RESEARCH PAPER

A Study on the Effects of Neuroplasticity Driven Brain Gym Interventions on Attention among College Students

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ABSTRACT

Introduction: Neuroplasticity enables the brain to adapt and improve its functions in response to experience. Brain Gym, a set of structured physical and mental exercises, may enhance attention by stimulating these adaptive processes. This study explores the impact of neuroplasticity-driven Brain Gym interventions on attention among college students, aiming to provide practical insights into strategies that support cognitive performance in academic settings.
Aim of the Study: The aim of the study was to evaluate the effects of neuroplasticity driven brain Gym interventions on attention among college students.

Objectives of the Study:
- To evaluate the effect of neuroplasticity-based Brain driven interventions on attention levels among college students
- To compare pre- and post-intervention attention scores to assess the effectiveness of neuroplasticity-based Brain driven interventions in stimulating attentional networks.

Method: 100 Subjects from both the genders, in the age group of 18-22 years, who were noticed as suffering from attention deficit, were separated into two groups, namely A & B. 50 subjects (A-experimental group) were given neuroplasticity driven brain gym interventions and the remaining 50 subjects (B-control group) were given awareness program of brain gym exercises for a period of 8 weeks, one hour per day for 5 days per week for 8 weeks. The outcome measure used was Mindful attention awareness scale.

Result: The data collected were statistically analysed by paired t-test. From the result of the statistics, it was found out that the attention span of the subjects was increased.

Conclusion: The study concluded that the neuroplasticity driven brain Gym interventions were effective on attention among college students.

Keywords: *Neuroplasticity, Brain gym exercise, cognition, attention, attention deficit, Mindful awareness attention scale.*
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INTRODUCTION

Neuroplasticity, the brain's remarkable ability to reorganize and adapt in response to experiences, has become a cornerstone in cognitive enhancement strategies. Recent research suggests that targeted interventions can harness this adaptability to improve specific cognitive functions, including attention. Brain Gym, a series of structured physical and cognitive exercises, has been proposed as a practical approach to stimulate neuroplastic changes. Among college students, who often face academic and environmental demands that challenge sustained attention, interventions that enhance focus and cognitive efficiency are particularly relevant. This study aimed to evaluate the effects of neuroplasticity-driven Brain Gym interventions on attention levels among college students, providing insights into the potential of integrative mind-body exercises in cognitive development.

Attention is a fundamental cognitive function that enables individuals to focus selectively on specific stimuli while ignoring irrelevant information. It plays a critical role in learning, memory, and daily functioning. Deficits in attention can significantly impact academic performance, work productivity, and overall quality of life, especially in children, older adults, and individuals with neurological or

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psychological conditions (Posner & Petersen, 1990).

Neuroplasticity, the brain's ability to reorganize and form new neural connections in response to learning or environmental stimulation, has opened promising avenues for enhancing attention through targeted cognitive and physical interventions (Kolb & Gibb, 2011). Recent advances in neuroscience highlight that engaging the brain in coordinated, purposeful movement patterns can stimulate cortical reorganization and enhance cognitive functions, including attention (Draganski et al., 2004).

Brain Gym® exercises, developed by Dennison and Dennison (1989), are a series of simple, coordinated physical activities designed to enhance brain function by stimulating both hemispheres and promoting integration of sensory-motor and cognitive pathways. These movements are believed to activate neural circuits associated with focus, concentration, and emotional regulation. Although Brain Gym has gained popularity in educational and therapeutic contexts, its mechanisms are increasingly being examined in light of neuroplasticity theory (Hannaford, 2005; Ratey, 2008).

Recent studies suggest that neuroplasticity-based physical interventions, including Brain Gym exercises, may be effective in improving attention in both clinical and non-clinical populations. However, further empirical validation is required to establish their efficacy and underlying neural mechanisms.

AIM OF THE STUDY

The aim of the study was to evaluate the effects of neuroplasticity driven brain Gym interventions on attention among college students.

OBJECTIVES OF THE STUDY

The objectives of the study were as follows:

1. To evaluate the effect of neuroplasticity-based Brain driven interventions on attention levels among college students
2. To compare pre- and post-intervention attention scores to assess the effectiveness of neuroplasticity-based Brain driven interventions in stimulating attentional networks.

RESEARCH DESIGN AND METHODOLOGY

A study was conducted for a period of 8 weeks, where 100 samples were recruited for the study based on the inclusion and exclusion criteria.

Study Design

A pre-test, post-test experimental design was adopted to evaluate effect of neuroplasticity-based Brain driven interventions on attention levels among college students

Sample Size Calculation

The required sample size was calculated using G*Power software (version X.X) for repeated-measures ANOVA with two groups (intervention and control) and two time points (pre- and post-intervention). The calculation was based on the following assumptions:

- Effect size (f) = 0.25 (moderate effect, derived from prior studies on neuroplasticity-based interventions for cognitive outcomes)
- α (significance level) = 0.05, Power (1-β) = 0.80
- Number of groups = 2 (intervention vs. control)
- Number of measurements = 2 (baseline and post-test)

Based on these parameters, the minimum required sample size was 86 participants. To account for potential attrition or incomplete data (estimated at 10–15%), the sample size was increased to 100 participants. Therefore, a total of 100 participants were recruited for the study, with equal allocation to the intervention group (n=50) and the control group (n=50).

Participants Recruitment

Inclusion criteria:

- Age ranging between 18-22yrs
- Both the genders can participate
- Under and Post graduate college students are included
- Willing to participate

Exclusion criteria:

- Those who are having difficulty to comprehend language
- Those who are having auditory or visual disorder
- Previous history of depression or psychosis
- Those who have undergone eye surgeries
- Smart phone adductors

Participants were recruited through posters, email circulars, and classroom announcements in the university. Written informed consent was obtained before enrolment.

Outcome Measures

Attention

MATERIAL USED

- Mindful Attention Awareness scale (MAAS)

PROCEDURE

It was an experimental study, where 100 samples were recruited based on the inclusion and exclusion criteria. Written informed consent was obtained from the samples. The total number of samples was divided into two groups, Group A and B namely experimental and control group. The experimental group was given neuroplasticity driven brain gym interventions for a period of 8 weeks. Control group was given the awareness program of brain gym exercises. Outcome measures were applied. Pre and post test scores was analysed based on the statistical analysis. Also, the reliability and validity of the outcome measures were verified. Totally Neuroplasticity driven brain gym interventions was given to the samples for a duration of 50 min/day under the supervision of therapist, for 5 days per week for 8 weeks.

PROTOCOL

Group A-Experimental Group
Sessions were supervised by a trained physiotherapist to ensure adherence and correct performance of the exercises.

Neuroplasticity driven brain gym interventions was given to the Group A (Experimental group) samples which included the following:

Group A-Experimental Group

Brain gym exercises includes:

- Lazy Eight
- Brain button
- Cross crawl
- Hook up
- Elephant trunk swing
- Double Doodle
- Energy Yawn
- Ankle cross
- Finger Tapping(Mirror motion)
- Positive points

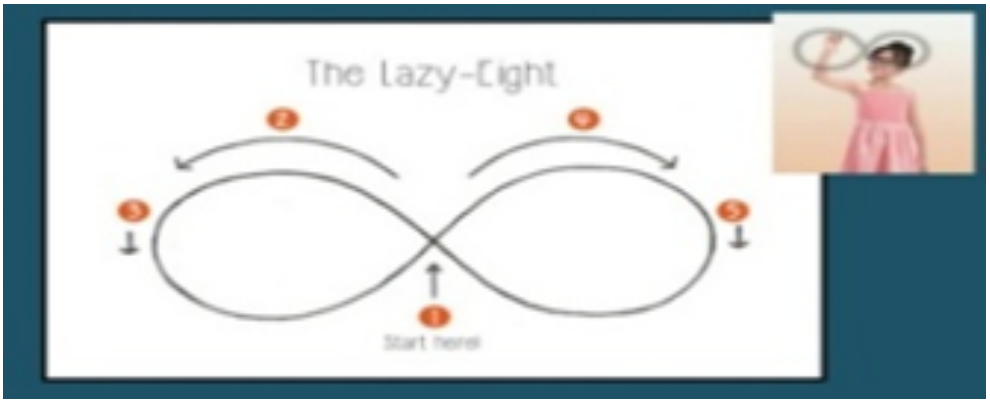


Fig:1LazyEight

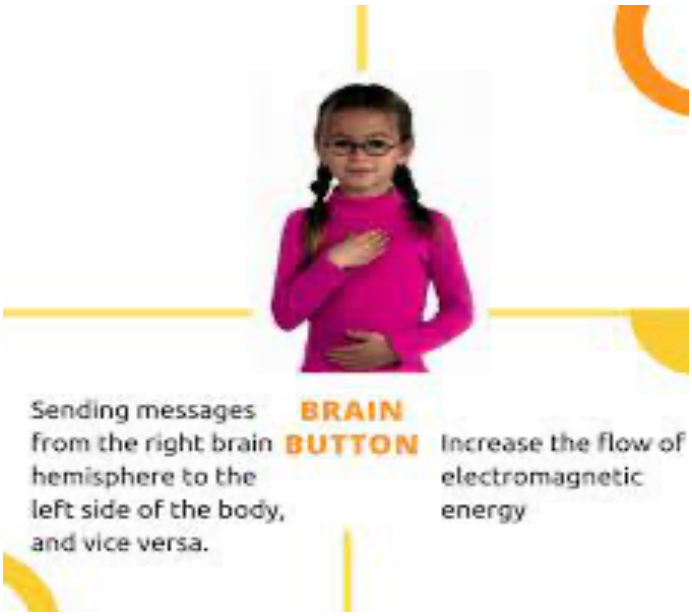


Fig:2 Brain Button

Fig:3 Cross crawl

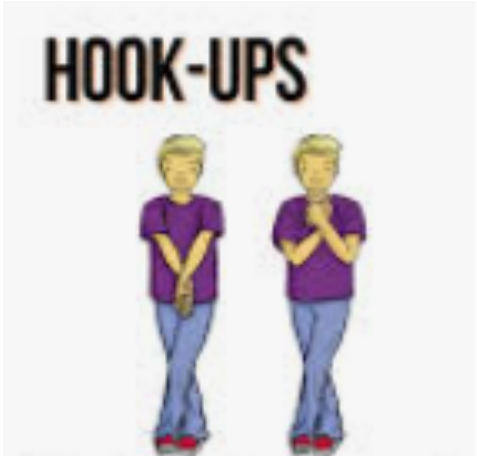


Fig:4 Hook up

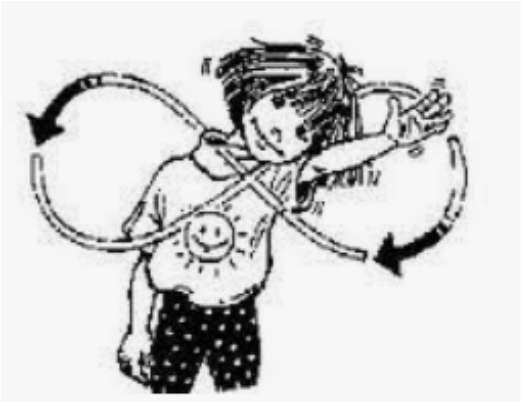


Fig:5 Elephant Trunk Swing

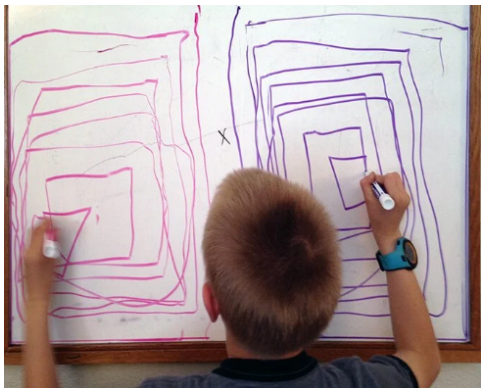


Fig:6 Double Doodle

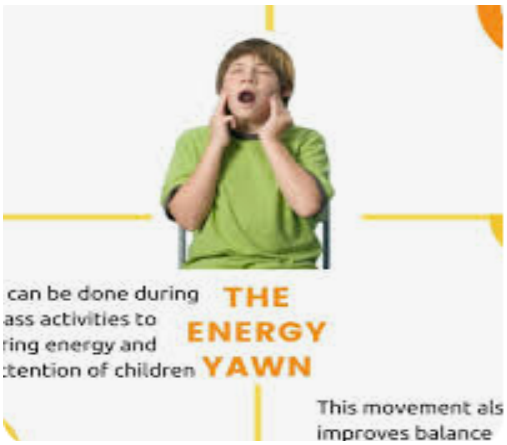


Fig:7 Energy Yawn

Fig:8 Ankle Cross

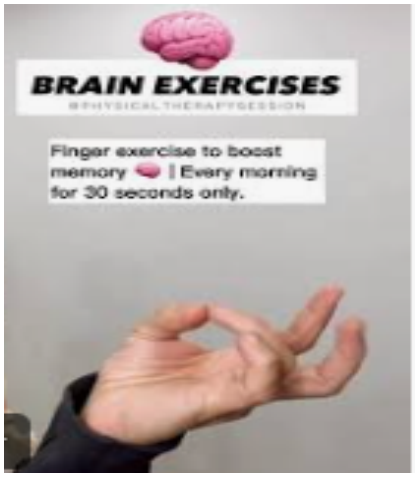


Fig:9-Finger Tapping

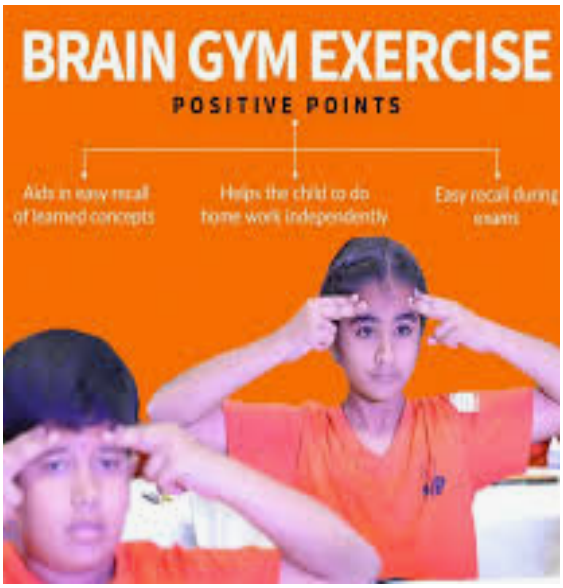


Fig:10 Positive points

All the exercises were performed one session/ day , each for 5 min making a total of 50min and with an initial warm up for 5 min and intermediate rest of 5 min making a total of one hour per day for 5 days per week.

Group B-Control Group

Control group(Group B) was given the awareness program of brain gym exercises. Outcome measures were applied. Pre and post test scores was analysed.

DATA ANALYSIS

Data analysis was done. Pre test and post test values of the control group and experimental group were statistically analysed by means of t-test. The post test values of experimental and control group were analysed. The significance levels used for this study was P<0.05.

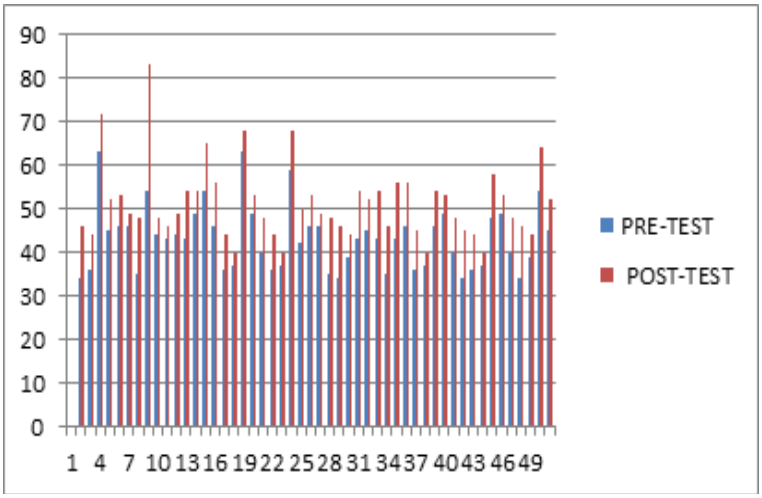
Experimental Group-Group A- Neuroplasticity driven brain gym interventions.

Table :1 Paired Samples Statistics

Mean		N	Std. Deviation	Std. Error Mean	
Pair 1	Pre_Test	43.20	50	7.323	1.036
	Post_Test	51.32	50	8.615	1.218

Table: 2 Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pre_Test - Post_Test	-8.120	4.345	.615	-9.355	-6.885	-13.213	49	.000



Graph: 1-Group A-Graphical representation of Pre and Post test scores of MAAS

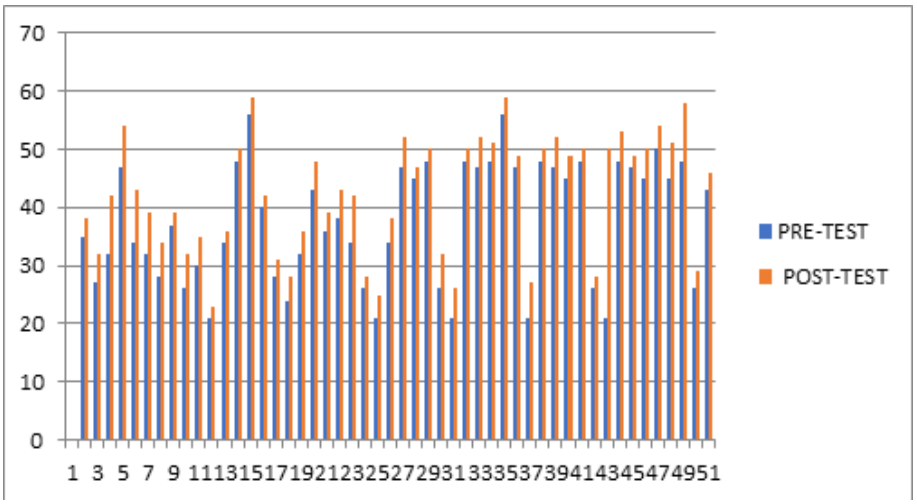
Control Group-Group B-Awareness Program of Brain gym

Table: 3 Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre_Test	37.68	50	10.356	1.465
	Post_Test	42.40	50	10.024	1.418

Table: 4 Paired Sample Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pre_Test - Post_Test	-4.720	4.101	.580	-5.885	-3.555	-8.138	49	.000



Graph: 2-Group B-Graphical representation of Pre and Post test scores of MAAS

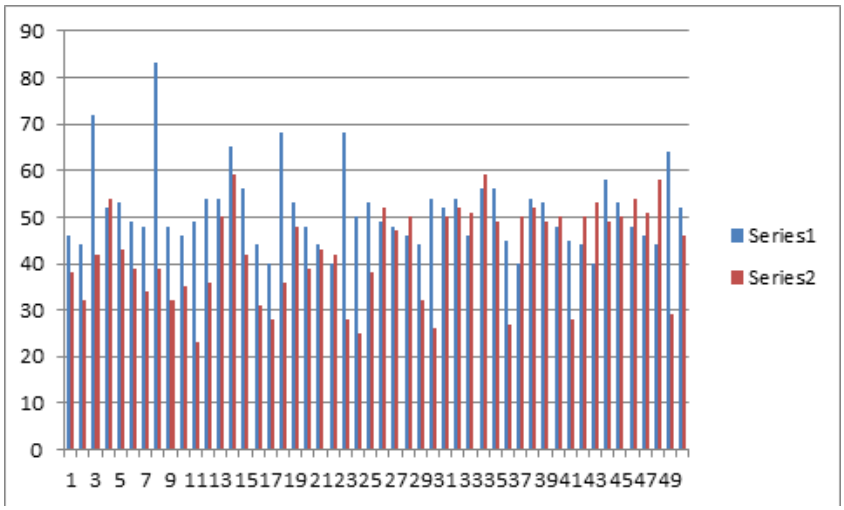
Comparison of post test of Experimental and Control Group

Table 3: Comparison of post test scores of Group A vs Group B

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Post_TestA	51.32	50	8.615	1.218
	Post_TestB	42.40	50	10.024	1.418

Table 4: Comparison of post test scores of Group A vs Group B Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Post_TestA - Post_TestB	8.920	13.235	1.872	5.159	12.681	4.766	49	.000



Graph: 3-Graphical representation of post test scores of Group A vs Group B of MAAS

RESULT

When comparing the outcomes between the two groups, the magnitude of improvement was found to be much greater in the experimental group, with the difference reaching statistical significance ($p < 0.001$). These results strongly suggest that Neuroplasticity driven brain gym interventions had a meaningful and positive impact on improving students' attention levels beyond the effects of standard classroom exposure.

DISCUSSION

The statistical analysis indicated that the mean post-test attention score of the experimental group (51.3) was notably higher than the mean pre-test score (43.2), suggesting a substantial improvement in attentional capacity following the intervention. On the other hand, the control group also demonstrated a minor increase in mean post-test scores (42.4) compared to pre-test scores (37.6). This could be attributed to natural adaptation to test familiarity, general classroom activities, or other extraneous factors. However, the magnitude of improvement was much greater in the experimental group, and the difference between the two groups was statistically significant ($p < 0.001$). This finding strongly indicates that Neuroplasticity driven brain gym interventions played a crucial role in enhancing the attentional performance of the students.

Comparison with Previous Studies

The outcomes of the present study are consistent with the findings of **Yang Liu (2021)**, who emphasized that students' attention can be improved through enhancement of attention, memory, and executive functions by applying the principles of information processing theory. Liu further highlighted that interventions such as mindfulness meditation strengthen cognitive processes and help in improving academic performance. Similarly, the current study demonstrates that Brain Gym exercises—which emphasize structured movements that integrate physical and cognitive activities—have a comparable role in stimulating neuroplastic changes that result in improved attention.

In addition, the findings corroborate the results of **Kulkarni (2019)**, who reported that Brain Gym exercises produced significant improvements in attention skills among young adults. These exercises, which involve cross-lateral movements, coordination tasks, and breathing patterns, are believed to enhance neural connectivity and promote efficient hemispheric communication. By doing so, they strengthen the neural networks responsible for attentional control. The agreement between the current findings and previous studies strengthens the reliability of the present conclusions.

Other studies also lend support to the observed effects. For example, **Dennison and Dennison (2005)** originally proposed Brain Gym as a method to integrate body and mind functions, thereby improving learning and concentration. More recently, **Reddy et al. (2020)** demonstrated that structured movement-based interventions improved both short-term and sustained attention among college students, attributing the improvements to neuroplastic adaptations. Taken together, these findings highlight that Brain Gym may serve as an effective adjunct tool in educational and therapeutic settings.

Possible Mechanisms

The improvement in attention observed in this study can be explained through the lens of neuroplasticity. Neuroplasticity driven brain gym interventions involve repetitive, structured movements that require coordination, cross-midline activity, and sensory-motor integration. Such activities stimulate the prefrontal cortex, parietal cortex, and cerebellum, which are key regions involved in attentional control. Neuroplasticity refers to the brain's ability to reorganize neural pathways in response to learning and practice. Through consistent engagement in Brain Gym exercises, students may have reinforced existing neural connections while forming new pathways that support attentional processes.

Additionally, these exercises integrate motor activity with cognitive engagement, which could lead to improved blood flow, increased oxygenation, and heightened arousal of the central nervous system. These physiological changes

may contribute to improved vigilance, concentration, and sustained attention.

Implications of the Study

The results of the present study carry important implications for both educational and clinical practice. In the academic setting, students often face challenges related to distraction, reduced concentration, and cognitive fatigue. Incorporating Brain Gym exercises as a brief intervention before classroom sessions or examinations could enhance students' attention, leading to better learning outcomes. For physiotherapists and educators, this suggests a non-invasive, cost-effective, and easy-to-administer tool for promoting mental well-being and academic performance among young adults.

From a neuro-rehabilitation perspective, the study supports the application of movement-based interventions for cognitive enhancement. While Brain Gym has often been used in children with learning difficulties, its demonstrated effects among college students broaden its potential application to older populations, including patients with neurocognitive impairments.

Strengths and Limitations

One of the strengths of this study lies in its randomized allocation and inclusion of a control group, which adds validity to the findings. Furthermore, the sample size of 100 participants enhances the generalizability of results.

However, certain limitations should be acknowledged. The study duration was relatively short, and long-term effects of Neuroplasticity driven brain gym interventions were not assessed. Moreover, the intervention was conducted in a controlled environment, which may differ from real-world classroom or clinical settings. Self-reported motivation and compliance levels of students could also have influenced outcomes. Finally, while attention was measured using standardized tests, additional neuroimaging or neurophysiological measures (such as EEG) could have provided deeper insights into the underlying neural changes.

Future Directions

Future research could extend the duration of Neuroplasticity driven brain gym interventions and evaluate the sustainability of attention improvements over time. Studies could also include neurophysiological assessments to directly measure neuroplastic changes. Furthermore, comparative studies between Brain Gym, mindfulness, and other cognitive enhancement interventions could provide clarity on the most effective methods for improving attention. Expanding research to include populations with neurological conditions, such as ADHD or post-stroke cognitive impairment, may also broaden the clinical applicability of these findings.

CONCLUSION

In conclusion, the present study provides strong evidence that neuroplasticity-driven Brain Gym interventions significantly improved attention among college students, with the experimental group showing superior gains compared to the control group. Supported by previous literature, these findings emphasize the value of Neuroplasticity driven brain gym interventions as an accessible, non-invasive, and effective approach to enhancing cognitive performance. With further validation and long-term studies, Neuroplasticity driven brain gym interventions have the potential to become a valuable tool in both academic and therapeutic settings. Thus, the study concluded that the neuroplasticity driven brain Gym interventions were effective on attention among college students**.**

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