EJPMR, 2026, 13(11), 687-693 **Research Article** **Impact Factor: 8.158**

EUROPEAN JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH

www.ejpmr.com

ISSN (O): 2394-3211
ISSN (P): 3051-2573
Coden USA: EJPMAG

THE EFFECTIVENESS OF THE BRAIN GYM EXERCISE WITH AEROBICS ON STRESS AND DEPRESSION AMONG UNDERGRADUATES

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DOI: https://doi.org/10.5281/zenodo.24553962

How to cite this Article: Sugasini Ramu[1]*, Priyadharshini B.[2], Sweety Venkatesan[3], Dr. P. Senthil Selvam[4]. (2026). The Effectiveness of The Brain Gym Exercise With Aerobics on Stress And Depression Among Undergraduates Journal of Pharmaceutical and Medical Research, 13(11), 687–693.
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Article Received on 05/10/2026 **Article Revised on 25/10/2026** **Article Published on 01/11/2026**

ABSTRACT

Anxiety, Depression, and stress an important concern in young college students. The prevalence rate is also quite alarming in India and abroad. Toktam Kianian (2018) and Lubna Khan (2024) have said that the brain gym exercise and aerobics can reduce Anxiety and Depression among college students. There are some other articles published regarding reducing Anxiety and Depression. In that, brain gym exercise and aerobics stand prominently. The study recruited 40 participants and divided them into Group A (brain gym exercise and aerobics) & Group-B (standard exercise) for 4 weeks. The outcomes were measured using the depression, anxiety stress scale (DASS-21). The pre- and post–test values of the depression, anxiety stress scale show high statistical significance in reducing the depression, anxiety, and stress in both groups. But the significant improvement was seen in Group A. This study concluded that both groups showed improvement, but the Brain Gym exercise with aerobics is more effective than standard exercise among college students.

KEYWORDS: Brain gym exercises, aerobics exercise, anxiety, depression, stress, college students, DASS-21.

INTRODUCTION

The World Health Organization (WHO) defines health as "A state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity."[1] A healthy and sharp mind is the origin of a happy life.[2] Depression is a mental health condition that involves a persistent feeling of sadness and loss of interest in activities. Anxiety is a feeling of fear, dread, and uneasiness that can be a normal stress reaction. Regular exercise is beneficial to the physical, psychological, and social health of a person. Regular physical activity decreases anxiety and depression, as well as being used as an adjuvant treatment of these conditions, and improves health.[3] The present review provides a cross-sectional picture of the students. Psychological well-being is crucial for formulating health policy for preventive and therapeutic purposes.[4] Adolescents, especially college-going students, suffer from both depression and anxiety at higher rates as the stressors/triggers are present in abundance. Emotional, behavioral, sexual, economic, academic, and social changes and efforts of discovering one's identity with psychosocial and maturation also occur.[1] Depression is more than just feeling down or having a bad day. When a sad mood lasts for a long time and interferes with normal activities. The symptoms can be feeling sad, feeling irritable, frustrated, having trouble falling asleep, waking up too early or sleeping too much, feeling tired, eating more or less, suicidal thoughts. The exact cause of depression is unknown. It may be caused by genetic, biological, environmental, and physiological factors. In general, about 1 out of every 6 adults will have depression at some time in their lives. Depression affects about 16 million American adults every year. Anxiety disorders often go hand in hand with depression. The people who have anxiety disorders struggle with intense

and uncontrollable feelings of anxiety, fear, worry, and panic. The symptoms can be feeling nervous, increased heart rate, breathing rapidly, sweating, trembling, feeling weak, trouble concentrating, trouble sleeping, and gastrointestinal problems. The causes of anxiety haven't been completely observed. Life experiences such as traumatic events appear to trigger anxiety disorders in people who are already prone to anxiety. It may be caused by heart disease, diabetes, thyroid problems, respiratory disorders, and chronic pain.[5] Stress can be defined as a state of worry or mental tension caused by a difficult situation. Stress is a natural human response that prompts us to address challenges and threats in our lives. Everyone experiences stress to some degree. The pattern may vary among different regions of India due to the diversity in social and cultural backgrounds, financial status, and future aspirations. Because the social and cultural factors influence the perception of stress, the findings of cross-sectional studies in one region cannot be generalized to other regions, especially when the sources of stress and predisposing factors have continuously evolved over the past years.[6] The level of stress experienced by individuals can vary widely depending on various factors such as personal circumstances, socio-economic status, and external pressures. Stress is a natural response to demands or challenges, and while some level of stress can be motivating and even beneficial, excessive or prolonged stress can have detrimental effects on mental and physical health.[7] The prevention of anxiety, depression, and stress focuses on maintaining a healthy lifestyle by getting regular exercise, eating a balanced diet, getting enough sleep, managing stress effectively, maintaining social connections, and avoiding excessive alcohol or drug use.

Brain Gym exercise is an intervention developed by Paul and Gail Dennison in the 1970s, consisting of 26 activities. It improves areas such as coordination, focus, academics, concentration, memory, writing, and reading through specific sets of movements, processes, and programs.[8]

It is based on the principle of training the person through movements. Brain Gym is a set of exercises designed to improve and strengthen cognitive function for learning, to link the body and the mind, and to stimulate the usage of the brain's hemispheres through physical and mental tactics. Scientific evidence regarding the effects of brain gym exercise as physiotherapy/rehabilitation is controversial.[9] The brain is a complex organ that focuses on motion, and according to Hannaford, "activity is necessary for learning". Brain stimulation is very important in neuro-rehabilitation, reducing atrophy, lessening the risk of brain structure lesions, and increasing cognitive performance. It is important therapy for adults with depression, as its neuronal advantages have increased with age-related atrophy exacerbated by neuropathology. Brain Gym is a great source of personal development, enabling individuals to obtain rapid transformations and also improve the quality of life in different age groups.[10] These studies were conducted across different age groups and populations, including teenagers, adults, and older adults.[12] So, this study was conducted to investigate the effectiveness of the brain gym exercise with aerobics on anxiety, depression, and stress among college students.

INCLUSION CRITERIA

- Age group within 17 to 23 years of age.
- Both genders.
- Participants having mild and moderate anxiety using the DASS-21 SCALE.[2]

EXCLUSION CRITERIA

- Participants not willing to participate
- Undertaking psychotic drugs
- Students below 17 years of age.
- Unable to understand the scales

OUTCOME MEASURES

DEPRESSION ANXIETY STRESS SCALE - (DASS-21)

The depression scale, anxiety, and stress-21 are chosen. The DASS-21 consists of three self-report measures used to assess depression, anxiety, and emotional tension. Depression spectrum tests dysphoria. Anxiety assessment tests autonomic activation, psychological anxiety. Stress is a common condition that students face nowadays and causes disturbance in their daily lives.

Thanch Duc Tran and Jane Fisher performed a study on the efficacy of DASS-21 in a cohort of Northern Vietnamese people in rural communities as a screening tool, and the study concluded that it can be useful in clinical practice, and the components, such as depression, anxiety, and stress levels, are determined by summing the ratings for the elements in question. The research aims to calculate the impact of brain gym exercise on stress, anxiety, and depression among college students using the scale of DASS-21 as an evaluation method. The DASS-21 is a self-report questionnaire that measures how much depression, anxiety, and stress you've experienced in the past week. The severity ratings are normal, mild, moderate, severe, and extremely severe. To calculate a DASS-21 score, add up the scores for each of the three subscales and multiply each sum by 2. The three subscales are depression, anxiety, and stress, and they assess symptoms of depression (items 3,5,10,13,16,17,21), anxiety (items 2,4,7,9,15,19,20), and stress (items 1,6,8,11,12,14,18). The degree to which

respondents endorsed the symptoms over the last week is rated on a scale that ranges from 0 (did not apply to me at all) to 3 (applied to me very much or most of the time). Higher scores reflect higher levels of symptom endorsement.[13]

PROCEDURE

A total of 40 samples that fulfilled the inclusion and exclusion criteria were recruited for the study. Written informed consent was obtained from the samples. The procedures were explained to the samples, and they were divided into two groups, namely group A-20 samples (brain gym exercise with aerobics) and group B-20 samples(conventional exercise).

INTERVENTION

GROUP-A (brain gym exercise with aerobics group)

3 sessions per week on alternate days were given (4 weeks×3 days=12 sessions). The duration of each session was 60 minutes. Brain gym exercise was given for 30 min (each exercise- 3 mins). Warm up(5min) was given, which included major stretches & active movements, which were followed by the exercise protocol. A cool-down (5 min) was given in between the exercises. Rest was given for 5 minutes. Aerobic training – normal brisk walking was given for 15 min per day on alternate days.

EXERCISE PROTOCOL GROUP-A

BRAIN GYM EXERCISE WITH AEROBICS

S.NO	BRAIN GYM EXERCISE AND AEROBICS
1.	Brain buttons
2.	Space buttons
3.	Earth button
4.	Thinking cape
5.	Cross crawl
6.	Hook up
7.	Lazy eight
8.	Double doodle
9.	Sits ups and cross crawls
10.	Neck rolls
11.	Aerobic training – normal brisk walking

GROUP-B (control group)

3 sessions per week on alternate days were given (4 weeks×3 days=12 sessions). The duration of each session was 60 minutes. Breathing exercise was given for 15 minutes conventional exercises were given for 30 minutes. Warm up(5min) was given, which included major stretches & active movements, which were followed by the exercise protocol. A cool-down (5 min) was given in between the exercises. Rest was given for 5 minutes.

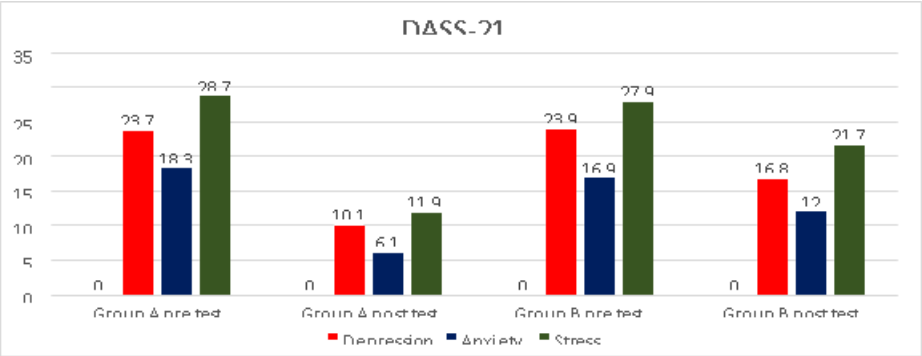
GROUP B: CONTROL GROUP

S.NO	CONVENTIONAL EXERCISE
1. **2.** **3.** **4.** **5.**	Breathing exercise Low-impact aerobic exercise: Bouncing a ball while an activity Throwing a ball in the air while walking, activity: Walking between cones in a zig-zag manner Mild jogging between cones

DATA ANALYSIS AND INTERPRETATION

Table 1: Comparison of DASS-21 scores in both pre- and post-test Group A(brain gym exercise with aerobics) and Group B (control group).

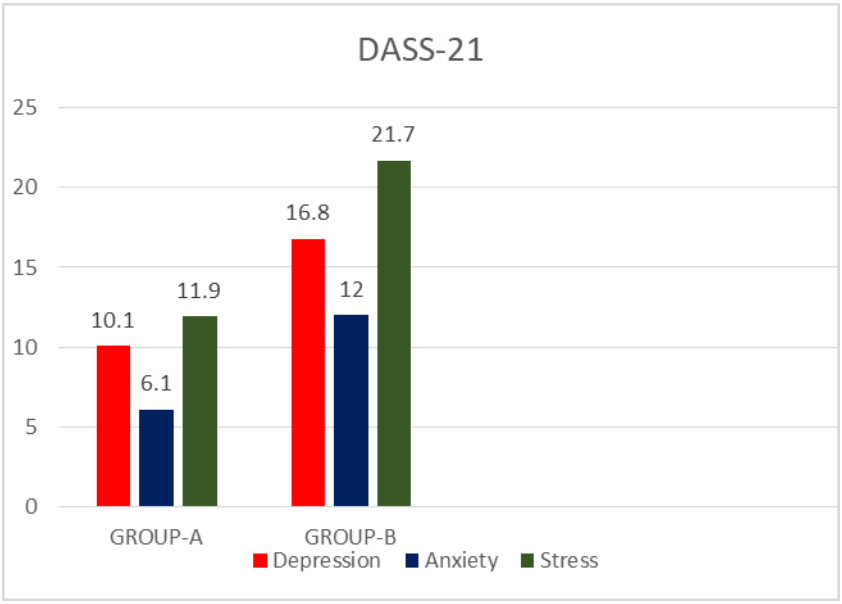
DASS-21	MEAN		STANDARD DEVIATION		T-VALUE	P-VALUE
GROUP-A	PRE-TEST	POST-TEST	PRE-TEST	POST-TEST		
DEPRESSION	23.70	10.10	2.27	1.65	21.7335	<0.0001
ANXIETY	18.30	6.10	1.63	1.65	25.4679	
STRESS	28.70	11.90	2.62	3.14	18.2165	
GROUP-B	PRE-TEST	POST-TEST	PRE-TEST	POST-TEST	T-VALUE	P-VALUE
DEPRESSION	23.90	16.80	1.65	2.55	11.7057	<0.0001
ANXIETY	16.90	12.00	1.20	1.70	9.9693	
STRESS	27.90	21.70	1.65	1.63	11.0699	



GRAPH 1: Comparison of DASS-21 scores in both pre- and post-test Group A(brain gym exercise with aerobics) and Group B (control group).

Table 2: Comparison of DASS-21 scores of post-tests for Groups A and B.

DASS-21	MEAN VALUES OF POST TESTS		STANDARD DEVIATION OF POST TESTS		T-VALUE	P-VALUE
	GROUP-A	GROUP-B	GROUP-A	GROUP-B		
Depression	10.10	16.80	1.65	2.55	9.8652	<0.0001
Anxiety	6.10	12.00	1.65	1.70	11.1375	<0.0001
Stress	11.90	21.70	3.14	1.63	12.3880	<0.0001



GRAPH-2: Comparison of DASS-21 scores of post-tests for Groups A and B.

RESULT

The statistical values of the respective groups – group A (brain gym exercise with aerobics) and group B (conventional exercise) for depression, anxiety, and stress are as follows: GROUP A - Depression T value - 21.7335, P value - <0.0001, Anxiety T value - 25.4679, P value - <0.0001, and Stress T value – 18.2165, P value - <0.0001. GROUP B – Depression T value – 11.7057, P value - <0.0001, Anxiety T value – 9.9693, P value - <0.0001, and Stress T value – 11.0699, P value - <0.0001, respectively. Hence, this study's results showed statistical improvement in reducing depression, anxiety, and stress in both group A and group B. But there is a statistically greater improvement in group A (Brain Gym exercise with aerobics) than in group B.

DISSCUSSION

The purpose of the study was to determine the effectiveness of brain gym exercise with aerobics on anxiety, depression, and stress among college students. In this, 40 students aged 17-23 years were divided into 2 groups. GROUP-A (Brain Gym with aerobics) and GROUP-B(conventional exercise). The assessments were taken for the college students, and the brain gym exercise with aerobics and conventional exercise were given for the individuals, along with aerobics for 4

weeks, and the results were measured using the DEPRESSION ANXIETY STRESS SCALE (DASS-21).

The result concluded that the data collected was statistically analyzed by an unpaired t-test. After that, the pre-test measures of the DASS-21 are evaluated and recorded as pre-test and post-test values after 4 weeks of training. Within an Average mean Difference of GROUP-A AND GROUP-B Depression –pre-test mean value – 23.70 and post-test mean value -10.10, Anxiety –pre-test mean value – 18.30 and post-test mean value – 6.10 and Stress – pre-test mean value – 28.70 and post -test mean value – 11.90 in brain gym exercise with aerobics group and in conventional exercise with an Average mean Difference of Depression – pre-test mean value – 23.90 and post-test mean value – 16.80, Anxiety – pre-test mean value – 16.90 and post-test value -12.00 and Stress – pre-test mean value – 27.90 and post-test mean value - 21.70. also the t-value and p-value difference of GROUP-A(Brain gym exercise with aerobics) AND GROUP-B(Conventional group)of the pre-test and post-test of GROUP-A Depression-t-value-21.733 and p-value-<0.0001, Anxiety- t-value-25.467 and p-value-<0.0001 and Stress-t-value-18.216 and p-value-<0.0001 and GROUP-B Depression-t-value-11.705 and p-value-<0.0001, Anxiety-t-value-9.969 and p-value-<0.0001 and Stress-t- value-11.069 and p-value-<0.0001.

According to our findings, the post-test values of the experimental Group A were significantly different. Even though both groups improved statistically and considerably, it was found that the experimental Group-A (brain gym exercise with aerobics) showed reductions in stress, depression, and anxiety greater than those of the control Group-B (conventional exercise) among college students.

Brain Gym exercise with an aerobics group helps to reestablish neural connections between the body and brain. The Brain Gym exercise influences attention and the ability to retain working memory. **Dennison** in 2018 stated that they are a sample and enjoyable exercise to enhance whole-brain learning. They are skills that can be used to enhance students' learning. Brain Gym exercises are suggested to be used to bring out the full potential of the students[2]. Integrating Brain Gym exercises with aerobic activities can be particularly effective in reducing stress, anxiety, and depression. Brain Gym focuses on movements that enhance cognitive function.

Brain-derived neurotrophic factor (BDNF) is understood to be an essential neurotrophin that modulates cognition, neuroplasticity, and angiogenesis and strengthens neural connectivity. Recent literature indicates that these biological activities are crucial in the development of learning and memory and contribute effectively to better academic performance and brain health.

In addition to playing an important role in several brain plasticity aspects, BDNF can act to regulate metabolic functions (fat oxidation and glucose uptake), contribute to cardiovascular improvement, and reduce the risk for neurodegenerative diseases. In this sense, the available evidence in the literature indicates that obesity and type 2 diabetes may have a negative regulation of BDNF levels compared to people who exercise regularly.

Current literature indicates that during this period, brain plasticity increases and that physical exercise practice can stimulate some markers, including the brain-derived neurotrophic factor (BDNF). It was observed that in all studies that adopted aerobic exercise programs, improvements in BDNF levels were detected, regardless of the adolescents' nutritional status (normal weight and overweight). Experimental and observational studies performed in adults and the elderly were analyzed, and the results indicated that there were improvements in BDNF levels after the intervention period with aerobic exercises; on the other hand, habitual physical activity was inversely correlated with peripheral BDNF. The study by **Feter et al.** discussed the dose-response relationship between BDNF concentration and the amount of physical activity or physical exercise in humans. The findings presented in this study reinforce the arguments that exercise promotes improvements in BDNF levels and that this increase is positively correlated with its intensity.

The BDNF protein is critical for acute cognitive performance in the short term and for brain morphology adaptations (e.g., plasticity) in the long term. The effects of BDNF isoforms on structural changes in the brain do not apply to studies of acute stress, as they are more likely to be chronic effects (which may be relevant to studies of long-term stress). Nevertheless, BDNF isoforms have also been observed to affect neuronal activity by being associated with cellular models of memory (i.e., long-term potentiation and long-term depression).

Approximately 70–80% of circulating plasma BDNF, both during exercise and at rest, originates from the brain. It appears that the brain is a mainstay for increasing BDNF plasma during exercise and recovery in healthy individuals.

CONCLUSION

The study was conducted to evaluate the effectiveness of brain gym exercise with aerobics on depression, anxiety, and stress among college students. The study concluded that both groups were effective in reducing depression, anxiety, and stress. However, **group A (brain gym exercise with aerobics)** was more effective than **group B (conventional exercise).**

COMPETING INTERESTS

In this study titled "**THE EFFECTIVENESS OF THE BRAIN GYM EXERCISE WITH AEROBICS ON**

ANXIETY, DEPRESSION, AND STRESS AMONG COLLEGE STUDENTS," The authors have no competing interests to declare.

ETHICAL APPROVAL

The present study was reviewed and approved by the Institutional Ethics Committee (IEC) of VELS INSTITUTE OF SCIENCE TECHNOLOGY AND ADVANCED STUDIES(VISTAS). Ethical clearance was obtained before the commencement of the study (IEC Approval Number: **SOPT/VISTAS/IEC/025/2025**, dated **30-01-2025**. Informed consent was obtained from all participants after explaining the nature, purpose, and potential risks of the study. Confidentiality and anonymity of the participants were maintained throughout the research process.

ACKNOWLEDGEMENTS

The author acknowledges the immense help received from the Scholars whose articles are cited and included in the references of this manuscript. The authors are also grateful to the authors/editors/publishers of all those articles, journals, and books from which the literature for this article has been reviewed and discussed.

FUNDING-NIL.

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