

# Effects of Brain Gym Exercises on Attention and Anxiety in Adolescents – An Experimental Study

Lubna Khan <sup>\*1</sup>, Rutika Shivdikar <sup>2</sup>, Ajay Kumar <sup>3</sup>.

<sup>\*1</sup> BPT Intern, DPO's NETT College of Physiotherapy, Thane, Mumbai, India.

<sup>2</sup> Assistant Professor, DPO's NETT College of Physiotherapy, Thane, Mumbai, India.

<sup>3</sup> Principal, DPO'S NETT College of Physiotherapy, Thane, Mumbai, India.

## ABSTRACT

**Background:** The common psychological difficulties in adolescents are anxiety states or minor depression and apart from that the attention span in adolescents is also shrinking as reported. The Brain Gym exercise is said to release learning blocks and cause improvement in areas such as memory, concentration, and focus. The goal of this study is to improve anxiety and attention in adolescents by performing brain gym exercises.

**Aim:** To study the effects of brain gym exercise on attention and anxiety in adolescents.

**Methodology:** The study employed an experimental study including 134 students within a 15-19 years age group, selected through purposive sampling. The primary outcomes are the Hamilton anxiety rating scale and the mindful attention awareness scale. Brain gym exercise was performed thrice a week for four weeks.

**Results:** A statistically significant improvement in anxiety and attention is observed with using brain gym exercise. The pretest mean anxiety score at week 1 was 18.46 and after four weeks the results showed a statistically significant decrease in anxiety with a mean score of 16.14. The pretest attention score in week 1 was 3.67 and the post-intervention score in week 4 was 3.98 showing a statistically significant increase in attention. The data was statistically significant with a p-value of <0.05.

**Conclusion:** The study concludes there's a significant effect of brain gym exercises in improving attention and anxiety.

**KEYWORDS:** Brain Gym Exercise, Anxiety, Attention, Adolescents, Hamilton Anxiety Rating Scale, The Mindful Attention Awareness Scale.

**Address for correspondence:** Lubna Khan, BPT Intern, DPO'S NETT College of Physiotherapy, Thane, Mumbai, India. **E-Mail:** [khanlubna0523@gmail.com](mailto:khanlubna0523@gmail.com)

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## INTRODUCTION

As WHO stated, "Adolescence is a process – a period of life as well as a series of rapid, varied, and extensive changes". A report on Adolescent health problems in India stated that this group is sometimes considered the healthy group and is not given attention by physicians as much as children and adults. They also reviewed the health problems in this age

group and said that one of the common psychological difficulties is anxiety or minor depression [1]. The prevalence of anxiety in this age group is estimated to be 3.6% in 10-14-year-olds and 4.6% in 15-19-year-olds [2]. According to some research apart from the psychological factors the attention span is also shrinking, the average attention span has been reduced from 12 seconds in the year 2000 to eight seconds now [3].

The directing of consciousness to perception or thought, a thing or a person is called Attention [4]. Possible factors for attention dysfunction in students are lack of stress management, lack of attention, physical problems, lifestyles, external factors like environmental noises, etc. [5] Lack of sleep can also harm functions essentials to academic success including attention [6]. Anxiety is a fearful and uneasy feeling that is characterized by apprehension, tension, trembling, restlessness, difficulty concentrating, and increased breathing and heart rate. Some of the most common causes of anxiety are high expectations from parents, peer pressure, trauma, substance abuse, and social media [7]. We also see anxiety in people when they are trying to reach a goal influenced by the anticipated judgment by others, episodes of failure, self-doubt, or anticipation of failure [8].

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 [9]. These activities can be used when we face challenges and all learning blocks can be released. According to brain gym literature, the brain activity is defined along three dimensions:

1. Laterality dimension (Stimulate)
2. Focusing dimension (Release)
3. Centering dimension (Relax) [10]

The 26 Activities that are used to stimulate these dimensions are described as Midline movements for the Laterality dimension which help to integrate the left and right sides of the brain and body, Lengthening activities for Focusing dimensions will help them reinforce the neural pathways to make connections between what they know, in the back of the brain and the ability to process that information in front of the brain, and Energy exercise for the Centering dimension which relaxes the system and helps people in processing information. These activities establish neural pathways and connections between the body and brain, facilitating the flow of electromagnetic

energy throughout the body, and activating and focusing the higher brain centers [10].

Physical activity reduces distress as it leads to psychological interactions, maintains cognitive functions, and reduces anxiety and depression, hence we aimed to study the effects of brain gym exercise on attention and anxiety in adolescents.

## METHODOLOGY

**Type of Study:** Experimental study

**Sample size:** 134

**Sample population:** Students - both genders in the age group 15–19 years

**Sampling method:** Purposive sampling

**Place of study:** St Marys Convent High School and Junior College, Mumbra, Thane.

### INCLUSION CRITERIA:

- Students willing to participate.
- Age group within 15-19 years of age.
- Both the genders.
- Participants having mild, moderate, and severe anxiety using the screening tool Hamilton anxiety rating scale.

### EXCLUSION CRITERIA:

- Participants not willing to participate
- Students diagnosed with psychological condition
- Undertaking psychotic drugs
- Students below 15 and above 19 years of age.
- Unable to understand the scales

### Outcome Measures:

- The Hamilton Anxiety Rating Scale
- The Mindful Attention Awareness Scale (MAAS)

**Procedure:** Ethical clearance from the institutional ethical committee was taken before conducting the study. A letter seeking permission to conduct the study at St Mary's Convent High School and Junior College, Mumbra, Thane was submitted to the principal. Permission was granted to conduct the study.

Participants were selected according to the inclusion and exclusion criteria and who were

willing to participate. A written informed consent was taken in the language best understood by them. The procedure and purpose of the study were explained to the participants before the assessment. The study includes 134 students between the age group 15 – 19 years. The demographic data, BMI, and the class of study were noted before the assessment. A Pre-test was done for attention and anxiety using the Mindful Attention Awareness Scale and the Hamilton Anxiety Rating Scale respectively and the readings were recorded. The participants then performed the exercises in the presence of the therapist thrice a week for four weeks. the exercise includes:

- 1. Drinking Water:** Before the exercise starts.
- 2. Spot Marching:** Stand straight and lift both legs alternatively above for one minute as a warm-up exercise.
- 3. Cross Crawl:** In standing lift one leg towards the chest and try to touch the knee with the opposite elbow and repeat the same on the other side for 5 sets of 8 repetitions. It's Used to improve the coordination between both sides of the brain.
- 4. Hook-ups:** In standing interlock hands, keep them near the chest, also interlock feet, and take deep breaths with eyes closed for 2 minutes. It is used for relaxation.
- 5. Neck Rolls:** The neck is moved in circular motions for 20 repetitions which Helps to reduce stress on the neck muscle.
- 6. Positive Points:** Breathe deeply and gently press the eyeballs with eyes closed for 1 minute. It improves stress levels and memory.
- 7. Gravity Glider:** Sit comfortably by crossing the ankles and keeping the knees relaxed, bending forward to reach out in front, and letting the arms glide down while exhaling and up, inhaling for 10 repetitions. It improves the blood and oxygen flow and boosts confidence.
- 8. Earth Buttons:** Rest one hand on the chest and place the palm of the other hand over the navel then breathe deeply, look at the ceiling and floor gradually just by moving eyes for 10 repetitions. Improves mental awareness and whole-body orientation.

**9. A lazy 8's:** Extend the hand and make a figure of eight horizontally in front for 10 repetitions. This helps in boosting eye muscle control, balance, and concentration.

**10. The Energy Yawn:** Place the index and middle finger over the Jaw muscles on both sides and massage the Jaw muscles gently with adequate pressure, then open your Jaw in a long yawning motion followed by gently closing the jaw for 10 repetitions. This improves oxygenation.

**Data Analysis and Interpretation**

The data was collected. A normality check was done for the data and it was noticed that data failed the normality test hence Wilcoxon signed-rank test was performed to compare pre and post-anxiety in adolescents.

Friedman repeated measures ANOVA was performed to compare anxiety and attention pretest scores and post-test scores at different weeks. Dunn’s post hoc test was performed to compare within which pair of weeks, there was a difference.

The significance level for all PRE-POST statistical tests for week 1 was  $p > 0.05$ .

The significance level for all PRE-POST statistical tests for week 2,3,4 was  $p < 0.05$ .

**RESULTS**

A total of 134 participants in the Age range of 15- 19 years were assessed and included in the study.

**Table 1:** Showing gender distribution of participants included in the study.

Gender	Frequency	Percent
Females	97	72.4
Males	37	27.6
<b>Total</b>	<b>134</b>	<b>100</b>

There were 72.4% female and 27.6% male adolescents included in the study.

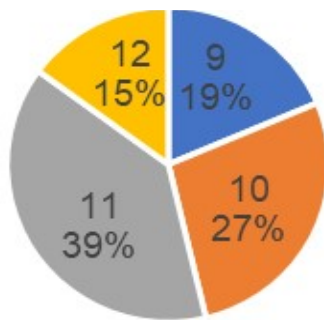
**Table 2:** Showing Mean of Age, Height, Weight, and Hamilton scale scoring among participants.

Descriptive Statistics	Mean	Std. Deviation
Age	16.03	1.14
Height	159.22	11.96
Weight	49.37	10.19
<b>Hamilton scale scoring</b>	<b>18.5</b>	<b>4.54</b>

The above table depicts the Mean age of adolescents as 16.03 years, the Mean height

as 159.22 cm, the Mean weight as 49.37 kgs, and the Mean Hamilton scale scoring as 18.50.

Class of study

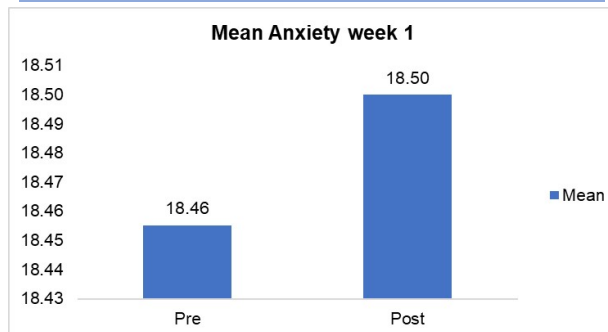


**Table 3 and Fig.1:** Representation of class of study

The above table depicts that 18.7% of adolescents were studying in the 9<sup>th</sup> class. 27.6% of adolescents in the 10<sup>th</sup> class. 38.8% were in the 11<sup>th</sup> class and 14.9% of adolescents were in the 12<sup>th</sup> class.

**Table 4.** Evaluating anxiety pretest scores at different weeks.

Anxiety Pre test	Mean	Std. Dev	Friedman F statistic	p-value
Week 1	18.46	4.57	292.08	<0.001
Week 2	18.5	4.54		
Week 3	18.08	4.21		
Week 4	17.15	4.26		



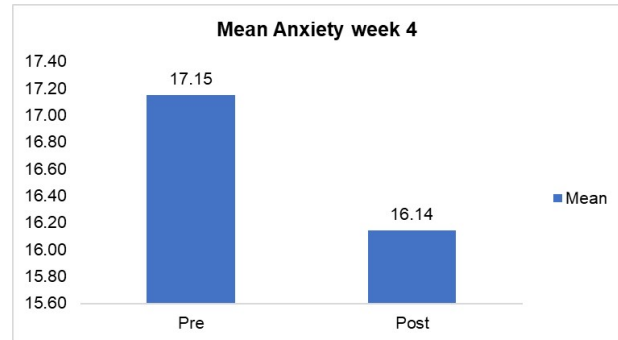
**Fig.2:** Representation of pre and post-values of anxiety at week 1.

**Inference:** <0.05 statistically significant

**Interpretation:** Friedman repeated measures ANOVA was performed to compare anxiety pretest scores at different weeks. It was found that It was significantly decreasing. The Pre-test anxiety score in week 1 was 18.46, at week 2 was 18.50, at week 3 was 18.08 and in week 4 was 17.15. Dunn’s post hoc test was performed to compare within which pair of weeks, there was a difference. It was found that there was a difference between (week 1, week 3), (week 1, week 4), (week 2, week 3), (week 2, week 4) and (week 3, week 4) (p<0.05).

**Table 5:** Evaluating Anxiety post-test scores at different weeks.

Anxiety Post-test	Mean	Std. Dev.	Friedman F statistic	p-value
Week 1	18.5	4.54	342.08	<0.001
Week 2	18.21	4.36		
Week 3	17.15	4.26		
Week 4	16.14	4.19		



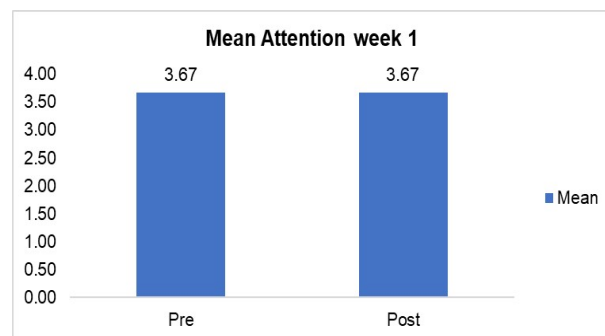
**Fig.3:** Representation of pre and post-values of anxiety at week 4.

**Inference:** <0.05 statistically significant

**Interpretation:** Friedman repeated measures ANOVA was performed to compare anxiety post-test scores at different weeks. It was found that It was significantly decreasing. The post-test anxiety score in week 1 was 18.50, in week 2 was 18.21, in week 3 was 17.15 and in week 4 was 16.14. Dunn’s post hoc test was performed to compare within which pair of weeks, there was a difference. It was found that there was a difference between (week 1, week 3), (week 1, week 4), (week 2, week 3), (week 2, week 4) and (week 3, week 4) (p<0.05).

**Table 6:** Evaluating Attention pretest scores at different weeks.

Attention Pre test	Mean	Std. Dev.	Friedman F statistic	p-value
Week 1	3.67	0.52	348.87	<0.001
Week 2	3.67	0.52		
Week 3	3.75	0.52		
Week 4	3.85	0.52		



**Fig .4:** Representation of pre and post-value of attention at week 1.

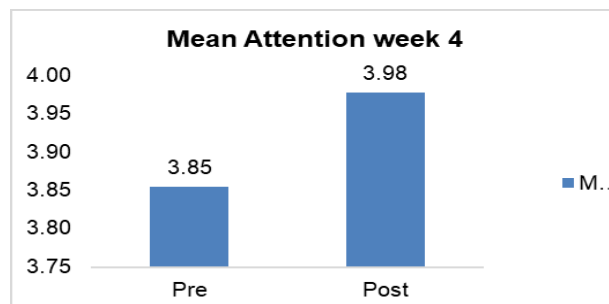
**Inference:** <0.05 statistically significant

**Interpretation:** Friedman repeated measures ANOVA was performed to compare attention pretest scores at different weeks. It was found that it was significantly increasing. The pretest attention score in week 1 was 3.67, in week 2 was 3.67, in week 3 was 3.75, and in week 4 was 3.85. Dunn’s post hoc test was performed to compare within which pair of weeks, there was a difference. It was found that there was a difference between (week 1, week 3), (week 1, week 4), (week 2, week 3), (week 2, week 4), and (week 3, week 4) ( $p < 0.05$ ).

**Table 7:** Evaluating Attention post-test scores at different weeks.

Attention Post-test	Mean	Std. Dev.	Friedman F statistic	p-value
Week 1	3.67	0.52	369.07	<0.001
Week 2	3.75	0.52		
Week 3	3.85	0.52		
Week 4	3.98	0.52		

The analysis shows a statistically significant difference in pre and post-intervention for both anxiety and attention with  $p < 0.05$ .



**Fig.5:** Representation of pre and post-values of attention at week 4.

**Inference:**  $<0.05$  statistically significant

**Interpretation:** Friedman repeated measures ANOVA was used to compare attention post-test scores at different weeks. It was found that it was significantly increasing. post-test attention score in week 1 was 3.67, in week 2 was 3.75, in week 3 was 3.85 and in week 4 was 3.98. Dunn’s post hoc test was performed to compare within which pair of weeks, there was a difference. It was found that there was a difference between (week 1, week 2), (week 1, week 3), (week 1, week 4), (week 2, week 3), (week 2, week 4) and (week 3, week 4) ( $p < 0.05$ ).

**DISCUSSION**

As stated by WHO Adolescence is a process and a period of life. It’s a period of life between

childhood and adulthood which ranges from 10 -19 years of age. There’s also a chain of anatomical, biochemical, and mental changes[1].

The prevalence of anxiety in this age group is estimated to be 3.6% in 10-14 years old and 4.6% in 15-19 years old [2] and the average attention span has been reduced from 12 seconds in the year 2000 to eight seconds now [3].

In a study by Dr. Chaitanya Kulkarni, they gave brain gym exercises to 60 adults within the age group 18–24 years old to improve their attention span where pre-intervention the population had grade six. they asked the participants to perform the exercise every day for a month at home daily, the result showed significant improvement in attention span with a p-value = 0.0001 with grades improving to grades 3 and 2[5]. Since their study showed a statistically significant improvement in attention in adults, our study was based on this to improve the attention in adolescents in the age group 15-19 years old where we advised them to thrice a week under supervision which gave us significant improvement in attention in adolescents at two weeks with a p-value  $< 0.05$ .

A similar study was done in Indonesia by Almeida Effendy where they gave brain gym exercises to 68 elderly population aged  $> 60$  for eight weeks to improve their sleep quality and anxiety, The study gave us the conclusion that brain gym is effective in improving anxiety and sleep quality in the elderly population with p-value  $< 0.001$  [11]. We in our study have proven that brain gym exercise is also effective in the adolescent age group for anxiety with a significant p-value  $< 0.05$  at three weeks.

Similar studies were done on the younger population within the age group 7 to 10 years for 12 weeks with a significant improvement of p-value  $< 0.0001$  on postural control in students experiencing hearing impairment [12]. Another study done on children with disabilities such as autism and developmental delays within an age group of 6-9 years old for 7-8 weeks proved significant improvement in their academic engagement [9].

However, our study in this regard is different from these previous studies as we have included the younger population concerning anxiety and



attention problems taking these previous studies for reference.

In this study, A total of 134 participants of the age group 15-19 years were included among which there were 97 females and 37 males. the participants were given brain gym exercises for four weeks to the adolescent age group for attention and anxiety.

The pretest mean anxiety score at week 1 was 18.46 and after four weeks the results showed a statistically significant decrease in anxiety with a mean score of 16.14. The pretest attention score in week 1 was 3.67 and the post-intervention score in week 4 was 3.98 showing a statistically significant increase in attention. The data was statistically significant with a p-value of <0.05.

The mechanism responsible for the improvement observed is through activities establishing neural pathway connections between body and brain, facilitating the flow of electromagnetic energy throughout the body, activating and focusing the higher brain centers for fine motor skills and new learning which creates wakefulness and promotes focus and attention [10].

### Limitation

1. Unequal gender distribution as the majority of the male population was rejected to participate as per criteria.
2. A comparative study can be done for a summative assessment of the concentration.

### CONCLUSION

According to the findings Marked reduction in anxiety is seen on the Hamilton anxiety rating scale and an increase in attention is seen on the Mindful attention awareness scale.

Hence this study concludes that BRAIN GYM EXERCISES are effective in the adolescent population for improving attention and anxiety levels.

**Conflicts of interest: None**

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