



## SCOPING REVIEW

### ADVANCING REHABILITATION: CURRENT CONCEPT, LIMITATION AND FUTURE TRENDS OF BRAIN GYM IN REHABILITATION -A SCOPING REVIEW

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## ABSTRACT

### Background:

Brain Gym is a set of movement-based exercises designed to enhance cognitive functions. It is increasingly being incorporated into rehabilitation strategies.

### Objectives:

To evaluate current concepts, limitations, and future trends of Brain Gym in rehabilitation.

### Methods:

This scoping review included studies from 2013-2023 obtained from PubMed, EBSCO Host, and Google Scholar, focusing on randomized control trials and cohort studies in English.

### Results:

Out of 69 initially identified studies, 19 met inclusion criteria. The reviewed literature suggests that Brain Gym exercises contribute to improved cognitive function, sleep quality, reduced dementia, and enhanced academic performance.

### Conclusions:

Brain Gym appears promising in rehabilitation, especially for cognitive enhancement, but more standardized and evidence-based research is needed to support its clinical application.

## KEYWORDS

Brain Gym, Cognitive Rehabilitation, Dementia, Sleep Quality, Physical Therapy

## INTRODUCTION

Brain Gym, created by Paul and Gail Dennison in the 1970s, is a kinesiology-based educational program designed to enhance learning and cognitive function through specific physical movements. It includes 26 core exercises believed to promote neural remodeling, fostering integrated brain activity for whole-brain learning (1). These deliberate movements and processes aim to improve focus, memory, academic skills like reading, writing, math, and test-taking, as well as physical coordination, personal responsibility, organization, and mindset, supporting the development of a balanced personality (2). Brain Gym is used globally in schools to boost students' cognitive abilities and coordination, in workplaces to enhance employee productivity across skill

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levels, in athletics to improve individual and team performance, and as a personal growth tool for rapid transformation in areas where individuals feel stuck. Movement is essential for brain function and learning, and physical activity can reduce brain atrophy, minimize white matter lesions, and enhance cognitive performance, particularly in older adults with depression or neurological conditions (3). By combining kinesthetic and tactile learning with visual and auditory exercises, Brain Gym activates both brain hemispheres, promoting sensory integration, motor learning, and a stronger brain-body connection (4). In physiotherapy, it complements efforts to optimize activity, social engagement, and quality of life for those with acute or chronic conditions. Unlike aerobic exercise, which focuses on physical fitness, Brain Gym targets cognitive enhancement through movement, strengthening neural pathways, reducing stress and depression, improving cognitive perception, adapting motor patterns, and enhancing biomechanics. Simple and free of adverse effects, these exercises are accessible and effective across all age groups, making Brain Gym a valuable tool for mental and physical well-being in education, workplaces, athletics, and rehabilitation, ultimately improving quality of life through a holistic mind-body approach (5).

## **MATERIALS AND METHODS**

### **Study Design:**

Scoping Review

### **Participants:**

Articles published between 2013-2023 involving individuals of all age groups with cognitive or physical impairments.

### **Materials:**

Published research articles from PubMed, EBSCO Host, and Google Scholar.

### **Procedures:**

A keyword-based search strategy was employed. Duplicates were removed, and full-text screening was done to finalize relevant studies.

### **Statistical-Analysis**

Descriptive synthesis based on study objectives and results.



YL-R	AUTHOR	TIME	ifETBODOLOGY	co:-.CLUSIO◆/RESULT
1)2023	Diana Shanty, Budi Suse,tyo, Imas Diana Aprilia	Bra.in Gym Improves Concentration Leaming to Read Children v,-ith Special Le.aming Difficulties.	<p><b>I.METHOD</b> :-The method used in this research is a descri.ptn-e method with a qualitati\·e approach. <b>Data obtam.ed dtroa◆la obse.n·afi.oa, intenifln, se.mi-worlulaops and ,alidation..</b></p> <p>◆e research use!anempiric.a.l-rational approach, meaning that data is collected according to the objecti\·es and rationally dra""-s conclusions that can be drawn from the collected data.</p> <p>The researchers oollaborated ,-,,-ith the te.ac:her to de·elop a brain gym prog,am which ,v.sthen,"3!idated in hvo different :schools.</p>	<p>1. coxcu;s10N: Tws stndy concludes that brain grm ex.erc.JSes are effective in the unpro·ement of the concentration leaming in children</p> <p>2. RESULT: Th-e result!! showed that the de\·elopment of a brain gym program to improve the concentration ability to learn to read m children with specific leaming difficulties could be implemented properly, through '3e\·eral bra.in gym mm·ements which function to balance the left brain and right brain, so that the mind becomes more Easy to capture infoi:ma.tiou..</p>
2)2021	Ar.a.celi Can◆ Estradal,• , Bra.in Gym on Jimenez- Global Cognitn-e Mendoza2 Function of Denny Irititutionalized Contrer.a.s- Older People.. Guerrero 1 , Mario Hem.andes- Alejandro 3 and .Andres Sala.3-Ca.sa	The Effect of Bra.in Gym on Global Cognitn-e Function of Irititutionalized Older People..	<p><b>I.METHOD:</b>The study ls a non-randomized quasisexperimenbl one us;ing Araceli pro◆and post-tecst control group design. The participants of the study were 65 years old or older who had been part of gerontological centers from a local oommu.mty. They were cli,-ided into m-o groups: control and intervention, eachone ""-ith 15 people.</p> <p><b>iuni-Ahntal State Examination (MA1"SI:)</b> was applied to all participants to determine their global oognitive function.The interpretation in the result! of the\·fMSE is that if the ?-,D,!SE ,:-afue is in the range 24-30, then it is included in the categoiy ofnnonna.l cogniti""e function, while ifit is less than or equal to 23, then it indicates reduced cognitfre functiomug.</p> <p>◆ Inclmion criteria i) aged 65 years old or above, ii) attended a gerontological center between 6 month and 3 years, iii) absence of a cl.in.ical diagnosu of dementia, and iv) independent ambulation.</p> <p>◆ Exclusion criteria :i)any acute illuess ii) se·ere ,isuai impairment or he◆ los.s. ni)who did not finish the inten·ention mo.,,r,an,i_</p>	<p>1.COXClt;SION: Tws study concludes that brain gym exerc15es are effecti\·e in the better cogmtn--e function.</p> <p>2..RESULT: The data collected were statistically analyzed by paired t-test .</p> <p>The overall sample had a mean age of 70.73 :± 6.08 years. Both groups had more females (90%) and most of them were housewives (63.33%).</p> <p>There were significant changes in orienhtiou, recalling (memory) and language scills among the participants of the inten·ention group (p &lt; 0.05). In addition, no significant changes were found in the participants of control groups in post-test (p &gt; 0.05).</p>



3)2021	Surita Ginting <sup>1</sup> , Afuiwatil Yufdel	The effect of brain Gymt on the dementia and depression reduction of the elderly.	1)METHIOD: A quasi-experimental research design pre-and -post test design was used in this research. The population of this study was 5765 elderly people. The sampling technique uses the SloYin formula and it is determined through inclusion c.riteria us a purposive consecuti\·e method so that the total sample of 30 respondents is d\yided into two groups, 15 respondents ""-ith dementia and 15 respondents with depression.  <b>fini-Mental State Examination</b> (MSE) and <b>Sustainable Denlopment Goals(SDG)</b> were applied to all participants.	1)CONCLUSION: This study concludes that the brain gym has an effect on decreasin_g the le\·el of dementia and depression in the elderly. 2)RESULT: The results showed that there are differences in the a\·era_e;e \·alue of pre-test and post-test of brain gym inten·entions in respondents with dementia and depression. The description of res\·ondents with dementia pre-test Brain Gym inten·ention \·was an a\·erage value of 3.00 with a Yalue (M\·SE <21), and post-test of the Brain Gym inten·ention was, the a\·erage value of 1.27 vvith a minimum \·alue (MMSE: 27-31) and maximum (M\·fSE: 22-26), and Wilcoxon test results p value =0.000 <0.05. \\While the description of the mean depression pre-test of Brain Gym ts an avera_ge of 2.23 with a minimum \·alue (SDG score 5- 8) and maximum \·alue (SDG score 9-11), and post-test of BrainGym is an average Yalue 1.40 with a minimum Yalue (SDG score 0-4) and maximum (SDG score 5-8), and Wilcoxon test results were p-value= 0.006 <0.05.
4)2021	Nikita H. Seth, Chaitanya A. Kulkarni, Waqar I\·tl. Naq\·i	Efficacy of brain gym exercises for impro\·in_g quality of sleep in physiotherapy students	1)METHIOD:It ts a quasi-experimental study of intervention type on Physiotherapy Students uith mild to moderate Insomnia for 6 months.The participants (n=65) will be well informed about the aim of the research and will get informed consentThen they will be given pre and post inten·entional assessment using Insomnia. Rating scale and Pittsburgh Sleep Quality Index (PSQI) s.scale, readin11;s will be recorded and exercise inten·ention will be given for the month.	1)CONCLUSION: This study concludes that the brain gym has an effect on significant impro\·ement in the quality of sleep and reduced insomnia and this outcome ,...ill be assessed usingPSQI. 2) RESULT: a) Insomnia SeYerity Index. It is highly reliable and valid scale ""ith 86.1% sensitivity and 87.7% specificity for detecting IDSotl1111a



			<ul style="list-style-type: none"> <li>❖ Inclusion criteria           <ul style="list-style-type: none"> <li>- age group 18 to 24,</li> <li>- physiotherapy undergraduate students</li> <li>- moderate severity insomnia (15-24 score on Insomnia Severity Index).</li> </ul> </li> <li>❖ exclusion criteria           <ul style="list-style-type: none"> <li>- students with migraine, students who are diagnosed with psychological disorder and undertaking Psychotic Drugs, and having a history of Xeroderma pigmentosum and cognitive impairment.</li> </ul> </li> </ul>	<p>b) Pittsburgh Sleep Quality Index (PSQI) is a valid and reliable measure for evaluating the quality of sleep. PSQI has specificity of 86.5% and sensitivity of 89.6%.</p>
5)2021	Muzza Yudha Pratama Artuti	The Effectiveness of Brain Gym Games in Optimizing the Right and Left Sides of Students' Brains..	<p>1)METHOD: It is a quantitative method with the type of pre-experimental. The population in this study were all students of class XI IPA at senior high school number 18 Palembang, amounting to 116 people (Data Source: administration staff at senior high school 18 Palembang for the academic year 2016/2017). Data collection techniques using observation, interviews, documentation, and questionnaires were carried out during the study at school to support data collection.</p>	<p>1)CONCLUSION: This study concludes that the brain gym game is effective in optimizing students' right and left brain.</p> <p>2)Result Based on the data obtained from the results of distributing questionnaires consisting of 18 items of right brain and left brain to 53 respondents consisting of pre-test and post-test, it shows that there was a difference between before and after giving the brain gym game in optimizing students' right and left brain. Then proved by analyzing using the t-test formula.</p>
6)2021	Fabiana Mohamed Elswery Amel Elwem Mohamed Hanan Abdallih Mohammed	Effect of Brain Gym Training on Intelligence, Knowledge and Information Retention among Children with Developmental Delay.	<p>1)METHOD: A quasi-experimental research design was used to achieve this purpose.</p> <p>The study was conducted at all ten primary schools.</p> <p>A purposive sample of 100 students with autism and Attention Deficit Hyperactivity Disorder (ADHD) was involved in this study were randomly selected and divided into two equal</p>	<p>1)CONCLUSION: it can be concluded that brain gym training had a higher intelligence, knowledge, and information retention score in the study group.</p> <p>2)Result The present study revealed that there were statistically significant differences between study and</p>



			<p>groups of 50 students in each group. Group (I) called the study group that was exposed to brain gym training and Group (II) the control group during the first semester of the academic year (2020-2021).</p> <p>: <b>inclusion criteria</b> such as primary school children suffering from ADHD and autism, from both sex, aged from 7 to 12 years old, and their parents agree to participate in the current.</p> <p><b>Tools for data collection:</b>  Tool I <b>Howard Gardner Multiple Intelligence Test</b> and  Tool II: <b>Acumen Retention Test</b></p>	<p>control groups and within study group before and after the application of brain gym technique with improvement after the application regarding all types of intelligence <b>and</b> achievement retention test total ;core.</p>
7)2021	<p><b>NM</b> Sumartyawati1 N L Sudiarti2 <b>IME</b> Santem3, C Sepriana4, Suhardin5</p>	<p>Brain Gym Therapy For Schizophrenics Cognitive Function In Mental Hospital</p>	<p>1)METHOD:This research is a quasi-experiment with a non-equivalent control group before-and-after design. The subjects in this study were schizophrenic patients in the room intermediate of RSJ Mutiara Sukma, NTB Province.</p> <p>The study population was all 65 schizophrenic patients in the intermediate room. Determination of the sample using incidental sampling and obtained 40 cooperative schizophrenia patients to be divided into treatment and control groups.</p> <p><b>OUTCOME MEASURES :The Schizophrenia Cognition Rating Scale (SCoRS).</b> The group was given brain exercise therapy for seven consecutive days within 20-40 minutes, with 15 kinds of brain exercise movements in the morning.</p>	<p>1)CONCLUSION :The study showed that there were different effects of brain exercise therapy on the reduction of cognitive function in schizophrenia patients in the intermediate room.</p> <p>2)RESULT: Soft cognitive function in patients before brain exercise therapy in the treatment group was 9 (45%), moderate cognitive function in patients before brain exercise therapy in the control group was 13 (65%), soft cognitive function in patients after being given brain exercise therapy in the treatment group was 14 (70%), moderate cognitive function in patients after brain exercise therapy was given to the control group, namely 14 (70%). The statistical test obtained P-Value = 0,001 &lt; α (0,05).</p>
8)2020	<p>Yudhisman Imran, Donna Adriani, Patwa Amani, Irmiya Rachmiyani, Pukovisa</p>	<p>Association Between Brain Gym And Cognitive Function In Postmenopausal</p>	<p>1)METHOD:This was an analytical-experimental study . Physical examination and Montreal Cognitive Assessment (MoCA )-INAT testing was performed and laboratory examinations were performed.</p>	<p>1)CONCLUSION:Cognitive functioning of postmenopausal women increased after performing brain gym. Postmenopausal women are recommended to perform brain</p>





	Prawiroharjo	Women.	<p>The study subjects were randomly selected postmenopausal women aged 60 years and above, who had satisfactorily filled in a questionnaire.</p> <ul style="list-style-type: none"> <li>The inclusion criteria were: <ul style="list-style-type: none"> <li>- women aged 60 years and above</li> <li>-capable of good verbal communication</li> <li>-walking unaided</li> <li>-agreeing to participate in the study (by signing informed consent) after receiving information about this study.</li> </ul> </li> <li>Exclusion criteria: <ul style="list-style-type: none"> <li>-patients with psychosis</li> <li>-neurological abnormalities,</li> <li>-on antidepressant or antipsychotic medications</li> <li>-malignancies or diabetes mellitus</li> <li>- subjects not completing the study.</li> </ul> </li> </ul> <p>-Cognitive function testing was carried out using the MoCA-INA test, while the MMSE test was used for screening purposes.</p> <p>-Sample size determination in this study was based on <math>r=0.80</math>. The sample size for each group was minimally 10. In this study each group had 15 subjects, in order to account for dropouts. In the final test, control and intervention groups contained 12 and 14 persons, respectively.</p> <p>-The selected subjects underwent the MoCA-INA and walking tests. Subjects passing both tests were assigned to the brain gym intervention group and the others to the control group without brain gym. The intervention group performed brain gym three times weekly for 3 months, after which both groups underwent a repeat MoCA-INA test.</p>	<p>gym to prevent or retard reduction in cognitive function:</p> <p>2) RESULT: Before the intervention (at baseline): Mean age of control group (<math>n=12</math>) was <math>64.58 \pm 3.42</math> years, mean age of intervention group (<math>n=14</math>) was <math>64.86 \pm 4.9</math> years. Mean MoCA-INA score of control group was <math>20.50 \pm 1.56</math>, and that of the intervention group <math>19.07 \pm 2.12</math> (<math>p=0.067</math>). After performing brain gym for three months, twice weekly with a duration of 60 minutes, mean MoCA-INA score of control group was <math>22.33 \pm 2.05</math> and mean MoCA-INA score of intervention group was <math>20.42 \pm 1.69</math> (<math>p: 0.016</math>).</p>
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9)2020	JoseM Cancelal, Miguel A Sanchez, La. cu-a_1, Carlos Ayan2'	Brain Gym Exercise:3 versus standard exercises for institutionalised older people with cognitive impairment: a randomised controlled study	1)METHOD:Institutionalised older adults with cognitive impairment were randomly assigned to either standard exercise (SE) group or Brain gym (BG) group. Participants performed a 1-hour sessions per week for 10 weeks. Cognitive function, functional independence, fitness level, and quality of life (QoL) of participants were assessed.  • Inclusion criteria - age >65 years - ability to follow instructions  • Exclusion criteria -with medical condition  -Cognitive function was assessed using the AfifSE, which has been used to assess the effect of exercise training on cognitive function of people with mild cognitive impairment. - The Bartlett Index and the 12-Item ShortForm Health Survey (SF-12) were used to assess functional independence and QoL, respectively.	1)CONCLUSION:BG and SE have similar effects on cognitive function, functional independence, QoL, and fitness levels among institutionalised older adults with cognitive impairment. 2)RESULT: A total of 55 participants were assigned to the SE group (n=19) or the BG group (n=36). Of them, 17 in the SE group and 33 in the BG group completed >80% of the session. The two groups were comparable in terms of baseline characteristics. Participants in both BG and SE groups had a slight decline in cognitive function, functional independence, and physical-related QoL, as well as minor improvement in fitness level and mental-related QoL. The effects produced by either programme was similar (F1,76=0.063-1.986, p=0.163). Both programmes had similar effect on participants, and neither the level of cognitive impairment nor the programme had any significant effect.
10)2020	Pery AguileraJ	Efficacy of brain gym on the cognitive function improvement of people with dementia	1)METHOD:It was a quasi-experimental study using a pre and post-test design. This study aimed to determine the effect of brain exercise on improving cognitive function in elderly dementia. The sample in this study was 63 older adults who were selected using a purposive sampling technique. The respondents enrolled in brain gym eight times each morning for 10-15 minutes in	1)CONCLUSION:Brain exercise affects improving cognitive function in older adults with dementia.  2)RESULT: The standard deviation, minimum, and a maximum score of cognitive function of dementia elderly increased after brain gym. Mean



			<p>2 weeks. Due to the pandemic, these interventions .assisted by facilitators and adhered to health protocols in every interaction.</p> <ul style="list-style-type: none"> <li>• inclusioo criteria: (1)willing to participate in research, (2) 60-80 years old, (3)Clock Drawing Test (COT} score was more than 2.</li> <li>• Exclusion criteria.: (1)who were reported having negative behaviors. (2)unable to follow the brain gym instruction</li> </ul> <p>Information on the capacity to give informed consent was also provided during this process. Once consent was obtained, the Short <b>Portable</b> Mental Status Questionnaire (SPMSQ) was conducted.</p>	<p>of cognitive increased from 6.6 before brain gym intervention to 8.8 after the intervention. Statistical analysis using the paired t-test indicated that there was a significant difference in cognitive function score prior and after brain gym therapy (Asymp. Sig 2 tailed &lt;0.05).</p>
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## RESULT

The Initial Search resulted in a total of 69 articles (PubMed: 16, Google Scholar: 45, EbscoHost: 8). We identified few more articles after reference checking of relevant studies. After removal of duplicates and screening of title and abstract, 19 full text were agreed for further evaluation .

## DISCUSSION

This scoping review examines studies on Brain Gym exercises for treating cognitive impairment. Diana Shanty et al. explored Brain Gym's impact on children with dyslexia, finding it enhances concentration and reading skills, benefiting not only those with learning difficulties but also other students and teachers (6). Araceli Cano-Estrada et al. investigated Brain Gym's effects on institutionalized older adults, noting that physical exercises improve cognitive function in those with dementia, with higher MMSE scores in cognitively normal participants, though lower academic levels correlated with lower scores (7). Surita Ginting et al. found Brain Gym reduces depression and dementia in older adults by relieving stress, enhancing memory, and supporting life adjustments through regular therapy. Chaitanya A. Kulkarni et al. demonstrated that Brain Gym improves sleep quality in physiotherapy students with moderate insomnia, using relaxation strategies assessed by the PSQI. Mirza Yuda Pratama et al. showed Brain Gym's simple movements balance right and left brain functions, improving academic success and social skills by optimizing logical and creative intelligence. Fatma Mohamed E et al. found Brain Gym enhances intelligence and knowledge retention in children with developmental disabilities by activating brain regions through physical activity, supporting task performance. Shaywitz and Audey (2019) concluded Brain Gym fosters hands-on learning, collaboration, and real-life skills, improving multiple intelligences (8). NM Sumartyawati et al. reported that Brain Gym activates both brain hemispheres in schizophrenics, enhancing academic, behavioral, and attitudinal outcomes, with the left brain supporting verbal and logical skills and the right brain boosting creativity and intuition. Yudhisman Imran et al. found Brain Gym improves concentration, memory, and creativity in postmenopausal women, potentially increasing hippocampal volume and BDNF levels for neuroplasticity (9). Jose M Cancela et al. compared Brain Gym to standard exercises in older adults with cognitive impairment, finding similar effects without significant improvements in cognition, independence, or fitness. Pery Agusman Motuho Mendrofa et al. showed Brain Gym enhances cognitive function in dementia patients by improving blood flow, oxygen delivery, and neural connections in the corpus callosum, hippocampus, and amygdala, increasing MMSE scores (10).



## CONCLUSION

After reviewing all the articles the study concludes that brain gym exercises an effect in better cognitive function ,concentration learning ,decreasing the level of dementia and depression and an effect on improvement in quality of sleep and reduced insomnia.

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