



## EFFECTIVENESS OF NEUROBIC EXERCISE IN IMPROVING COGNITION IN YOUNG INDIVIDUALS.

### Physiotherapy

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### ABSTRACT

**Background:** The stress and fatigue of sleep deprivation may exacerbate cognitive changes in young adults at risk. Cognition includes different cognitive processes like learning, attention, memory, language, reasoning, decision making etc which are part of intellectual development and experience. Neurobic exercise is a unique brain exercise which stimulates neural activity that create more connections between different brain areas and causes nerve cells to produce neural brain nutrients called neurotrophins. The aim of the study was to determine the effectiveness of neurobic exercise in improving cognition in young individuals.

**Methodology:** 60 participants were taken in the age range of 17-25 years. All the participants were assessed with Addenbrooke's cognitive assessment ACE-III (Indian English version) before and after the intervention. The participants received neurobic exercises for 2 weeks each week 4 consecutive days.

**Results:** The pre and post intervention ACE-III score was  $69.9 \pm 6.712$  and  $81.8 \pm 4.776$  respectively. Paired t test showed that there was significant difference in ACE-III score after 2 weeks of intervention as there was greater improvement in ACE-III scores of the participants ( $p < 0.0001, t = 18.347$ ).

**Conclusion:** The study concluded that neurobic exercise were effective in improving cognition in young individual.

### KEYWORDS

Neurobic exercises, cognition, young individuals, ACE-III

### 1. INTRODUCTION:

The word cognition comes from the Latin verb cognoscere meaning 'to know'. Cognitive psychology came into the 1950's as the disagreement to the widespread behaviorism of the case. Authors like Piaget and Vigotsky transformed the scientific vision with their theories regarding the growth and cognitive knowledge which are still valid today. Cognition is something of knowing, alertness, logic, judgement and memories. In other words, the gathering of information that have been acquire through education or experience. Cognition includes a range of cognitive processes like knowledge, concentration, reminiscence, speech, logic, executive etc which are the component of intellectual progress and experience.<sup>1,11</sup> Diverse cognitive functions play a function in the cognitive processes such as perception, concentration, recollection, logic. All of these cognitive functions work equally to merge the innovative knowledge and create an understanding of the world around us.<sup>11</sup>

Cognitive impairments are common in young adults with major depression and anxiety disorders and their nature remains partly uncertain.<sup>2</sup> Exercise had been confirmed to contain a helpful result on bodily, psychological and cognitive performance in altering populations. This study have looked into the result of exercise on periodic memory, perceptual speed and administrative function in young adults.<sup>3</sup>

The term "NEUROBICS" was first introduced about 10 years ago by neurobiologist Lawrence C. Katz, with the hypothesis that mental exercises, especially those that brain can stimulate the growth of new dendrites and neurons.<sup>5</sup> The term Neurobics was first of all brought in existence in 1999 (Ballard, 2010). Neurobics deals with brain exercise i.e. performing our daily task in different ways. Its main aim is to improve our memory or brainpower. It is completed by using our non dominant hand to eat, write and brush our teeth.<sup>6</sup>

Neurobics aims to help maintain a continuing level of mental fitness, strength, and flexibility as age. The exercise program calls for presenting the brain with non-routine or unexpected experiences using various combinations of your physical senses—vision, smell, touch, taste, and hearing "sense." It stimulates patterns of neural movements that creates more links among different brain areas and results nerve cells to create natural brain nutrients know as neurotrophins which can considerably increase the size and complexity of nerve cell dendrites. Neurotrophins as well makes the adjacent cells stronger and more resistant towards the effect of aging. Neurobics varies from other brain exercise which includes logic puzzles, memory exercises.<sup>7</sup>

Neurobic exercise is a unique brain exercise program based on the latest findings of scientific research. The brain exercise program is presenting the combinations of physical senses, including vision, hearing, taste, smell, touch with changing the daily routine regularly. It stimulates neural activity to reinforce and produce brain cells constantly. Neurobics activate neural systems to work and increases blood supply to the brain.<sup>4</sup>

There were many tests to asses cognitive functions such as Mini Mental State Examination (MMSE), Montreal Cognitive Assesment (MoCA), Addenbrooke's Cognitive Assesment-ACE-III from all of this Mini Mental State Examination (MMSE) and Montreal Cognitive Assesment (MoCA) are most commonly used, but in the present study Addenbrooke's Cognitive Assesment-ACE-III was used as the index study of the ACE-III demonstrated high sensitivity and specificity with cutoffs recommended as for the ACE-III as follows: 1) 88 (sensitivity =1.0; specificity =0.96) and 2) 82 (sensitivity =0.93; specificity =1.0).<sup>8</sup>

### 2. METHODOLOGY:

**2.1 Participants:** An approval for the study was obtained from the Institutional Ethical Committee (Ref no-PIMS/DR. APJAKCOPT/IEC/2019/478). The study was conducted in OPD setting of Dr. APJ Abdul Kalam College of Physiotherapy. 60 participants aged between 17-25 years, both males and females willing to participate were included. Exclusion consisted of history of any neurological residue symptoms like sensory or motor deficit, disability or deformity, any cardiac or pulmonary problems that may restrict treadmill walking. The written consent was obtained prior to the study. 60 participants were then given neurobic exercises accordingly.

**2.2 Measurements and outcome measures:** Demographic data was collected, and the participants were evaluated with Addenbrooke's cognitive assessment (ACE-III) before and after 2 weeks of intervention.

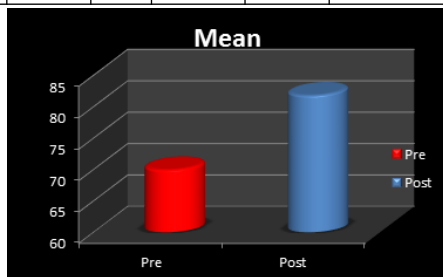
**Addenbrooke's cognitive assessment (ACE-III):** The ACE-III is a exposure method that can distinguish patients with and without cognitive weakening. The ACE-III takes ~20 minutes to complete. The directory study of the ACE-III showed high sensitivity and specificity with cutoffs suggested for ACE-III are as follows: 1) 88 (sensitivity =1.0; specificity =0.96) and 2) 82 (sensitivity =0.93; specificity =1.0).<sup>8</sup> The explanation of this study stands that a score of 88 and above is considered normal, below 83 is abnormal, between 83 to 87 is inconclusive.<sup>10</sup>

**2.3 Intervention:** 60 participants were given neurobic exercises for 4 consecutive days per week for 2 weeks. The exercise session was conducted for 20 minutes. The neurobic exercises includes:- 1) brushing, 2) combing or styling hair, 3) buttoning clothes, 4) eating food, 5) insert the keys, 6) smell and tell, 6) backward walk on treadmill using non-dominant hand.

### 3. DATA ANALYSIS AND RESULT:

**Table 1: Showing values of t and p after performing paired t-test in young individuals.**

Group	Mean	SD	't' value	df	P value and significance
Pre	69.9333	6.712	18.347	59	P=<0.0001
Post	81.8	4.776			Extremely significant



**Figure 1: Graph showing pre-post intervention.**

### 3.2: RESULT:

Severity of cognition was measured using ACE-III scale. The mean value of ACE-III score for the group pre intervention was  $69.9 \pm 6.712$  and post intervention was  $81.8 \pm 4.776$ . By using paired 't' test it was observed that this difference is considerably extremely significant ( $p < 0.0001$ ,  $t = 18.347$  with  $df = 59$ ).

### 4. DISCUSSION:

The present study aimed to find out the effectiveness of neurobic exercise in improving cognition in young individuals. Another study by Diana Bruno et al (2019) conducted a critical review on Addenbrooke's cognitive examination III in the diagnosis of dementia. The study showed that Addenbrooke's cognitive examination III was a screening test that is composed of tests of attention, orientation, memory, language, visual perceptual and visuospatial skills and was useful in detection of cognitive impairment, especially in the detection of Alzheimer's disease and fronto-temporal dementia.

The stress and fatigue of sleep deprivation may also exacerbate cognitive changes in young adults at risk.<sup>9</sup> In the present study Neurobic Exercise Program was given and the participants were encouraged to practice all the six senses of vision, hearing, smelling, tasting, touching and emotional sense and breaking a routine activity in an unexpected way to strengthen of nerve cell stimulation. Through all the sessions of Neurobic Exercise Program, the participants received all of the program to use senses in joining two or more senses per day. Thus the combination of two or more senses stimulates the function of brain, which is involved with memory process, including the frontal, parietal, temporal, occipital lobe. Neurobic aims to help to maintain a continuing level of mental fitness, strength and flexibility as we age. The neurobic exercise stimulates neural activity that will create more connection between different brain areas and causes nerve cells to produce natural brain nutrients called "neurotrophins".<sup>7</sup> Neurobics is practiced in order to activate the inactive part of the cells of the brain. It may be helpful for the people those who are unable to express themselves and suffer a lot in this competitive world.<sup>6</sup>

The present study showed that neurobic exercises were effective in improving cognition in young individuals. This in accordance with Saifon Kanthamalee et al (2014) who conducted a study on effect of Neurobic Exercise on Memory Improvement in elderly population suffering from Dementia. Selected participants were included in Neurobic Exercise Program for every 2 days continuously for 4 weeks. The outcomes came that normal memory scores of experimental group after receiving Neurobic Exercise Program was statistically and suggestively higher than before getting the Neurobic Exercise Program at the level of  $p < .001$ . The study concluded that Neurobic Exercise Program improved the memory retention in the elderly with dementia with statistical significance.<sup>7</sup>

The post-intervention mean ACE-III score, using paired t test showed that it was extremely significant in improving cognition in young individuals. The overall result of present study revealed that neurobic exercises were effective in improving cognition in young individuals.

### LIMITATION:

The sample size was small. There was no equal distribution of male and female. In this study there was no control group. And this study had no follow up after 2 weeks of intervention so long term effect could not be suggested.

### FUTURE SCOPE:

Future study can be done by overcoming the limitations by increasing the sample size. The use of functional MRI can be done in the identification of reduced neural function in the areas supporting cognitive dysfunction who are at greater risk of developing dementia and allow for early cognitive rehabilitation techniques whose success could be future monitored by using functional MRI.

### 5. CONCLUSION:

The study concluded that neurobic exercise were effective in improving cognition in young individual.

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