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## Effectiveness of cognitive training exercises and physical activity in subjects with transient ischemic attack with cognitive impairment.

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### ABSTRACT

**Introduction:** In India, the prevalence of transient ischemic attack in urban population are more than the rural. The symptoms of a transient ischemic attack (TIA) by definition subside completely within 24 hours. Despite the transient nature of focal symptoms associated with TIA and the absence of visible brain lesions in most patients, many experience persistent cognitive problems afterward. Cognitive impairment subjects are with depressive symptoms, anxiety and fatigue and affect the activity of daily living. As many studies have shown that effectiveness of cognitive training in cognitive impaired TIA patient, none of the study has seen with combined exercise. Thus, our aim of the study was to find out the effect of combination of physical activity along with the cognitive training in transient ischemic attack subjects with cognitive impairment. **Methodology:** A total sample of 60 female subjects with the age group of 45-60 years is taken for this study. After getting the ethical clearance from the Institutional ethical committee, the subjects were allocated into cognitive training group (30 subjects) and physical activity with cognitive training group (30 subjects) by simple random sampling method. Level of cognition was measured at the baseline and after 12 weeks of intervention by Montreal cognitive assessment scale (MoCA) and cognitive assessment for stroke patients (CASP). The cognitive training (45 minutes for 5 days per week) aims at abilities (Information processing speed), attention and memory function. In physical activity and cognitive training group, the subjects are instructed to do this above cognitive training program under supervision and advised to do brisk walking in their home for one continuous bout (45 minutes for 5 days per week). **Results:** The collected data were interpreted with the statistical analysis which shows significant changes in the cognitive level in both the group but the changes were more significant in the physical activity with cognitive training group ( $p < 0.05$ ) when compared with the cognitive group alone. **Conclusion:** This study shows that the physical activity can be recommended along with the cognitive training in improving the cognitive impairment of TIA subjects.

**KEYWORDS:** Transient ischemic attack; cognitive training; brisk walking

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**INTRODUCTION:** World health organization (WHO) defines Transient ischemic attack are brief episodes of neurological dysfunction caused by focal brain or retinal ischemia with clinical symptoms typically lasting less than one hour and without evidence of acute infraction<sup>(1)</sup> and the symptoms of transient ischemic attack (TIA) subsides

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completely within 24 hours. But the risk of developing cognitive impairment are high. As per TIA in India 84-264/one lakh population in rural areas and between 334 and 424 per one lakh population in urban areas. TIA carries particularly high short-term risk of stroke, and approximately 15 % of diagnosed stroke are produced by TIA'S. 7% to 40% of stroke patients are found to have TIA episodes. Age above 55years are in higher risk for TIA in males than in females, high blood pressure, diabetes mellitus and tobacco smoking are also the risk factors<sup>(2)</sup>. Cognitive impairment is frequently associated with aging and cerebral vascular pathology. Cognitive impairment patients are with depressive symptoms, anxiety and fatigue which affects the activity of daily living. Cognition is a common type of complaints in older population with transient ischemic attack in age group of 45 to 65 years of age.<sup>(3)</sup> As many studies have shown the effectiveness of cognitive training in cognitive impaired TIA patient, none of the study have seen with combined exercise. Physical exercise shows promise as a modifiable risk factor to reduce the risk of cognition and related neurodegenerative diseases<sup>(1)</sup>. As cognitive function declines with advancing age, a physically active lifestyle has an important role in reducing such declines,<sup>(3,4)</sup> as well as the incidence of cognition. Aim of this study was to evaluate the effect of cognitive training with physical activity of the cognitive impairment in TIA subjects

**MATERIALS AND METHODS:** This study was a comparative study conducted over a period of 12 weeks in the hospital set-up. Ethical permission was obtained from the Institutional Ethical committee before the study was conducted. All the participants were informed about the study and an informed consent form was signed by each participant. 60 subjects were equally divided into 2 groups using simple random sampling with random allocation. Female subjects who were willing to participate in the age group of 45-65 are included in this study. Level of cognition was evaluated at the beginning and at the end of the 12 weeks training with MoCA and CASP scale respectively followed by group A and B were given two different sets of training program for a period of 12 weeks. Cognitive training was given for group A (Control group) and physical activity with cognitive training was given to group B (experimental group) for 5 days per week for 12 consecutive weeks. Each session will begin with a general warm up for 10 minutes and ends with a general cool down for 10 minutes to prevent injuries. Control group (Group A): The cognitive training aims at abilities (Information processing speed), attention and memory function. The training of speed of information and attention was focussed on visual search tasks. Visual information (e.g. A specific number or letter) was to be located as quickly as possible (e.g. In a row or a diagram of numbers or letters). Memory training included training of short-term storage and retrieval of verbal or numerical material, as well as the training of memory strategies for long-term storage like verbal categorization, verbal elaboration or visual imaging for remembering names and numbers or more complex information of texts. The memory tasks were mainly related to demands of daily life (e.g. telephone numbers, names, shopping lists, newspaper texts). Furthermore, the participants received information on ageing processes of memory functions. Intervention begins with the Warm up session 10 minutes, Cognitive Training 45 minutes and Cool down session 10 minutes. Cognitive activities like Jigsaw puzzle: 5 minutes, Pegboard: 10 minutes, Find the difference: 10 minutes, Brainvita: 10 minutes, Colour confusion: 10 minutes.

Experimental group (GROUP B): Participants are instructed to walk briskly in one continuous bout (45 minutes for 5 day, 150 minutes per week) intensity and duration are initiated in a step wise manner in order to reduce the possibility of injury. The training program is based on international guidelines of physical exercise from World Health Organization (WHO). The first 2 weeks they must walk 30 mins considered light intensity. Time is increased to 45 min with the same intensity during the second week. During the rest of the program (10 weeks), they maintain the 45 min and increase the intensity of the activity to a moderate-high effort. Brisk walk should be done in their home and made to update the exercise chart regularly and submit at the end of session to the department. In addition to that the participants will do cognitive training program in the out-patient department with supervision as similar like in the control group for 12 weeks.

**STATISTICAL ANALYSIS:** The IBM SPSS® software were used in this study for the statistical data analysis. The collected data from both the groups baseline and post-intervention values are interpreted using the paired t test with the level of p value (<0.05) significance.

Table 1: Comparison of Pre and Post- test values of MoCA scale

Group	MoCA	Mean $\pm$ SD	t value	p value
Group A (Cognitive training)	Pre	18.428 $\pm$ 3.15	-4.163	0.003
	Post	19.785 $\pm$ 3.37		
Group B (Cognitive training and physical activity)	Pre	20.142 $\pm$ 4.38	-0.391	0.001
	Post	21.787 $\pm$ 4.11		

Table 2: Comparison of Pre and Post- test values of CASP scale

Group	CASP	Mean $\pm$ SD	t value	p value
Group A (Cognitive training)	Pre	19.657 $\pm$ 3.27	3.789	0.002
	Post	20.875 $\pm$ 3.37		
Group B (Cognitive training and physical activity)	Pre	20.214 $\pm$ 4.11	6.497	0.001
	Post	21.428 $\pm$ 4.14		

**RESULTS:** From the above given table 1, it has been described by the descriptive statistics, mean, standard deviation, the post mean value of group A with cognitive training, it is calculated with paired t test evaluated by MoCA scale. This study shows a significant difference ( $p < 0.003$ ) for group A, who received cognitive training alone and ( $p < 0.001$ ) for group B who received physical activity with cognitive training. Both groups were statistically significant but the values of group A who received cognitive training alone are less as compared to group B physical activity with cognitive training. From the above given table 2 it has been described by the descriptive statistics, mean, standard deviation, the post mean value of group A with cognitive training, it is calculated with paired t test evaluated by CASP scale. This study shows a significant difference ( $p < 0.002$ ) for group A, who received cognitive training alone and ( $p < 0.001$ ) for group B who received physical activity with cognitive training. Both groups were statistically significant but the values of group A who received cognitive training alone are less as compared to group B physical activity with cognitive training. From the above results, we see that both “CASP” and “MoCA” were found to be improved from Pre to Post-test values. This clearly indicates that the treatment is effective in terms of both the parameters.

**DISCUSSION:** There is considerable impact of physical activity on prevention of cognitive impairment of vascular aetiology. Still, there is a great number of experimental studies that evaluated the effect of physical activity and cognitive training respectively on impairment of physical functions, cognitive functions, and mental status in older people with TIA. The purpose of the study was to investigate the effects of cognitive training with physical training and cognitive alone showing improvement in level of cognition in cognitive declined transient ischemic attack patients. The present study was conducted to see the effect of physical activity with cognitive training is much better than the effect of cognitive training alone. In this study, subjects reported a significant improvement in cognition with the treatment provided for 12 weeks of training to both groups A and B. The study was conducted within 30 subjects. Subjects divided into two groups, cognitive training given to group A and physical activity with cognitive training given to group B. Prior consent was taken. Treatment protocol carried out for 5 days per week for 12 weeks. The outcome measure for either study was MoCA and CASP. The result of this study showed that there was a significant difference in improving cognition level in TIA patients after 12 weeks of interventions in both group A and B. Cognitive training and exercise have a positive impact on health, brain and cognition with the possibility of greater benefits when they are combined<sup>(5)</sup>. There is a considerable controversy concerning the impact of physical activity on the prevention of cognitive impairments<sup>(1)</sup>. It is hypothesised that the neural and vascular adaptations to physical exercise improve cognitive function through promotion of neurogenesis, angiogenesis, synaptic plasticity, decreased pro-inflammatory processes and reduced cellular damage due to oxidative stress.<sup>(6)</sup> Impaired cognitive function might have been present prior to TIA and cognitive impairment can result from same underlying cerebrovascular disease process. Cerebral vascular damage including silent brain infarcts and white matter hyperintensities of presumed vascular origin may use to cognitive impairment<sup>(7,8,9)</sup>. Although, these psychiatric disturbances may be a major cause of cognitive impairment when assessed shortly after TIA. Paired t test is used to analyse the effect of cognition training in TIA patients and showed that there was significance in MoCA and CASP. Paired t test is used to analyse the effect of physical activity with cognition training in TIA patients and showed that

there was significance in MoCA and CASP. Desjardins-Crépeau L et al, showed that physical activity and cognitive training proves effective in improving cognitive impairment in TIA patients<sup>(10)</sup>. Verdelho A et al stated in their study that whether or moderate physical activity has a beneficial impact on cognition, quality of life, motor, and functional status in people with vascular cognitive impairment and to generate new insights on the applicability of implementing physical activities in this specific population<sup>(1)</sup>. This improvement may be due to increase in blood flow to brain and increase cardio respiratory rate and it may also be effective to improve cognition level in transient ischemic attack patients when it given along with physical activity. Exercise may decrease the sympathetic activity and relieve the stress. Gheysen F et al, 2018 concludes that combined physical activity plus cognitive activity programs should be promoted as a modality for preventing as well as treating cognitive decline in older adults<sup>(5)</sup>. Kirk I. Erickson et al, 2018 concludes that is moderate to strong that physical activity benefits cognitive functioning during early and late period of life span in certain cognitive deficits<sup>(3)</sup>. In further study cognitive intervention components could include single-domain or multi-domain cognitive training.

**CONCLUSION:** Thus, this study showed that both cognitive training with physical training and cognitive training alone improved cognition in transient ischemic attack patients, from the statistical analysis a highly significant difference between pre and post during cognitive training with physical activity and a significant improvement in cognition training alone. Hence it can be concluded that the physical activity with cognitive training is improved the level of cognition in transient ischemic attack patients than cognitive training alone.

**Conflict of Interest:** Nil

**Funding:** Nil

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