Original Research Article

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Effectiveness of brain training between men and women: a comparative study

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ABSTRACT

Background: The aim of the study was to test the effectiveness of brain training on memory function between men and women.

Methods: The study was designed as a comparative design. The 50 samplings who have full filled the selection criteria were selected and they were conveniently divided into two equal groups with the gender differentiation, group A (female) and group B (male). Both the groups underwent 6 sessions of training period for 2-3 months. And they were assessed before and after training using mini mental state examination (MMSE) to know the outcome.

Results: There was a significant difference in the outcome measure MMSE between the group A (female) and group B (male) group after intervention (brain training) at the level 0.05% with p<0.05%. It has been shown that brain training or brain gym exercise had significant improvement in memory and cognitive function between both the groups.

Conclusions: Brain training or brain gym exercise is an effective and feasible mode of practice in any environment to improve the memory function of men and women.

Keywords: Brain gym exercises, Brain training, Memory function, Mini mental state examination

INTRODUCTION

Cognition (the ability to learn, solve problems, remember, and appropriately use stored information) is a key to successful health and aging. Higher-order integrative cortical areas, called association areas, intervene between the sensory inputs and motor outputs. Three multimodal association areas in conjunction with three unimodal association areas and three primary sensory areas. Limbic association area, located in the anterior-ventral portion of the temporal lobe, the para-hippocampal gyrus. Links emotion with many sensory inputs. Important in learning and memory. Posterior association area, located at the junction of occipital, temporal and parietal lobes. Links information from primary and unimodal sensory areas. Important in perception and language. Anterior association area located in the prefrontal cortex. Links information

from other association areas. Important in memory, planning, and higher-order concept formation.

Sensory information is processed and sent from receptors along parallel pathways through primary sensory cortex and unimodal association cortex to the posterior multimodal association cortex of each hemisphere- the posterior parietal and temporal cortices. The posterior multimodal association cortex is highly connected to the anterior association areas which in turn are responsible for conceptual cognitive functions and planning motor actions. After planning motor actions in the anterior association area, the actual processing of the motor response output is the reverse of processing in the sensory (input) system. The premotor cortex is rostral to the motor cortex- Brodmann's areas 6 and 8. Retrieval of information that has been

learned apparently is also a reverse of the paths and structures used in storing this information.

Cognitive disorders are a category of mental health disorders that primarily affect learning, memory, perception, and problem solving, and include amnesia, dementia, and delirium.³ Cognitive disorders are defined as any disorder that significantly impairs the cognitive function of an individual to the point where normal functioning in society is impossible without treatment. Some common cognitive disorders include dementia, developmental disorders, motor skill disorders, amnesia, substance-induced cognitive impairment. Cognitive impairment is recognized as being either syndromic (example, mild cognitive impairment (MCI), subjective cognitive decline, mild neurocognitive disorder, or cognitive frailty) or etiologic (example prodromal Alzheimer's disease (AD) or early symptomatic AD).⁴

Incidence estimates of MCI range widely.⁵ An estimated 40% to 60% of individuals aged 58 years and older with MCI have underlying AD pathology. Meta-analysis estimates (95% confidence interval (CI)) of MCI incidence per 1000 person-years were 22.5 (5.1-51.4) for ages 75-79 years, 40.9 (7.7-97.5) for ages 80-84 years, and 60.1 (6.7-159.0) for ages 85+years.

The definition of the mind according to Bruce Goldstein is that "it creates and controls mental functions such as perception, attention, memory, emotions, language, deciding, thinking and reasoning." When it comes to brain training (BT) or the goal is to enhance the mind's capacity to do some of these pivotal mental functions. BT refers to the participation in certain activities or programs that aims to improve cognitive ability resulted from the repetition of activities over a period of time. It involves the control function that requires focus, intelligent, and the control of misleading stimulus including reasoning, working memory and inhibitory control.

Brain gym, also known as educational kinesiology, was developed in the 1970s by Dennison and Dennison ("official brain gym website") and consists of a series of movements that purportedly activate the brain, promote neurological repatterning and facilitate whole brain learning. The brain gym intervention group performed brain gym® super space exercise on a daily basis for four weeks during the first school session. Meanwhile, BT intervention was carried out by another intervention groups on a daily basis for four weeks. They were allocated with 5-minutes BT exercises for each person. Data for the working memory function that were collected during pre-and post-test using MMSE.

The MMSE, as developed by Folstein and Mc Hugh, is the most widely used of cognitive screening tools. ¹⁰ An examination of the psychometric properties of the MMSE seems warranted because the accurate and comprehensive assessment of mental status can yield profound implications for the quality of life of cognitively impaired

older adults. Performance on the MMSE is moderated by demographic variables, with scores decreasing with advanced age and lower levels of education. The MMSE test includes simple questions and problems in a number of areas: the time and place of the test, repeating lists of words, arithmetic such as the serial sevens, language use and comprehension, and basic motor skills.¹¹ It has both validity and reliability for the diagnosis and longitudinal assessment of AD.

In the present study, we assessed whether BT could improve the cognitive abilities compared to baseline in a group of healthy subjects using a MMSE.¹² The study results indicate that playing BT may also improve cognitive functions and help reduce effects of aging in adults.¹³ However, further research is warranted to determine the long-term beneficial effect of BT on cognitive functions in elderly patient populations. It provides significant results that pave the way for further clinical studies.

Need for the study

To enhance cognitive processes such as perception, motor control, memory and decision making. Emerging research demonstrates that such cognitive processes can be trained, leading to improvements in everyday functioning that depend on these processes. As such, brain training is a rich and exciting field that delves into the limits of the human brain and has potential to benefit everyone's lives. Hence this study was conducted to find out whether BT can be used to improve memory and cognition in a healthy individual (between men and women).

Objective of the study

Objectives of the study were to test the effectiveness of BT on memory function between men and women, find out the effect of brain training program on healthy individuals, improve cognitive function and enhance minds' capacity to do some of pivotal mental functions.

METHODS

Study method

A comparative study.

Study setting

The study was conducted in Dr. B. R. Ambedkar medical college, Bangalore, Karnataka.

Sample size

30 adults were assigned into two groups of 15 each. Group A (female) and group B (male).

Treatment duration

The treatment was given for 6 sessions with 3 sessions per week.

Study duration

The study was conducted for a period of 2 months i.e. from June 2020 to August 2020.

Inclusion criteria

The inclusion criteria for the study was as follows: age: 30-70 years, both the gender (male and female).

Exclusion criteria

The exclusion criteria for the study was as follows: age group below 30 years and above 70 years; any cases diagnosed with neurological impairment; any recent head injury or trauma; IQ level (intelligence quotient); and not willing participants.

Ethical permission

The participants of both groups were explained about the study and a written consent was obtained.

Study tool

MMSE was used to assess the pre and post interventional scores to know the outcomes of the treatment.

Statistical method and tool

Data collected from participants between the two groups were analyzed using independent 't' test. Differences were considered at significant level of 0.05%.

Sampling technique

The study was a convenience sampling. The 't' value was calculated using the formula,

$$t = \frac{\bar{x}_1 - \bar{x}_2}{s} \sqrt{\frac{n_1 n_2}{n_1 + n_2}}$$

Method of collection of data

50 adults who fulfilled the selection criteria and who were underwent MMSE scale were selected for the study. The adults were conveniently divided into two equal groups; group A (female) and group B (male). Both the groups received BT programme alone respectively for a period of about 2 weeks. The treatment sessions were carried out under the participants' cooperation. At baseline of the study, all participants were assessed using MMSE to know the pre-interventional level of cognitive impairment. After

6 sessions of training period, all participants were measured using the same scale to know the postinterventional score.

Treatment technique

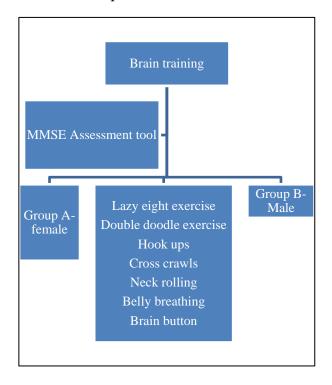


Figure 1: Treatment technique.

RESULTS

Data collected from participants were analyzed using independent 't' test i.e. the difference between the two groups (inter group). Differences were considered at significant level of 0.05%.

The demographic data of the participants were figured below.

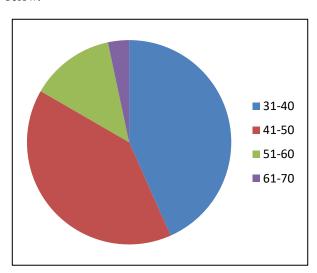


Figure 2: Age distribution.

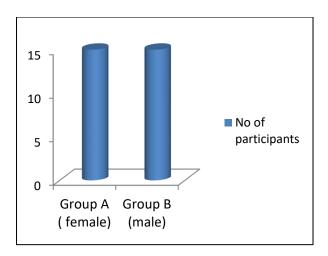


Figure 3: Number of participants.

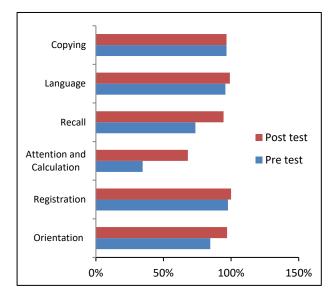


Figure 4: Clinical characteristics of the study participants.

Table 1: Outcome of the study.

Group	Test	N	Mean	SD	T	P
Group A	Pre post	15	28.33	5.81	2.09	0.004552
Group B	Pre post	15	26.27	0.92	3.06	0.004332

There was a significant difference in the outcome measure in BT group A and group B at the level 0.05% at 28 degrees of freedom.

DISCUSSION

The study aimed to evaluate the effectiveness of BT on memory function between men and women. BT was performed to enhance the mind's capacity to do some of these pivotal mental functions and to improve cognitive ability resulted from the repetition of activities over a period of time.⁷ This in line with findings of Tanaya et al

reported that brain gym exercise has positive effect in increasing the level of self-esteem and quality of life. 15 Also there was an evidence to suggest that it is used to train the strength of memory in elderly. Nouchi et al reported that commercial brain training game improves executive functions, working memory, and processing speed in young adults. 16

Kuntarti et al reported that the results of short-term memory test before and after exercise to brain in 27 participants show increase in mean of score 7.74 (95% CI: 3.36 to 11.8, p<0.05). Breatly increase occurred in elderly (60 years) than in middle adult groups (p>0.05). Brain gym activities are carried out regularly to prevent and slow done memory loss as a result of aging process.

Most of the research on BT has been concluded that it may also improve cognitive functions, working memory, executive functions and processing speed in adults and healthy individuals. There is an evidence that it was an effective intervention in writing concern in grade 1 pupils' and also enhance working memory performance in learning disability children. 9,17 Also there was a significant increase in IQ (Intelligence quotient) after intervention of brain gym three times a week in children aged 10-12 years of age. 14

The global input of this study was to see the effectiveness of brain training program between men and women in healthy individuals. For this purpose, 30 healthy individuals were selected on the basis of selection criteria by convenience sampling. The participants were conveniently divided into two equal groups, group A (female) and group B (male). The participants attended the session of training thrice a week. The treatment was continued for 6 sessions. During the training there was no discontinuation of training from the participants.

The demographic details of the participants were collected along with consent form. In this study 15 participants were of group A (female) and 15 participants were of group B (male). Out of which 6 participants were MCI and 9 normal cognition from group A. And from group B 8 participants were of MCI and 7 normal cognition.

The outcome was measured by MMSE before and after intervention. The obtained data was statistically analyzed by a statistician. In order to compare variables between two groups, independent 't' test was used. Differences were considered at significant level of 0.05%. The pre and post interventional scores of BT showed significant differences in outcomes of MMSE.

The results of MMSE for BT group A and group B were tabulated with their standard deviation, t and p value (Table 1). The pre-interventional scores of BT group A (M=23.2) and group B (M=22.8) showed no significant difference in the score of MMSE. The post-interventional scores of BT group A (M=28.33) and group B (M=26.27) showed significant difference in the score of MMSE.

The result demonstrated that BT intervention was effective in group A healthy individuals compared that of group B. All dimensions of MMSE were significantly improved following BT. The participants who received brain training experienced greater improvement in cognition and memory in group A healthy individuals than the group B healthy individuals.

The future study recommends in large scale with geriatric or pediatric populations with or with neurological deficits.

Limitations

The limitations of the study were as follows: the study samples were in small size; the post interventional exercise is not followed up and the study samples were from healthy individuals.

CONCLUSION

The study result indicates that the BT program was more effective in group A (female) participants compared to that of group B (male) participants in a healthy individuals. BT could improve the cognitive abilities compared to baseline in a group of healthy subjects. It can be used as the easy and fun therapy that is useful to train the strength of memory in elderly. BT intervention was successful in enhancing working memory performance and processing speed in trained tasks in group A (female) participants.

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Ethical approval: The study was approved by the

Institutional Ethics Committee

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