

Effect of Neurobic Exercises on Cognitive Function in Older Adults

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ABSTRACT

BACKGROUND: Neurobics focuses on brain exercises. The brain exercise program includes changing daily routines to engage the senses - vision, hearing, taste, smell, and touch. Neurobics activate neuronal systems and increase blood circulation to the brain - aging-related cognitive decline and cognitive impairment greatly impact. Cognitive issues like dementia can lead to disability in older adults. Prioritizing overall health is essential for independence and quality of life. Neurobics means “Neuro + aerobics = Neurobics.”

PURPOSE: Neurobic exercises are a type of brain exercise that aims to stimulate the brain by challenging activities. The primary goal is to enhance memory and cognitive abilities. It is done by utilizing our non-dominant hand to brush our teeth, combing hair, buttoning clothes, etc. This study finds out the effectiveness of neurotic exercise programs on cognitive function in older adults.

AIMS AND OBJECTIVES: To find out the effect of neurobic exercises on cognitive function in older adults

METHODS: An experimental study was done on 42 participants aged between 65-74 years, both males and females were included. Patients are conveniently divided into two groups. Group 1 Interventional group receive neurobic exercise, and group 2 control group receive standard care. The

Mini-Addenbrooke’s Cognitive Examination (New Zealand Versions - 2020) was used to assess the cognitive functions in older adults before and after the treatments. (4 days/week for 2 weeks.)

RESULT: An independent t-test was employed to compare the groups; the results showed that, for cognitive functions in older persons, $p = 0.002$ was significant. The t values between the groups were $t=29.3$ in cognitive functions, respectively.

CONCLUSION: The study concluded that neurobic exercises effectively improved cognitive function in older adults.

Keywords: Neurobic exercises, cognitive functions, older adults, Mini Addenbrooke’s Cognitive Examination scale.

INTRODUCTION

Cognitive impairment, including dementia, is now the major cause of disability and death in older age. Dementia affects 47 million individuals worldwide, and this number is expected to quadruple by 2050 nearly^[1]. The deterioration in cognitive function affects individuals as well as their families and dramatically reduces independence, quality of life, and everyday functional capacities^[1]. Recent data suggests that cognitive decline is reversible since the brain retains flexibility in later life. Physical activity (particularly aerobic and strength exercise) is recognized to play a significant role in the prevention of cognitive decline

and dementia. Although there are various ways to identify this population, some research has classified old persons between the ages of 65 and 74. Age-related cognitive decline and impairment significantly impact the daily lives of older persons.^[1] The World Health Organization (WHO) has emphasized the need to address dementia's impact on society and healthcare systems worldwide.^[2] cognitive impairment and dementia are the leading causes of disability in older persons, and improving mental, physical, and social health is critical for preserving independence and a high quality of life.^[3]

The word cognition derives from the Latin verb *cognoscere*, which means 'to know.'^[4] the elements of cognition include knowledge, alertness, reasoning, judgment, and memory. Stated differently, the process of compiling knowledge that has been acquired by education or experience. A variety of cognitive functions, such as knowledge, focus, memory, speech, reasoning, executive function, and so forth, are included in cognition and are essential to experience and intellectual growth.^[4] after age 65, age is the most frequent risk factor for cognitive impairment. The cognitive signs of different kinds of vascular dementia differ from person to person. It encompasses issues with organizing and planning, following instructions, feeling sluggish or confused, memory-related concentration difficulties, despair and apathy loss, and challenges with spatial awareness.^[5] neurobiologist Lawrence c. Katz coined the name "neurobics" approximately 10 years ago on the theory that mental activities, particularly those involving the brain, can promote the development of new dendrites and neurons.^[4] exercises involving the nervous system stimulate new neural circuits and increase the creation of neurotrophin, which fortifies nerve connections and preserves the strength of nerve cells and synapses.^[5] the word neurobics first appeared in 1999 (Ballard, 2010). Neurobics deals with brain exercise i.e. performing our daily tasks in different ways its major goal is

to strengthen our memory and brainpower. Eating, writing, and cleaning our teeth with our non-dominant hands round out the procedure.^[4] "neurobics" is defined as "neuro + aerobics." it is a special kind of brain training that combines the physical senses - vision, hearing, taste, smell, and touch - with the emotional senses in a routine that is constantly changed.^[5,6,7] It enhances the blood flow to the brain and activates neurons to build and develop brain cells continually. To improve memory, neurobic exercise works directly with the cortex and hippocampus, which are found in the medial temporal lobe.^[6] to boost memory, it aids in stimulating neurotrophin, a naturally occurring brain nutrient that improves dendritic complexity and size. This application engages your brain through various combinations of your body's senses to provide unusual or unexpected experiences.^[5] additionally, neurobic exercise promotes a pattern of neural activity that directly connects several brain regions, particularly the cerebral cortex. The human brain's most developed region is the cerebral cortex.^[6] exercise that stimulates neurotrophin production, a natural brain nutrient that keeps dendrites larger and more complex, helps them stay younger and stronger and enhances memory retention, is known as neurobic exercise.^[6] the scientific basis for neurobic exercise is that the cerebral cortex comprises an incredibly large number of distinct areas, each of which focuses on various aspects of receiving, presenting, and storing data from the five senses.^[7] because there are hundreds of distinct neuronal pathways and a central processing unit in the brain, cognition through the senses does not end there. Several interconnected regions of the brain cortex. Neurobic exercise stimulates the brain's huge underutilized areas to create new connections and potential combinations. The frontal lobe's extensive network of thalamic and bihemispheric structures that regulate attention was impacted by training exercises (Filley, 2002).^[7] stimulate the hippocampus, a limbic system structure that

influences memory. The prefrontal lobe, which influences high brain resolution, planning, and reasoning in decision-making, was also activated by the training program.^[7] Neurobic exercise stimulates patterns of neural activity, which in turn improves cognitive function and helps in better physical function.^[8] Cognitive stimulation in healthy elders can be provided by a variety of fun activities that focus on cognitive stimulation and social interaction.^[9]

MATERIALS & METHODS

Participants: Approval for the study was obtained from the Institutional Ethical Committee. An experimental study was done in Ahmedabad on cognitive function in older adults. A total of 42 participants aged between 65-74 years, both males and females willing to participate were included. My source of data collection is from Ahmedabad city. As well as who is ready to give written consent and Individuals who are willing to participate in the study. The written consent was obtained before the study. History of any neurological symptoms like sensory or motor deficit, disability (hearing and visual impairments), or deformity, any cardiac and pulmonary problems, Neurological disorders like brain tumors, Alzheimer's, Parkinson's disease, stroke, etc., Other psychiatric illness, Hemodynamic instability with uncontrolled HT and progressive metabolic diseases, and Elderly individuals with recent surgeries were excluded. The duration of the study was 2 weeks.

Measurements and outcome measures:

Demographic data was collected, and the participants were evaluated with Mini Addenbrooke's cognitive assessment (Mini-ACE) before and after 2 weeks of intervention.^[10]

Mini-Addenbrooke's Cognitive Examination (Mini-ACE): (Mini-ACE) is a quick and accurate cognitive screening test for dementia and moderate cognitive impairment. A higher score denotes stronger

cognitive functioning; The overall Mini-ACE score is 30. It takes 5 minutes on average to administer the Mini-ACE. It was created by applying a data-driven scaling technique to Addenbrooke's Cognitive Examination-III (ACE-III). 25 and 21 are the two cutoffs.

PROCEDURE:

Data was collected by a convenient sampling technique. The Mini-Addenbrooke's Cognitive Examination (New Zealand Versions - 2020) was used to assess the cognitive functions in older adults before and after the treatments. The participants were divided into two groups. **Group 1** Interventional group receives neurobic exercise, and the **Group 2** control group receives conventional therapy. The written consent was obtained before the study. The data collection period was 4 days/week for 2 weeks. Data analysis will be after pre and post-intervention assessment. It is a special kind of brain training that combines the physical senses—vision, hearing, taste, smell, and touch—with the emotional senses in a routinely changing way. This program is for the brain with the non-dominant hand and uses various combinations of your physical senses. Each of the participants of Group 1 received a Neurobic Exercise Program for 4 consecutive days per week for 2 weeks. The exercise session was conducted for 30 minutes 10 repetitions of each exercise.

INTERVENTION:

GROUP 1: The Interventional group includes activities that 1) Morning Roulette-In that brush your teeth and comb with a non-dominant hand. 2) Close your eyes smell an object (food, herb, or flavoring), and guess what it is. Ten minutes later, the participants were asked to write the answer on the paper with a non-dominant hand, 3) Button clothes with closed eyes with a non-dominant hand 4) Close their eyes to taste juice or food, and guess what they ate or drank. Ten minutes later, the participants were asked to write the answer on the paper with a non-dominant hand, 5) Insert the

keys. All exercises using non-dominant hand. 6) Touch items inside a box and allow the subjects to guess what they have touched. Ten minutes later, the participants were asked to write the answer on the paper with a non-dominant hand.^[11]

GROUP 2: The control group continued with their usual activities Like Walking and jogging, 4 days a week for 2 weeks at their home or garden.

STATISTICAL ANALYSIS

The data was collected and analyzed in Microsoft Excel version 2013 and IBM SPSS statistics 20.

RESULT

The main purpose of the study is to find out the “Effect of Neurobic exercises on cognitive function in older adults”. There is insufficient evidence of research that has evaluated cognition-related function. This study's findings demonstrated a significant improvement in cognitive function in older adults. The study concluded that neurobic exercises effectively improved cognitive function in older adults. The mean age of patients in interventional group 1 & control group 2 is 68.42 and 68.66 years respectively in Table 1.1. The standard deviation in interventional group 1 &

control group 2 is 1.74 and 2.05 respectively. Table 1.2 shows the gender distribution of the 42 participants in the study. Both the groups, Interventional Group 1 had 15 males & 6 females, and Control Group 2 had 10 males and 11 females. Table 1.3 shows the dominant distribution of the 42 participants in the study. Both the groups, Interventional Group 1 had 17 right handed & 4 left-handed, and Control Group 2 had 15 right handed & 6 left-handed. **Paired t-test** was used within the groups. P value <0.005 was considered significant. Here Paired t-test was performed for analysis. For the interventional group 1 in Table 1.5 t value = 29.303, and P value = 0.002 was found to be significant. In this study to analyze the effects on outcome measures (i.e. Mini ACE) before and after intervention. An **Independent t-test** was used between the groups. P value <0.005 was considered significant. Here Independent t-test was performed for analysis. For the interventional group 1 in Table 1.4 t value = -31.63, and P value = 0.000 was found to be significant, and. For the Control Group 2 t value = -2.50, and P value =0.0210 was found to be significant.

TABLE 1.1: AGE DISTRIBUTION:

GROUPS	NO. OF PATIENT	MEAN AGE	SD
GROUP 1	21	68.42	1.74
GROUP 2	21	68.66	2.05

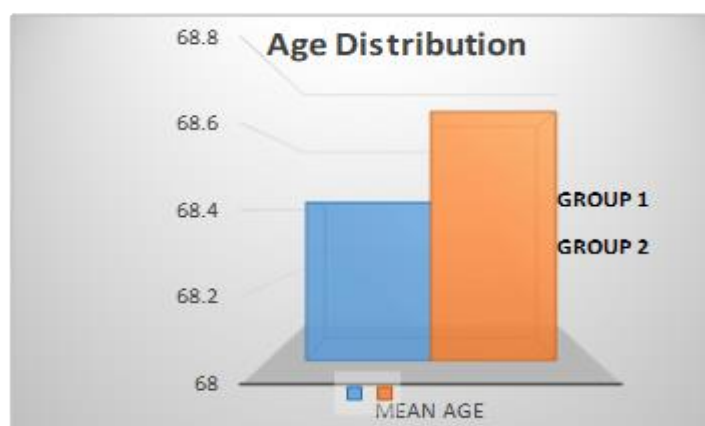


TABLE 1.2: GENDER DISTRIBUTION:

GROUPS	N	MALE	FEMALE
GROUP 1	21	15	6
GROUP 2	21	10	11

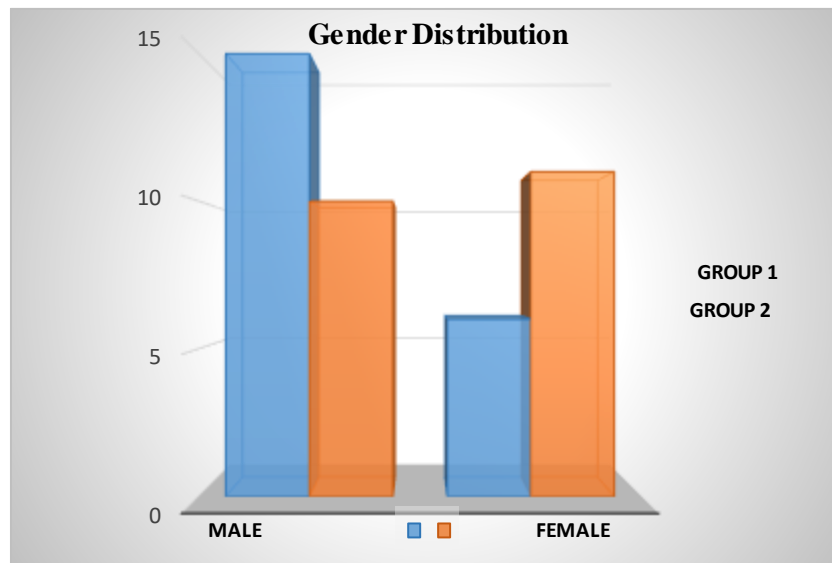


TABLE 1.3: DISTRIBUTION OF DOMINANCE:

GROUP	N	RIGHT-HANDED	LEFT-HANDED
GROUP 1	21	17	4
GROUP 2	21	15	6

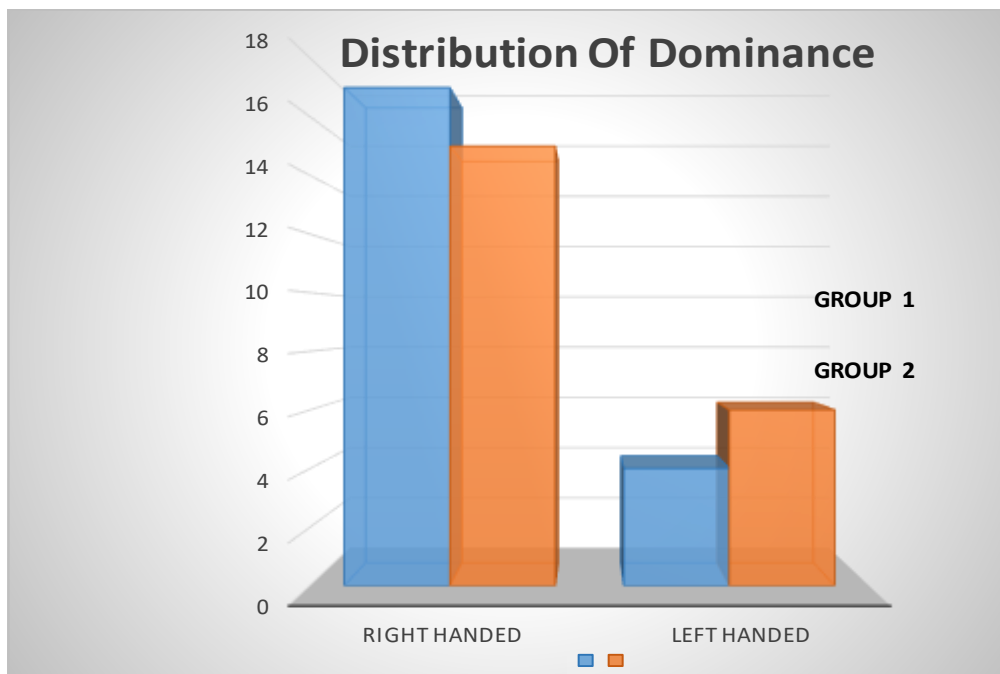
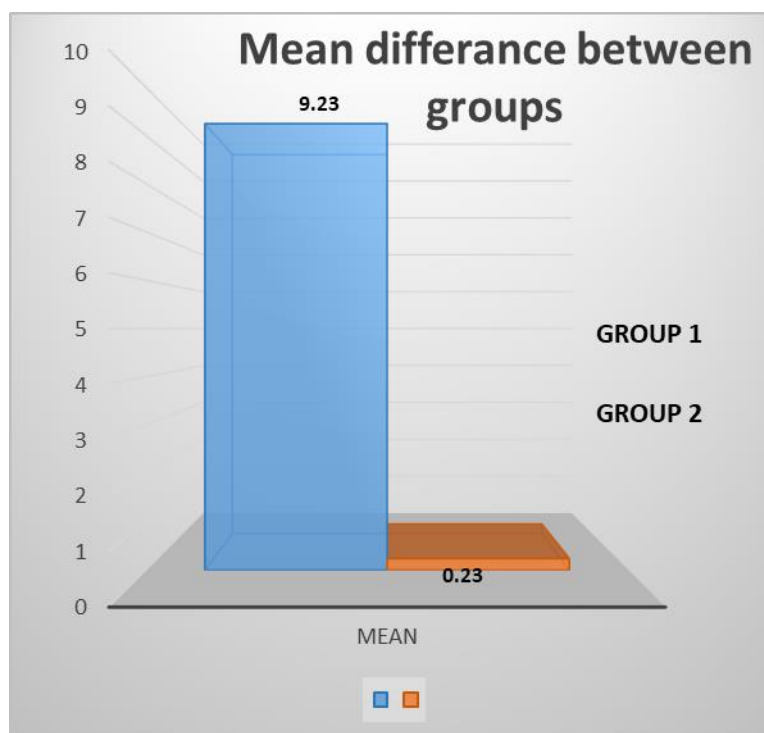


TABLE 1.4: SHOWING VALUES OF t AND P AFTER PERFORMING PAIRED SAMPLE TEST WITHIN THE GROUPS:

GROUPS	PRE-TREATMENT		POST-TREATMENT		t VALUE	P VALUE
	MEAN	SD	MEAN	SD		
GROUP 1	17	2.33	26.23	2.04	31.63	0.000
GROUP 2	18.38	2.74	18.61	2.74	2.50	0.021

TABLE 1.5: SHOWING VALUES OF t AND P AFTER PERFORMING INDEPENDENT T-TEST BETWEEN THE GROUPS:

GROUPS	MEAN	STD. DEVIATION	STD. ERROR MEAN	t VALUE	P VALUE
GROUP 1	9.23	1.33	0.29	29.3	0.002
GROUP 2	0.23	0.43	0.09		



DISCUSSION

As people age, their ability to do daily duties and engage in physical activity declines. The objective of the study is to find out the effect of neurobic exercises on cognitive function in older adults. Neurobic exercises, sometimes called "brain exercises," are activities designed to stimulate and challenge the brain in novel and unexpected ways. These exercises aim to promote the brain's ability to reorganize and form new neural connections throughout life. In older adults, neurobic exercises have gained attention for their potential to improve cognitive function and even potentially delay cognitive decline associated with aging. Here's a detailed discussion on the effects of neurobic exercises on cognitive function in older adults: Improvement in Cognitive Skills: Research suggests that engaging in neurobic exercises can lead to improvements in various cognitive skills, including memory, attention, processing speed, and executive

function. For example, activities that require problem-solving, creativity, or learning new skills can help challenge the brain and enhance cognitive abilities over time. One author found that enhancing attention can improve brain function, particularly learning, and memory, in the elderly. Enhancement of Memory: Neurobic exercises often involve tasks that require the retrieval of information from memory or the formation of new memory associations. These activities can help improve both short-term and long-term memory function in older adults. For instance, activities like learning a new language, playing musical instruments, or engaging in complex puzzles can stimulate memory-related brain regions and promote memory consolidation. Others found that cognitive training and neurotic exercises can improve memory in older adults. Therefore, further research is effective in developing Neurobic activities that can enhance memory and cognitive function, improving quality of life. Regular

involvement in neurobic exercises has been linked to a lower risk of cognitive decline and dementia in older persons. By keeping the brain active and continuously challenged, these exercises may help preserve cognitive function and protect against age-related cognitive decline. Moreover, some studies suggest that engaging in mentally stimulating activities throughout life may build a cognitive reserve, allowing individuals to withstand better the effects of aging on the brain. Stimulating a network of thalamic and bi-hemispheric regions in the frontal lobe improves the ability to age. Many neurobic exercises can be combined with physical exercises, such as walking, dancing, or tai chi. Combining mental and physical activity in this way can provide additional benefits for cognitive function and overall health in older adults. Physical exercise has been shown to promote neuroplasticity, improve cardiovascular health, and reduce the risk of chronic conditions that can affect brain function, such as hypertension and diabetes. Another study showed that engaging in both physical and mental exercise together improves cognitive performance more than completing either activity alone, especially when social activities involve engaging in interesting activities. The current study found that neurobic exercises were beneficial in improving cognition in older adults. This is consistent with the findings, that investigated the influence of neurobic exercise on memory improvement in an elderly population suffering from dementia. In conclusion, neurobic exercises are a promising technique for improving cognitive health and well-being in older persons. These activities, which challenge the brain in unique and engaging ways, can improve cognitive skills, lower the risk of cognitive decline, and contribute to overall cognitive vigor and quality of life in later years. Incorporating various mentally challenging activities into daily routines and leading an active and engaged lifestyle can help people retain good brain function as they age.

LIMITATION

The proportion of men and women was unequal. Furthermore, following the two-week intervention, there was no follow-up in this study, so a long-term effect could not be suggested.

FUTURE SCOPE

By expanding the sample size, it will be possible to overcome the restrictions in future research. Functional magnetic resonance imaging (fMRI) can be used to detect diminished neural function in the regions associated with cognitive dysfunction in individuals who are more likely to develop dementia. This enables the implementation of early cognitive rehabilitation strategies, the outcomes of which can be tracked in the future using functional MRI.

CONCLUSION

Neurobic exercises showed significant improvement with the help of Mini ACE to improve cognitive functions in older adults. The study concluded that neurobic exercises are effective in improving cognitive functions in older adults.

Declaration by Authors

Ethical Approval: Approved

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