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Research Article

The Effect Of Brain Gymnastics Training On The Body Image, Excitement And Anxiety Of Elementary School Girls

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ABSTRACT

The aim of this research is to investigate the effect of brain gymnastics training on the psychological functions of primary school girls. The design of this research was semi-experimental design containing pre-test-post-test and control group on the psychological performance of preschool children. The statistical population in this research was all the primary school girls in Tabriz. In the first stage of sampling from among the centers of the statistical population, all female primary school students of Tabriz city were selected by cluster sampling method of two education districts and finally two primary schools were selected. In the second stage, 30 children were voluntarily selected in the research and randomly placed in experimental and control groups. To collect information, Goodenough's manikin drawing test was used to measure psychological performance with a validity of 92%. Brain gymnastics activities were used for motor performance. To collect data SPSS 22 software and one-way analysis of covariance test at 0.05 level were used. The results showed that brain gymnastics exercises have a significant positive effect on psychological performance, body image, excitement, anxiety, depression, aggression and incompatibility of first and second grade primary school girls.

Keywords: brain gymnastics, body image, excitement, anxiety

Introduction

Movement in human life continues from birth to the end of life. The motor development of humans has a unique potential and timeline that is influenced by a combination of genetic and environmental factors, which environmental factors before and after birth play an important role in the development and evolution of human abilities (Gallahue, 2019). Psychologists such as Kephart, Getment, and Delakato also believe that physical activity and movement experiences in general are among the most obvious and important environmental stimuli for the development of mental abilities (Haywood, 2015).
Evidence shows that exercise is a subset of physical activity that is defined by planned, structured, repetitive and purposeful methods, in the sense that improving or maintaining one or more components of physical fitness is possible. improves cognitive performance; Especially those cognitive processes that are influenced by executive functions and are involved in controlling behavior. Recently, it has been discussed about the importance of the role of executive processes in everyday life and how they are useful for adaptive behaviors, cognitive performance and academic success of elementary school children (Tomporowski, McCullick, Pendleton & Pesce, 2015). The neurobiological hypothesis suggests that regular physical activity encourages changes in the central nervous system through the formation of new neurons in the hippocampus, the formation of blood vessels in the brain, and the increase in gray matter volume in areas of the brain responsible for learning and memory processes (Singh et al. , 2019). Evidence supporting the neurobiological hypothesis is mainly derived from correlative and interventional brain imaging studies in adults (Vasilopoulos, Jeffrey, Wu & Dumontheil, 2023). In the neurobiological hypothesis, the metabolic demands of physical effort are modulated by the frequency, intensity, duration of the session or the duration of the exercise (Audiffren & André, 2019).

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There is positive correlation between the level of physical activity and the ability to perceive, memory, verbal skills, mathematical skills, as well as academic skills in elementary school children. Physical exercise that done from a younger age increases the elasticity and durability of the brain, increases cognitive capacity in childhood and continues throughout life (Fediani, Santoso, Kadir & Dewi, 2018).

In addition, a growing body of evidence supports the effect of exercise on the vitality and function of the central nervous system (CNS) and strengthening resistance to neurological disorders. Also, increasing evidence indicates that physical activity also has a positive effect on physical, mental, cognitive performance, participation and communication with society, as well as sense of identity (Ouyang & Liu, 2023). Based on these studies, exercise has a great capacity to control emotions (Tse, 2020), improve mental health (reduce depression and anxiety); reduces aggression and maladjustment in children and adolescents (Hale, Colquhoun, Lancastle, Lewis & Tyson, 2023) and current efforts to use this capacity to reduce cognitive decline in aging and psychiatric disorders are ongoing. (Pereira et al., 2007). The understanding of the mechanisms by which exercise affects cognitive abilities has been nurtured from several aspects. In particular, exercise has shown a remarkable ability to influence molecular pathways involved in synaptic function underlying learning and memory. Considering the intrinsic relationship between exercise and energy metabolism, it is not surprising that modulation of energy-related molecular systems appears to be a central mechanism by which exercise affects synaptic plasticity and cognition.

These findings align with a series of emerging studies that show that energy metabolism at the cellular level is related to the regulation of synaptic plasticity and neuronal excitability. The emerging story is that proper energy metabolism involving mitochondria is critical to support neuronal signaling events across the plasma membrane. In this realm, molecular systems such as those involving Brain-Derived Neurotrophic Factor (BDNF), located at the interface of metabolism and synaptic plasticity, can play an important role in exercise-induced cognitive enhancement. Accordingly, the ability of exercise to influence molecular systems involved in metabolism and synaptic plasticity that can maintain cognitive function is debatable (Gomez-Pinilla & Hillman, 2013). Based on this, studies show that in primary school age, the physical, mental, emotional and cognitive growth of children is faster than in later years and the speed of adaptation of children in primary school is higher than in other periods. Therefore, if the problems of the living and social environment on the way of intellectual and mental development of children, which delay their intellectual, mental and physical development, are recognized in time and efforts are made to solve them, it is possible to avoid the unfortunate consequences that even In adulthood, it bothers a person, prevent it. Basically, the child's ability to learn in preschool and elementary school is very high and deep (Amirkhani et al., 2019).

Therefore, children spend more time in school. Schools play an important role in optimizing their growth and development and should provide children with enough opportunities to do organized physical activity properly (Fedyani et al., 2018). Given that theoretical education is boring for elementary school children and the developments in the field of developmental psychology are especially related to the concept of physical education. Several contemporary researchers have promoted theories of cognitive development that focus on the role of physical movement in establishing basic mental processes during infancy, childhood, and adolescence. These theories are important for practitioners who develop and implement physical activity interventions designed for the physical, cognitive and psychological development of children and adolescents (Tomporowski, McCullick, Pendleton & Pesce, 2015). Based on this, physical activity has attracted increasing attention in prevention and intervention studies due to its cost-effectiveness and numerous positive effects on physical and mental health (Ouyang & Liu, 2023). Therefore, sports psychology researchers believe that appropriate interventions and complementary medicine should be used to improve the physical and mental health of primary school children. Based on this, among the interventions to improve cognitive performance and reduce the level of depression, anxiety, aggression and emotional control of children, we can refer to Brain Gymnastics (Pratama, Purwanti, Sansuwito & Said 2022).

Recent studies indicated that the increase in learning concentration and cognitive performance in children does not only include the brain, but also the whole body, such as feelings, movements, emotions and brain integration functions, all originate from our body. Therefore, a system is needed that can connect the mind and the body, and that is brain gymnastics, which consists of a series of simple movements that usually take 10-15 minutes and are performed 3 times a week, which aims to linking or uniting mind and body. Brain gymnastics not only facilitates the flow of blood and oxygen to the brain, but also facilitates movements that can optimally stimulate brain work and proper brain function (Panzilion, Padila, Tria, Amin & Andri, 2020; Suratun & Tirtayanti, 2020). In fact, Brain Gymnastics is a new cognitive motor program developed by Dennison (2021) and first used for children with ADHD, brain damage, poor concentration, and depression. But in its development, anyone can use it for different purposes, brain gymnastics exercises are now commonly used and popular in America and Europe. Many people find it useful in reducing stress, clearing the mind, improving memory and concentration. According to Cahyo, brain gymnastics includes balancing the right and left brain, calming the back and front brain as focus dimensions, stimulating the middle brain or limbic system in regulating emotions, and stimulating the focus dimension in the forebrain (Djamarah, 2008). According to its founders, Brain Gymnastics stimulates different areas of the brain with special emphasis on the corpus callosum and facilitates interhemispheric communication.

Therefore, Brain Gymnastics is proposed as a potentially useful physical therapy approach to increase brain function in people and is available to health and rehabilitation professionals working in the fields of psychiatry and psychology(Varela, Ayán, Bidaurrazaga-Letona, Diz, & Duñabeitia, 2023). Since the brain training method is basically focused on the use of movement activities to spend all the expected energy of a person, with brain training movements, blood flow can be increased and due to fatigue and excessive stress of learning, it can increase Blood flow and automatic muscle tension become nervous. School-age children actively benefit from brain exercises. This activity provides a comprehensive approach that helps to increase motivation and cognitive performance (Sa'idah, Sari & Ratnasari, 2023). Also, brain gymnastics involves performing specific movement patterns that involve the head, eyes, and limbs, focusing on three dimensions: laterality, attention, and focus. During a typical brain gymnastics session, participants engage in a wide variety of tasks that involve different aspects of cognitive and physical performance. These activities include dynamic movements involving coordination and balance such as Cross crawl (touching hands with opposite knees and vice versa) and hand-eye coordination activities such as Lazy 8's (drawing three times with each hand) or Brain Buttons (holding your navel). ¬Id, rub the point below the clavicle on the right and left side of the sternum firmly). In addition, brain gymnastics includes activities aimed at promoting relaxation, such as "energy yawning" by placing your fingers on the points you feel on the jaws and yawning deeply to gently release tension and pressure. Get away from yourself (Varela, Ayán, Bidaurrazaga-Letona, Diz & Duñabeitia, 2023). Based on this, compared to other non-pharmacological treatments, brain gymnastics can increase blood flow to the brain, increase oxygen intake to cleanse the brain (remove negative thoughts, jealousy) and improve breathing, endurance, and stress reduction, inconsistency and anxiety, reduce fatigue, improve inattention and lack of concentration. By using brain gymnastics, it is hoped that depressed people who have negative thoughts can be eliminated and those who do not have enthusiasm, lack of concentration and daily activities, will find motivation to meet their physical, mental and social needs(Harzandi, Salehian, 2022). In this regard, the results of some studies indicated the potential benefits of brain gymnastics on reducing depression (Pragholapati), stress and anxiety (Arbianingsih, Huriati, Musnayni, Afiifah & Amal, 2021), as well as increasing concentration (Anggraini & Dewi, 2022) in people. With regard to the mentioned cases, the current research examines the question of whether children's brain gymnastics training has an effect on the cognitive and psychological functions of first and second grade female students.

Research Methodology

This research was semi-experimental and an experimental design containing pre-test-post-test and control group was used due to following the effect of children's brain gymnastics training on the cognitive and psychological performance of primary school girls.

Statistical Society

The statistical population in this research was 657 students enrolled in girls' primary schools in Tabriz in the academic year 2023-2024.

Statistical sample and sampling method

Several steps were taken to select the statistical sample. First, the researcher was introduced by a letter from the university to the General Department of Education in Tabriz city, and then by this department to the Departments of Education. In the first stage of sampling, among the centers of the statistical population, all the first and second grade primary school girls of Tabriz city were 657 people who were selected by cluster sampling method of two educational districts and finally two primary schools were selected. In the second stage, 30 children were voluntarily selected in the research and randomly replaced in two experimental and control groups.

Research measurement tools

Projection tests were used to collect information in this research. Projection tests are basically based on psychoanalytic theory. According to the supporters of the psychoanalytical school, many aspects of people's personality cannot be measured through conscious self-assessment and using questionnaires. In order to get an accurate picture of a person's inner world, one must choose a way to prevent unconscious psychological resistances and defenses.

Based on this, by using projection paintings, it is possible to enter the subject's inner world and in this way evaluate his unconscious and deep personality traits. Drawing tests are projective diagnostic methods in which a person is asked to draw a picture of a person, subject or a situation in order to evaluate his cognitive, interpersonal or psychological functions (Powell, 2000; cited by Ahmadi et al., 2013).

Dummy drawing test

The use of pictures of people drawn by young children for various purposes has been popular for a long time. Goodenough 's dummy test was used to score the cognitive performance of the paintings. This test was designed in 1926 by Florence Laura Goodenough to measure the cognitive, mental and intelligence abilities of children, and then revised by Harris in 1963. According to the creators of the test, there is a relationship between the child's age and his mental abilities. This means that with increasing age, the child paints more parts of the human image. Personality factors are also effective in the results of Goodenough's mannequin test, children who are more socially and behaviorally compatible have taken into account more details in the drawing of the mannequin (Bahrami, 2023). Of course, it should be noted that the lack of growth and cognitive maturity of 4-5-year-old children and sometimes weakness in visualization (especially in autistic children) affects their drawing ability (Blaydes, 2004).
Currently, researchers agree that the Goodenough scale is not only sensitive to intelligence, but at the same time measures factors that are related to the sociability and emotions of the child. Therefore, the mannequin drawing test is considered a personality test before it is an intelligence test (Dadestan, 2023).

Validity of Goodenough's test

The researches that have been conducted on the reliability and validity or confirmation of the results of the manikin drawing test have reached very satisfactory findings to the extent that Makavar believes that the manikin drawing can be considered as the personal signature of the person doing the drawing (Dadestan, 2023).
In the field of test validity, based on projection tests, researches have shown that the dummy test has high sensitivity. Jafari and Delawar (2006) standardized this test on 6-11 year old students of Saveh and concluded that Goodenough's intelligence test has discriminant validity (0.141) and reliability (0.782).

Family drawing test

A child's drawing can be used to determine a person's level of intelligence and evaluate his or her special perception (Goodenough test). Apart from the formal elements, the painting also has content and apart from intelligence, it also reveals emotions. This test gained more fame at the same time with the progress of family therapy in the 1960s and 1970s (Sharifi, 2012). In addition to the subject's individual characteristics, the family drawing test also reflects his family relationships and needs.

Brain gymnastics training program

1. Lazy8 s
2. Cross crawl
3. Sit-Up Cross
4. Neck rolls
5. Think of an X
6. The double doodle
7. The Rockre
8. Belly breathing
9. The Energizer
10. Calf purmp
11. The Grounder
12. Gravity Glider
13. The Owl
14. The active arm
15. Brain buttons
16. Balance Buttons
17. Drink Water
18. Earth Buttons
19. Space buttons
20. Energy Yawn
21. Thinking Cap
22. Positive Points
23. Hook- up

Research implementation method

In the first stage of sampling from among the centers of the statistical population, all female primary school students of Tabriz city were selected by cluster sampling method of two educational districts and finally two primary schools were selected. In the second stage, 30 children were voluntarily selected in the research and were randomly replaced in two experimental and control groups, and the post-test, which was the projection tests of drawing a mannequin and drawing a family, in the following order from both groups (experimental and control) taken:

A letter was sent to the parents of the children in the experimental group to participate in the brain gymnastics training to obtain their consent. Brain gymnastics training for children as an intervention program was conducted on the experimental group for two months and 3 sessions of 40 minutes each week. The sessions consisted of 5 minutes of warming up, 10 minutes of practicing learned movements, 10 minutes of teaching new movements, 10 minutes of performing new movements, and the last 5 minutes of cooling down. The teaching method was in such a way that cerebral gymnastics movements were taught. The control group was engaged in practicing lessons unrelated to body awareness or had non-educational activities during the training of the experimental group. Due to this training, the possibility of the control group learning more than the experimental group was eliminated during the intervention.

After the completion of 2 months of intervention of brain gymnastics exercises, the research tests were conducted again and finally the pre-test and post-test tests were scored according to specific instructions by 4 psychologists in order to obtain the objectivity of correct scoring. And after scoring the scores of 3 psychologist who were close to each other, the average of those scores formed the data.

Statistical analysis methods

Data were analyzed by SPSS version 22 software and one-way analysis of variance test at 0.05 level.

Results

Table 1. The difference in body image in the post-test in the control and brain gymnastics groups

Source of change	SS	DF	MS	F	Sig.	Eta
Pretest effect	432.43	1	432.43	1211.6	0.001	0.579
Group effect	107.58	1	107.58	311.22	0.001	0.441
error		27	0.315			
Total		30				

According to Table 1, it can be seen that the group effect is significant at the 99% probability level (p = 0.001, eta square = 0.44, F = 311.22). That is, after adjusting the pre-test scores, the body image in the post-test has a significant difference in the control and brain gymnastics groups.

Table 2. Adjusted average of body image in the post-test in two groups of control and brain gymnastics

group	N	Adjusted mean and standard error	Adjusted mean and standard error
Control	15	2.31	0.112
Brain gymnastics	15	39.05	0.112

According to Table 2, it can be seen that the body image in the post-test in the two brain gymnastics groups (m = 39.05) is significantly higher than the control group (m = 28.31). Therefore, it is concluded that brain gymnastics exercises have a more significant positive effect on the body image post-test of the experimental group of first and second elementary school girls.

Table 3. The difference in excitement in the post-test in the control and brain gymnastics groups

Source of change	SS	DF	MS	F	Sig.	Eta
Pretest effect	512.11	1	512.11	1129.6	0.001	0.699
Group effect	136.28	1	136.28	341.29	0.001	0.621
error	10.193	27	0.377			
Total	5017	30				

According to Table 3, it can be seen that the group effect is significant at the 99% probability level (p = 0.001, eta square = 0.62, F = 341.29). That is, after adjusting the pre-test scores, there is a significant difference in the post-test excitement in the control and brain gymnastics groups.

Table 4. Adjusted mean of emotion in the post-test in two groups of control and brain gymnastics

group	N	Adjusted mean and standard error	Adjusted mean and standard error
Control	15	27.30	0.112
Brain gymnastics	15	42.19	0.112

According to Table 4, it can be seen that the excitement in the post-test in the two brain gymnastics groups (m = 42.19) is significantly higher than the control group (m = 27.30). Therefore, it is concluded that brain gymnastics training has a more significant positive effect on the post-examination of the excitement of the experimental group of first and second primary school girls.

Table 5. The results of the analysis of covariance test to investigate the difference of anxiety in the post-test in two groups of control and brain gymnastics

Source of change	SS	DF	MS	F	Sig.	Eta
Pretest effect	442.41	1	442.41	1279.6	0.001	0.946
Group effect	143.58	1	143.58	331.14	0.001	0.511
error	10.193	27				
Total	5613	30				

According to the results of Table 5, it can be seen that the group effect is significant at the 99% probability level (p = 0.001, eta square = 0.51, F = 331.14). That is, after adjusting the pre-test scores, there is a significant difference in post-test anxiety in the control and brain gymnastics groups.

Table 6. The adjusted mean of anxiety in the post-test in the control and brain gymnastics groups

group	N	Adjusted mean and standard error	Adjusted mean and standard error
Control	15	25.31	0.112
Brain gymnastics	15	36.25	0.112

According to the results of Table 6, it can be seen that anxiety in the post-test in the two brain gymnastics groups (m = 36.25) is significantly higher than the control group (m = 25.31). Therefore, it is concluded that brain gymnastics exercises have a more significant positive effect on the anxiety post-test of the experimental group of first and second elementary school girls.

Discussion

The results showed that brain gymnastics exercises have a significant positive effect on the body image of first and second grade girls. There has been no report about this research finding in the research literature; But the result is aligned with the results of the studies of Tiro et al. (2009), Cantika et al. (2024), Salehian et al.(2023) that regular exercise and physical activity have a positive and significant effect on the dimensions of body image attitude, and non-aligned research was not found. In explaining this research finding, it can be stated that purposeful movements are the main factor in the development of body image because they provide the opportunity to combine and reason about body shape from information sources, especially vision, touch and proprioception, and the proprioception of primary sensory information. provide from the body image. Since the brain in the first period of life does not have enough experiences to integrate sensory and motor information, and with age, the integration of sensory and motor information in the brain develops and as a result, the child is able to identify his body parts and the surrounding environment. It helps, as a result of children's sensory and movement experiences, it can help children to improve their body parts identification (Dana, Ranjbari, Chaharbaghi, Ghorbani, 2023). Based on this, Tiro et al. (2021) and Suratun et al. (2020) believe that increasing physical fitness, increasing physical performance, reducing body mass, promoting a more favorable self-image, sports provide more positive social feedback, and lead to recognition in the peer group. And this leads to improvement in the image of the person himself. In fact, Dennison's (2021) basic theory of educational kinesiology is that simple exercises and body movements help to integrate the two hemispheres of the brain and thus cure learning problems and help reduce mental and emotional stress. slow, as well as special brain gymnastics exercises, can coordinate gross and fine motor activities, strengthen the necessary connections between the body and the brain for any type of function in a person, and generally

increase the power of the non-leader hemisphere, and the two hemispheres coordinate that improve movement skills, balance and physical fitness in people. Therefore, compared to other non-pharmacological treatments, brain gymnastics can increase blood flow to the brain, increase oxygen intake so that it can clear the brain (removing negative thoughts about body image) and also improve breathing, endurance, balance, decrease tension, incompatibility and anxiety, reduce fatigue, improve inattention and lack of concentration and increase physical strength, and remove the unrealistic view that children have about their own bodies and increase the desired body image in children (Salehian, Hosseinzadeh Peyghan, ShafaeianFard, Khajeaflaton Mofrad, 2023; Hausenblas and Fallon, 2006).The results showed that brain gymnastics exercises have a significant positive effect on the excitement of first and second grade girls. There has been no report about this research finding in the research literature; But the result obtained with the results of the research of Suratun et al. (2020) fast running has a protective effect against neurodegenerative disorders caused by the administration of kainic acid and stress and also with the results of the study of Tiro (2021) who stated that exercise and physical activities reduce the level of emotionality, obsession and depression, were consistent and inconsistent research was not found.In explaining this research finding, it can be said that human emotions include anger, hatred, fear, happiness, sadness, and surprise, and their control and management is important. Sports today is not only a simple activity, but it strengthens the complex capabilities of the brain in various matters, including learning materials, coordination, agility, acting correctly, making correct decisions, etc., and in all parts of the body and soul and The mind has a positive effect, for example, exercise has a great effect on health and physical fitness, emotional balance and stability, attracting attention, tension, competition, self-confidence, reducing depression, positive physical and social image (Arefi et al., 2016). . Based on this, compared to other non-pharmacological treatments, brain gymnastics can increase blood flow to the brain, increase oxygen intake to cleanse the brain (remove negative thoughts, jealousy) and improve breathing, endurance, and stress reduction, anger, fear, incompatibility and anxiety, controlling emotions, reducing fatigue, improving inattention and lack of concentration, which is associated with happiness and peace of mind (Dennison and Gill, 2009).

The results of covariance analysis showed that brain gymnastics exercises have a significant positive effect on the anxiety of first and second elementary school girls. There has been no report about this research finding in the research literature; But the result obtained with the results of studies by Tiro et al. (2021), Suratun et al. (2020), Pereira et al.(2007). Sports activities are an effective and cost-effective alternative for all types of anxiety disorders.In explaining this research finding, it can be stated that several studies such as Anggraini & Dewi (2022) showed that sports activity has a repulsive effect against negative phenomena such as fear, worry and nervous pressure. If sports activity is done regularly, it will lead to better self-knowledge, more self-confidence, less anger, better mental performance, more relaxation under conditions and reduction of nervous pressure. When exercise is done in a group, it makes people to be in contact and communicate with each other, the social relations of the person are strengthened and the expression of the body's emotions flourishes. This activity and coordination is one of the methods that has beneficial effects on a person's mood and thoughts and eliminates negative and destructive thoughts. Based on this, brain gymnastics as a sports activity can be useful to overcome physical and mental tensions, i.e. to reduce emotional disorders such as anxiety and stress due to various stresses that children face. . The researchers also believe that the reduction in stress that occurs in the respondents is because the respondents are given brain training interventions. These brain gymnastics movements are one of the different types of exercise in which we not only gain physical fitness but also increase our mental health. According to the findings of Purwanto & Widyaswati (2009), brain gymnastics movements for stimulation (lateral dimension) for the left and right hemispheres of the brain, illumination (concentration dimension) for the brain and brain stem (brain stem) and the front part of the brain (lobes) forehead) as well as rest and relaxation (after attention) for the limbic system (middle brain) and cerebral cortex. Therefore, the gymnastic movements of the brain can activate the neocortex and parasympathetic nerves to reduce the increase in the adrenaline hormone in the body, which can reduce mental and physical stress, so that the soul and body can find more peace. And in general, performing brain gymnastics exercises in primary school children can reduce stress and anxiety and promote relaxation (Sartini & Aszrul, 2021).

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