraw from the study at any time were emphasized.

### Statistical analysis:

After data were collected and transferred into specially design formats, so as to be suitable for computer feeding. Data were analyzed using computer with statistical package for social sciences (IBM SPSS) version 20 ( Dawson B., Trapp G.2012).

#### 1. Descriptive statistics

Count and percentage: used for describing and summarizing data.

#### 2. Analytical statistics

The statistical analysis was included:-

1. Chi-square ( $\chi^2$ ): It was used to test the association between two qualitative variables.

2. The level of significant for the study was  $p \leq 0.05$ .

## Results

**Table (I): Shows distribution of both studied groups (I and II) regarding their socio-demographic characteristics.**

As regards age, it was observed that the highest percentages of students in both groups I and II respectively were in the age group of (20). With no statistical significant difference ( $\chi^2 = 0$ ,  $P = 0$ ). Regarding sex, around two thirds of students in both group I and II respectively were females. The difference also was not statistically significant ( $\chi^2 = 0.077$ ,  $P = 0.781$ ). In relation to marital status, All students in both groups I and group II respectively were single. All of the students did not have any previous training program.

**Graph (I): Illustrates the distribution of students of both groups (I and II) regarding their cognitive abilities in the assessment phase before application of brain gym training**

Regarding students' cognitive abilities during the assessment phase. It was observed that no statistical significant of students in both groups (I and II) in relation to all cognitive abilities assessment criteria as their abilities to demonstrates professional behaviors, collects and analyzes comprehensive patient data, plans appropriate patient care, provides safe patient-centered care, engages in systematic and ongoing evaluation of the plan of care, applies knowledge relevant to patient care, communicates effectively, uses teaching-learning process when providing individualized patient/family/group education, and exhibits caring to facilitate physical, mental, and spiritual health.  $p = (0.983, 0.973, 0.941)$ .

**Graph (II): Illustrates the distribution of students of both groups (I and II) regarding their cognitive abilities during the**

**evaluation phase after one month of brain gym training concerning professional behaviors.**

Regarding professional behaviors the graph revealed that, higher percentages of patients in group I compared to low percentages of patients in group II show improve their professional behaviors after on month of brain gym training. There was a highly statistical significant difference between the two groups in relation to all performance criteria, after the application of brain gym training for students in group I. ( $\chi^2 = 1.456$ ,  $p = 0.228$ ), ( $\chi^2 = 5.192$ ,  $p = 0.023$ ) and ( $\chi^2 = 5.700$ ,  $p = 0.006$ ).

**Graph (III): Illustrates the distribution of students of both groups (I and II) regarding their cognitive abilities during the evaluation phase after one month of brain gym training concerning collect and analyze comprehensive patient data.**

As for Collect and analyze comprehensive patient data, the majority of students in group I (93.3, 93.3, 83.3, 83.3 & 96.7 %) respectively have improve their abilities to collect relevant information needed, identifies appropriate sources for data collection, uses correct techniques for assessment, interprets laboratory/diagnostic test results, Incorporates data from patient, family/support persons and health care team members

**Graph (IV): Illustrates the distribution of students of both groups (I and II) regarding their cognitive abilities during the evaluation phase after one month of brain gym training concerning planning appropriate patient care.**

As regards planning appropriate patient care the table revealed that, higher percentage of students in group I than those in group II had develops plan of care based on analysis of assessment data, accurately determines priorities for care, communicates priorities and rationale for decisions to instructor considers needs/preferences of the patient in planning care establishes realistic goals/expected outcomes identifies appropriate

resources to inform care planning .there was a statistical significant difference between the two groups (  $\chi^2=1.456$ ,  $p=0.228$ ), (  $\chi^2=5.192$ ,  $p=0.023$ ) and (  $\chi^2=5.700$ ,  $p=0.006$ ).

**Graph (V): Illustrates the distribution of students of both groups (I and II) regarding their cognitive abilities during the evaluation phase after one month of brain gym training concerning providing safe patient-centered care**

Concerning provide safe patient-centered care and safe behavior criteria: it was observed that the majority of students in group I demonstrate safe behavior criteria compared to low percent of group II The difference was statistically significant between the two groups

**Graph(VI): Illustrates the distribution of students of both groups (I and II) regarding their cognitive abilities during the evaluation phase after one month of brain gym training concerning engagement in systematic and ongoing evaluation of the plan of care.**

In relation to engagement in systematic and ongoing evaluation of the plan of care, it was found that the majority of students (96.7%) in group I evaluates nursing interventions based on goals/expected outcomes, analyzes patient data for accuracy and completeness, revises plan of care based on evaluation and consultation involves patient, significant others, and health team members in evaluation process as relevant, more than those in group II(76.77%).

**Graph (VII): Illustrates the distribution of students of both groups (I and II) regarding their cognitive abilities during the evaluation phase after one month of brain gym training concerning applying knowledge relevant to patient care.**

Regarding applying knowledge relevant to patient care it was found that half of students (50%) in group II had demonstrates initiative to obtain needed knowledge evaluates sources of data for appropriateness, usefulness, and accuracy integrates theory from nursing, natural and social sciences to enhance patient care relates pathophysiology and epidemiology of disease(s) to patients' assessment findings, medications, laboratory

and diagnostic test results, medical and nursing interventions

Integrates concepts of health promotion and disease prevention into patient care identifies issues/problems in nursing practice that need to be improved, evaluates nursing practices based on current research evidence, while in group I the percentage was (90%). The difference between the two groups was statistically significant (  $\chi^2=7,500$ ,  $P=0.006$ ).

**Graph (VIII): Illustrates the distribution of students of both groups (I and II) regarding their cognitive abilities during the evaluation phase after one month of brain gym training concerning effective communication.**

In relation to effective communication it was observed that two third of patients in group II (63%) Communicates therapeutically with patients utilizing verbal and nonverbal skills Listens attentively, while in group I the percentage was (90%). The difference was statistically significant between the two groups (  $\chi^2=5.963$ , and  $P=0.015$ ).

**Graph (IX): Illustrates the distribution of students of both groups (I and II) regarding their cognitive abilities during the evaluation phase after one month of brain gym training concerning using teaching-learning process.**

Regarding use of teaching-learning process when providing individualized patient/family/group education it was found that the majority of students in group I (90%)assesses learning needs of patients, families, and groups, assesses readiness for and barriers to learning considers appropriate patient characteristics in teaching , develops an appropriate teaching plan for learner needs specifies reasonable and appropriate outcome measures utilizes appropriate principles of teaching/learning when implementing a teaching plan evaluates learner outcomes, provides feedback, and revises teaching plan as needed, while in group II the percentage was (60%)

**Graph (X): Illustrates the distribution of students of both groups (I and II) regarding their cognitive abilities during the evaluation phase after one month of brain**

gym training concerning ability to exhibit caring to facilitate physical, mental, and spiritual health.

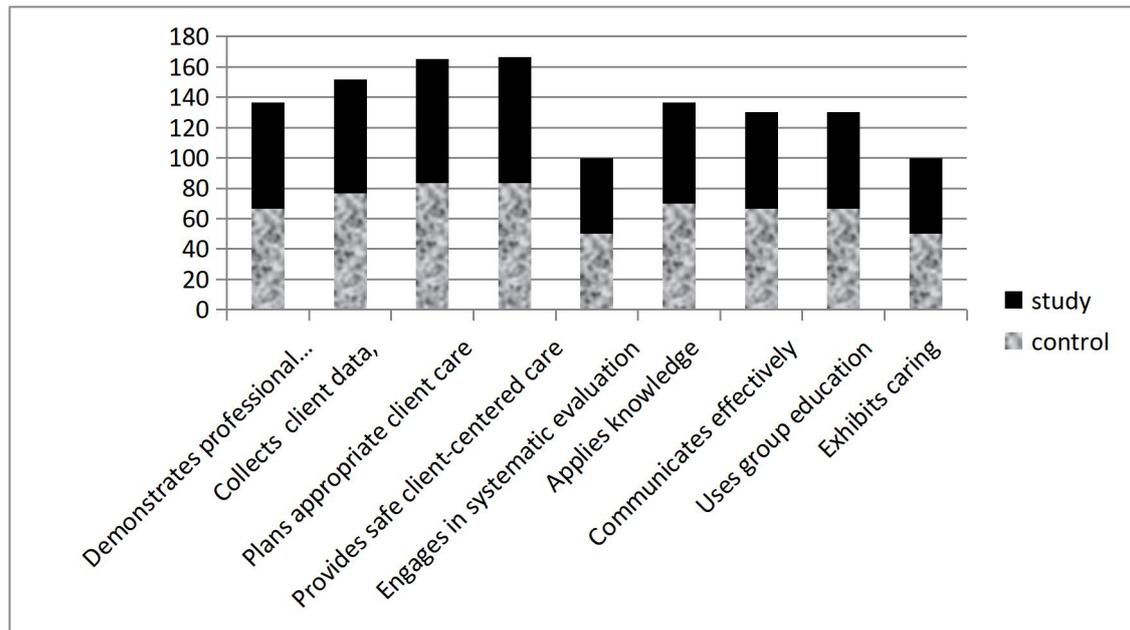
Regarding ability to exhibit caring to facilitate physical, mental, and spiritual health. An equal percentage (96.7%,76.7%) of students in both groups I and II had demonstrates sensitivity to cultural, moral, spiritual, and ethical beliefs of patients, families, peers, health care team members, and

others recognizes barriers to care such as socioeconomic

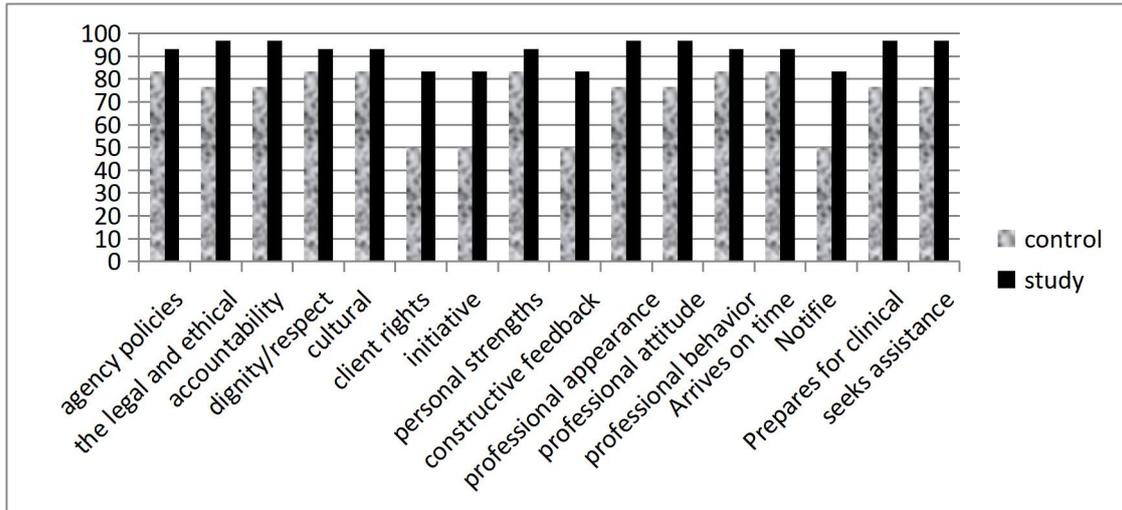
factors, environmental factors, and support systems protects the patient’s safety and privacy, and preserves human dignity while providing care encourages family and/or significant others’ participation in care as appropriate assists patients with coping and adaptation strategies. the difference between the two groups was statistically significant (P =0.023}).

**Table (I):** Distribution of patients of both studied groups (I and II) regarding their sociodemographic characteristics.

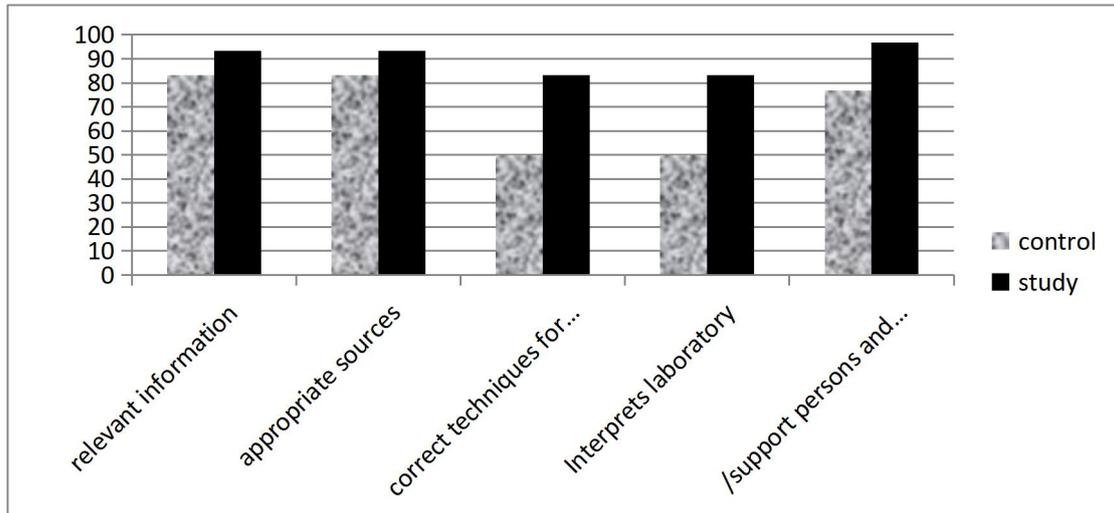
Socio-demographic Data	Group I (Study)		Group II (Control)		Test of significance
	No (30)	%	No (30)	%	
Age					
20	30	100	30	100	
>20	0	0	0	0	p=(0)
Sex					
Male	9	30	10	33.3	
Female	21	70	20	66.7	p= (0.781)
Marital status					
Single	30	100	30	100	
Married	0	0	0	0	p= (0)
Divorced	0	0	0	0	
Widow	0	0	0	0	
Received previous training					
No	30	100	30	100	p= (0)
Yes	0	0	0	0	



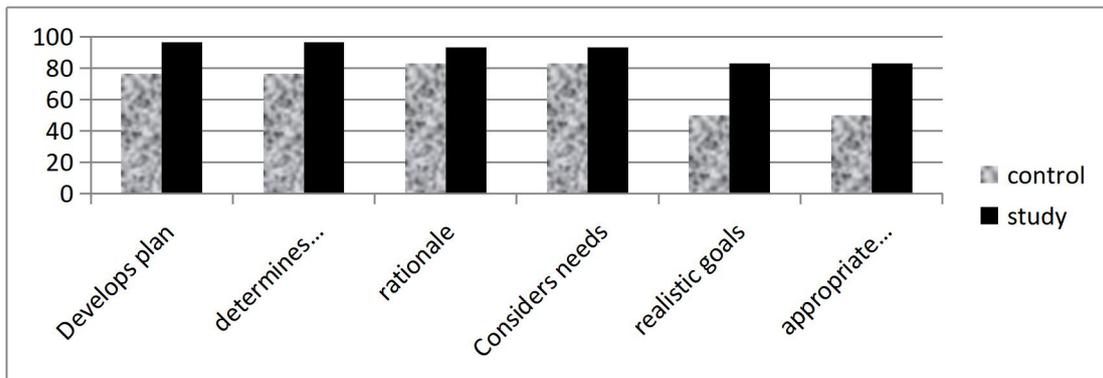
**Graph (I):** Distribution of students of both groups (I and II) regarding their cognitive abilities in the assessment phase before application of brain gym training.



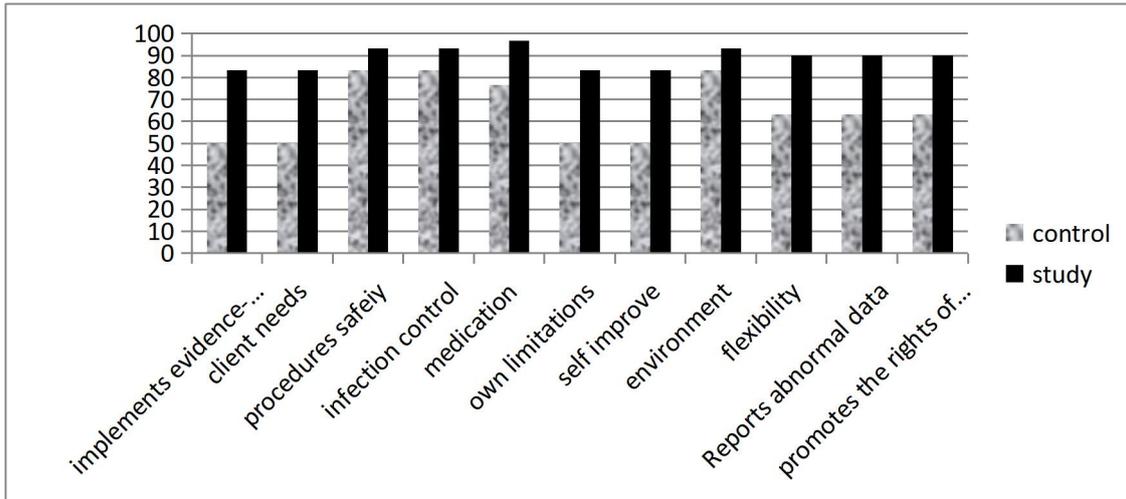
**Graph (II):** The distribution of students of both groups (I and II) regarding their cognitive abilities during the evaluation phase after one month of brain gym training concerning professional behaviors.



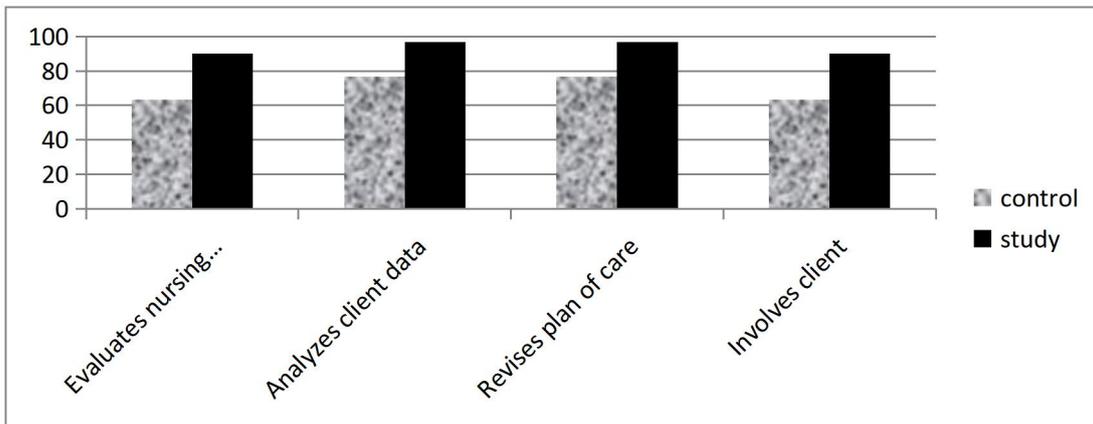
**Graph (III):** Illustrates the distribution of students of both groups (I and II) regarding their cognitive abilities during the evaluation phase after one month of brain gym training concerning ability to collect and analyze comprehensive patient data.



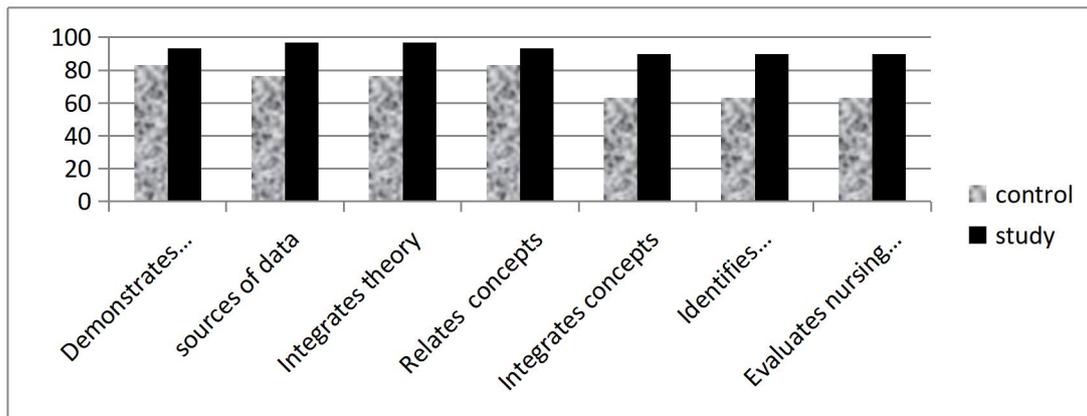
**Graph (VI):** Illustrates the distribution of students of both groups (I and II) regarding their cognitive abilities during the evaluation phase after one month of brain gym training concerning planning appropriate patient care.



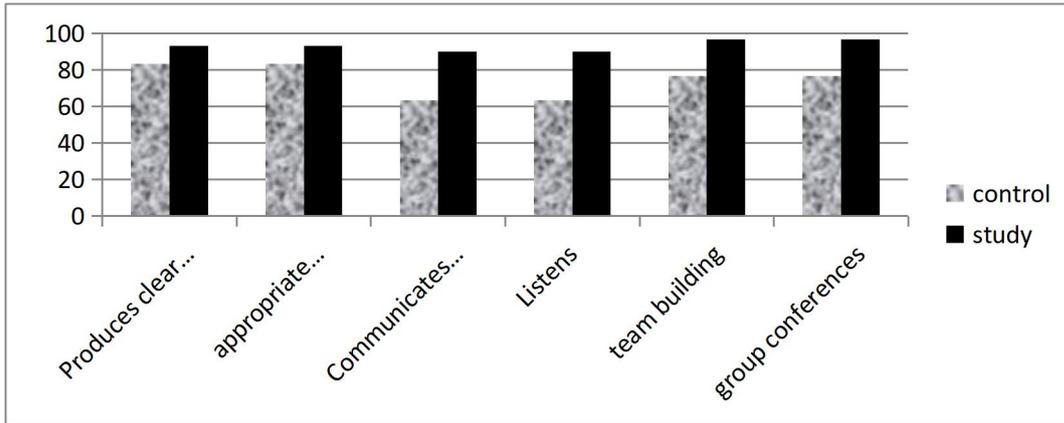
**Graph (V):** The distribution of students of both groups (I and II) regarding their cognitive abilities during the evaluation phase after one month of brain gym training concerning providing safe patient-centered care.



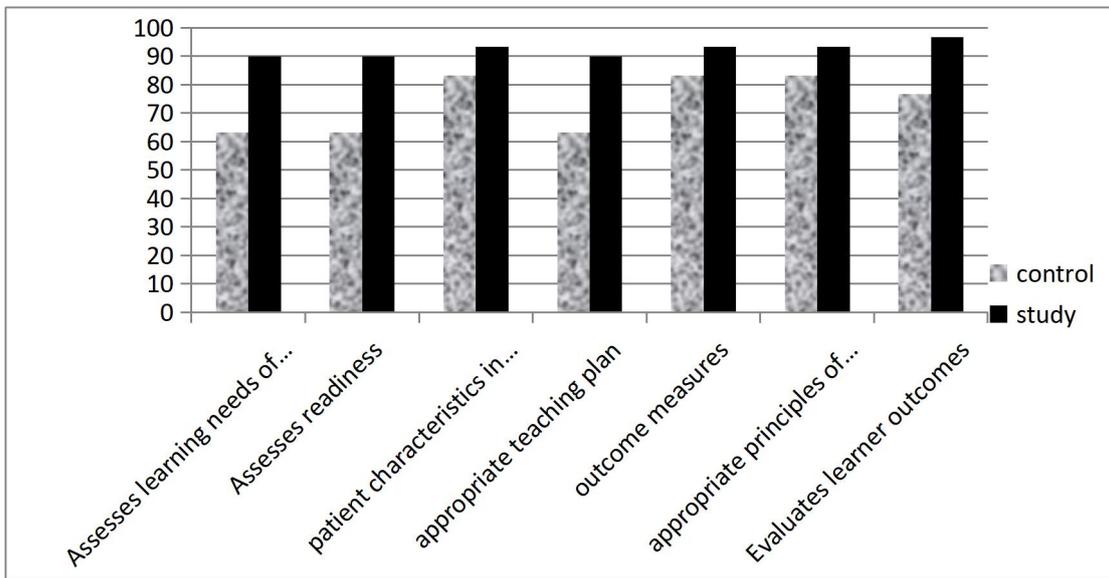
**Graph (VI):** Illustrates the distribution of students of both groups (I and II) regarding their cognitive abilities during the evaluation phase after one month of brain gym training concerning engagement in systematic and ongoing evaluation of the plan of care.



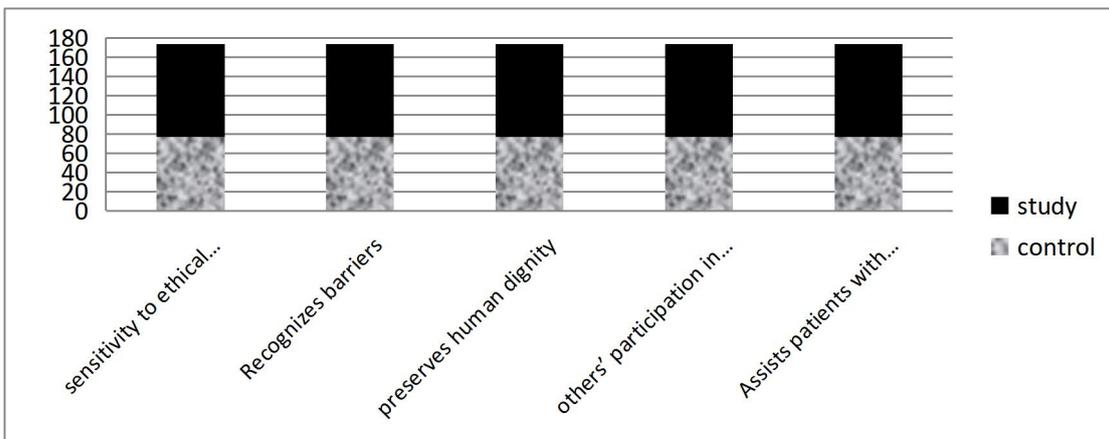
**Graph (VII):** Illustrates the distribution of students of both groups (I and II) regarding their cognitive abilities during the evaluation phase after one month of brain gym training concerning applying knowledge relevant to patient care.



**Graph (VIII):** Illustrates the distribution of students of both groups (I and II) regarding their cognitive abilities during the evaluation phase after one month of brain gym training concerning effective communication.



**Graph (IX):** Illustrates the distribution of students of both groups (I and II) regarding their cognitive abilities during the evaluation phase after one month of brain gym training concerning using teaching-learning process.



**Graph (X):** Illustrates the distribution of students of both groups (I and II) regarding their cognitive abilities during the evaluation phase after one month of brain gym training concerning ability to exhibit caring to facilitate physical, mental, and spiritual health.

## Discussion

Brain gym exercises are simple enjoyable movements that are used to enhance the students' ability to learn and process information in an ease filled way it bring fresh oxygen to the brain, release stress and restore energy, empowers individuals to utilize their own brain power more effectively, Brain gym exercise is intended to remap or create neural pathways through positive self-talk, exercise, repetition, and stimulation. Going with this context, the present study was conducted in order to evaluate the impact of brain gym training on the cognitive performance of Undergraduate nursing students (Terry Doyle, 2018).

Regarding age: The results of the present study demonstrated that, the age group was almost similar for group I and group II (20) years old. As regards sex: the present study showed that, students in both groups were females'. Regarding marital status: the finding of this study indicated that the majority of students were single. This may be attributed to the selection criteria of students; this is supported by barraran who reported that it is much better to evaluate the training effect among students with similar personal characteristics (barraran, 2014)

In relation to students' **abilities to demonstrate professional behaviors**: the findings of this study revealed that the majority of students had in group I compared to low percentages of students in the group II show improvement of their professional behaviors after on month of brain gym training. This observation may be due to brain gym exercises' great activity to calm the body and control breathing and behavior. This is in line with Jaakkola who reported that following 1 year of Brain Gym activities, the participants scored significantly higher on a test of perceptual-motor skills on an academic behavior (Jaakkola, 2015). This is supported by Panse, who stated that ,the Brain Gym exercise program is purported to be based on scientific research relating to neurological repatterning, cerebral dominance and perceptual motor training that has a great influence on students behavior (Panse, 2018).

As regards students' **abilities to collect and analyzes comprehensive patient data**, the findings of the present study revealed that the majority of students in group I had improved their abilities to collect relevant

information needed , Identifies appropriate sources collect data and analyzes patient data. This may be attributed to brain gym exercise program that assist in the students awaken and help them to stay alert and able to comprehend and analyze systematically .That was supported by the study which was done by El-Henawy , who Summaries the theoretical foundations of brain gym materials and writings have consistently promoted the notion that the exercises "activate the brain" and facilitate "whole brain learning." (El-Henawy, 2019) .Ocampo , clarified that brain gym exercises could be used to facilitate learning in a variety of academic areas: reading skills, oral reading, reading comprehension, thinking skills, spelling, creative writing, clear listening and thinking and data analysis , self-esteem, sports and play, memory, abstract thinking, creative thinking, speed reading, and test taking (Ocampo Jr, 2017).

Concerning students' **abilities to plans appropriate patient care**, this study results revealed that, the majority of the groups I than those in group II had developed a plan of care based on analysis of assessment data, accurately determines priorities for care, communicates priorities and rationale for decisions. This may be due to the effect of brain gym exercise on improving communication between the right and left hemispheres of the brain for higher level reasoning (critical thinking, problem solving).That result was supported by the study , (Kováčiková, 2017) , the notion of perceptual motor training as an academic intervention has persisted that improves students planning abilities. Furthermore, Szczasny described a study conducted to determine the response time of college students to a brain gym intervention, and he found that it improves students planning and comprehensive abilities. Also, he reported that there is great importance of drinking sufficient amounts of water and this idea has been championed by brain gym, a program which has found widespread acceptance only in some countries, such as the UK (Szczasny, 2016)

Concerning students' **abilities to provide safe, patient-centered care** the majority of students in group I demonstrate safe behavior criteria compared to a low percent of group II. This may be attributed to Brain Gym activities resulted in improving students reading, writing, spelling, listening comprehension; improves left/right coordination. Also, Weslake, conducted a

study to determine whether participation in brain gym activities resulted in improved students' performance in relation to safe patient care (Weslake, 2015). On contrary Leisman, noted that .He did note that for some areas of the brain, such effectiveness of Brain Gym .Brain Gym was therefore rejected by leading neuroscientists as a 'neuromyth' early on in the debate about the value of neuroscience to education (Leisman, 2016).

In relation to students' **abilities to Engage in systematic and ongoing evaluation of the plan of care** it was found that the majority of students in group I evaluate nursing interventions based on goals/expected outcomes. This may be attributed to brain gym exercises that connect the electrical circuits in the body. The mind and body relax as energy circulates through areas blocked by tension, so it facilitates the process of student relaxation and self-evaluation. This comes on line with Al-Shargie,2019, emphasized that, for example, promoted a movement curriculum called Movigenics, claiming that the development of movement patterns was related to learning efficiency and self-evaluation efficiency. He noted that it "endures even though it has been poorly defined and is not well validated in existing intervention studies that brain gym exercise affect student evaluation skills. Therefore, the instrument used to measure their academic performance had not been validated for this use. Another serious flaw in this study was the use of grade-equivalent scores, which are not suitable metrics for statistical comparisons (Al-Shargie, 2019).

Concerning students' abilities to **apply knowledge relevant to patient care** it was found that the majority of students in group I, had demonstrate initiative to obtain needed knowledge evaluates sources of data for appropriateness, usefulness, and accuracy integrate theory from nursing, natural and social sciences to enhance patient care relate pathophysiology and epidemiology of diseases to patients' assessment findings, medications, laboratory and diagnostic test results, medical and nursing interventions, integrates concepts of health promotion and disease prevention into patient care identify issues/problems in nursing practice that need to be improved, more than those in group II. According to Wu H., accordingly, the students would be taught motor skills, with the idea that this would repattern the neurons, leaving the student neurologically intact and ready to acquire

academic skills and apply knowledge relevant into clinical skills, (Wu, 2014) that was supported by Donnelly who stated that brain gym exercise affect their consequences for everyday life activities, are improve, that the developmental processes and functional capacities of the brain and the student abilities for knowledge transformation into practice (Donnelly, 2016).

As regards **students' abilities to communicate effectively**, the present study denoted that ,the majority of students in group I communicates therapeutically with patients utilizing verbal and nonverbal skills Listens attentively (Blake, 2019). That finding supported by study done by Nagarkar, noted that brain gym was improve learning disabilities and communication skills (Nagarkar, 2018). In this respect Snow, determined that the evidence to support the contention that deviations in brain morphology were related to learning difficulties and brain gym has evidence that improve students language and communication skills . In essence, the final study obtained was reported by in an article focused on improving the success of his students in higher education (Snow, 2016)

As for uses **students' abilities to use teaching-learning process when providing individualized patient/family/group education**, the present study revealed that ,the majority of students in group I improve their ability to use teaching-learning process .In this context Ruhaak, reported a significant main effect for groups, with the repatterned group decreasing response time most, followed by the control group (Ruhaak, 2017).

In students' abilities to **exhibits caring to facilitate physical, mental, and spiritual health**. It was noted that the majority of students in group I demonstrate sensitivity to cultural, moral, spiritual, and ethical beliefs of patients, families, peers, health care team members, and others recognize barriers to care such as socioeconomic factors, environmental factors, and support systems protect the patient's safety and privacy, and preserve human dignity while providing care encourage family and/or significant others' participation in care as appropriate assist patients with coping and adaptation strategies. That finding supported by Kroeze ,who found that neurological repatterning a major foundational assumption of brain gym is the idea of neurological repatterning, and many of its

activities are based on theory of development (**Kroeze, 2016**). Also, Frith Stated that, thus, to achieve efficient neurological development, the individual must satisfactorily acquire specific brain gym motor skills in order to improve teaching-learning skills during clinical experience (**Frith, 2017**). On the other hand the Doman-Delacato procedures, (Ruane clearly described and noted that the program was not effective in ameliorating disabilities (**Ruane, 2019**). On the other, Ryan concluded that if teachers use research-based practices to the maximum extent, they must have adequate students response for providing holistic patients care (**Ryan, 2016**).

### Conclusion

This study seeks to determine the impact of brain gym training on the cognitive performance of Undergraduate nursing students. Based on the results of this study, the following conclusions were justified:-

- Throughout the period of assessment there are no differences of both studied groups (I and II) in relation to all cognitive abilities
- While After brain gym training for one month the majority of students in group I show significant improvement in all cognitive abilities assessment criteria as their abilities to demonstrates professional behaviors, collects and analyzes comprehensive patient data, plans appropriate patient care, provides safe patient-centered care, engages in systematic and ongoing evaluation of the plan of care, applies knowledge relevant to patient care, communicates effectively, uses teaching-learning process when providing individualized patient/family/group education, and exhibits caring to facilitate physical, mental, and spiritual health.

### Recommendations

Based on the findings of the present study, the following recommendation are derived and suggested:-

1. The booklet should be distributed to each student about brain gym exercises.
2. Teaching brain gym exercise to preserve the students' cognitive abilities should be provided for each student.

3. The brain gym technique should be integrated in nursing theory and clinical training to improve the level of students' knowledge and performance.
4. Also a practical workshop for teachers and students and train them on the brain gym to enhance their thinking skills, whereas these skills are highly correlated to students' theoretical and practical levels and to prepare them as future competent nurses.
5. Effect of using the different type's brain gym exercises program for the students per exam anxiety

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