



## EFFECTIVENESS OF FUNCTIONAL EXERCISE CIRCUIT ON COGNITIVE FUNCTION IN ELDERLY POPULATION: A CASE STUDY

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**ABSTRACT** **Background:** Aging is a fundamental process which causes decline in neurological, musculoskeletal, cardiovascular, visual and vestibular system. Similarly studies shows that cognitive decline is also closely related to the ageing process. Cognition is critical function to live independently as people age. Many studies have shown that physical activities like aerobic exercises, resistance exercises, walking, tai chi has positive effect on cognition in healthy adults.

**Objectives :** To find out effectiveness of functional exercise circuit on cognitive function by using RUDAS scale and trail making test in elderly population over the period of 6 weeks.

**Method :** A 74 year old female was selected in the study on the basis of inclusion and exclusion criteria. case study was done by using convenient sampling. Participant received functional exercise circuit training for 6 weeks. Pre and post-intervention assessment was done by using RUDAS scale and Trail making test. Data was collected and analysed.

**Result / Conclusion:** The present study shows functional exercise circuit is effective in improving cognitive function in elderly population over the period of 6 weeks with respect to RUDAS scale and Trail making test.

**KEYWORDS :** Cognitive function, Elderly population, functional exercise circuit

**INTRODUCTION:**

India is popular country within the world which has seen a sharp increase in the population of elderly and it has been suggested that it would rise up to 324 million by 2050. <sup>(2)</sup> According to the population census of India (2011), the percentage of older adults above the age of 60 is 8.6% of total population. The prevalence of cognitive impairments in India, above 60 years, reported to range 10% - 45%.<sup>(2)</sup>

Ageing is a fundamental process that affects deficits in the neurological, vestibular, and visual systems. Also studies suggests that there is a gradual decline in the level of cognitive function and it is closely connected with the aging process. As age increases, cognition becomes more important for functional independence such as to manage finances, take medications correctly, and drive safely. <sup>(3)</sup> Also, intact cognition is crucial for humans to communicate effectively, including processing and integrating sensory information and responding properly to others. <sup>(3)</sup>

It is critical to understand the cognitive changes occurring with age because of the rapidly increasing number of adults over the age of 65 and the increasing prevalence of age associated neurodegenerative disorders. <sup>(3)</sup>

Cognitive abilities can be divided into specific cognitive domains which includes attention, memory, executive cognitive function, language, and visuospatial abilities. Each of these domains has measurable declines with age though changes in cognition are usually mild and affect visual and verbal memory, visuospatial abilities, immediate memory or the ability to name the object. These changes reflects the aging of nervous system. <sup>(1)</sup>

It has been suggested that regular physical exercise has a positive effect on reducing risk for dementia or slowing down the decline in cognitive function. Research reveals that physical activities may positively affect brain function and productivity, though the molecular mechanism is not clear yet. <sup>(7)</sup>

Various treatment strategies are proven to be effective in improving cognitive function. Studies shows that aerobic exercises, resistance exercises, walking is helpful. Functional exercise circuit is a circuit training which involves variety of exercises such as endurance training, strength training, aerobic exercises, coordination and balance exercises. Functional exercises trains the muscles to work together and prepare them to perform daily tasks. Thus it helps body to perform well in variety of common situations.

**MATERIAL AND METHOD:**

A 74 year old female participant was selected on the basis of inclusion and exclusion criteria by using convenient sampling method. Various

old age homes, housing societies and clinics were visited in and around the city.

**INCLUSION CRITERIA:-**

Age group from 65 - 75 year old ( both males and females) <sup>(6)</sup>, Score of RUDAS scale should be < 25, BBS score: >45, ROM of B/L Upper and lower limb should be within normal limits, Minimum grade of MMT of B/L Upper limbs, lower limbs and trunk should be grade 3 and above, Vision and hearing function should be within normal limits, individuals should be able to read and write alphabets and numbers.

**EXCLUSION CRITERIA:-**

Ophthalmic pathology, Recent fractures of upper limb, lower limb and spine (within past 6 months), Any deformity of upper limb, lower limb or spine, Obese and obese individuals, Limb length discrepancy, Endocrinal conditions, Individuals using walking aids, History of cardiovascular, neurological, musculoskeletal disorders, Individuals with dementia and psychiatric illness..

**PROCEDURE:**

We report the case study of Mrs. S. S. a 74 year old female, who lives in a society on third floor with her family and total number of family members are 6 (husband, son, daughter in law and two grandchildren). According to Kuppuswamy scale she belongs to upper middle class and her socioeconomic status is good. She is a known case of hypertension since 8-10 years and on regular medications for the same. Mrs. SS was explained about the study and her consent was taken. She complains about forgetfulness of recent conversation or any task she performs. She also complains about difficulty in sustaining attention and performing multitasking activities since 2 years. It was also noticed that there is difficulty in performing visuospatial tasks like buttoning clothes, sewing, arranging utensils. On assessment RUDAS scale score was found 24/30, indicating mild cognitive decline.

Mrs. SS received functional exercise circuit training for 6 weeks. Her pre and post-intervention assessment was done by using RUDAS scale and Trail making test to check the effect of functional exercise circuit on cognitive functions. The data was recorded and data analysis was done.

**FUNCTIONAL EXERCISE CIRCUIT TRAINING:-**

- 1) Warm up – 10-15 min (walking, slow jogging)
- 2) Functional exercise circuit training - 25-30 min  
Functional exercise circuit aimed of training components like Agility, Coordination, Aerobic Capacity, Strength, Accuracy, Balance. <sup>(5)</sup>
- 3) Cool down – 5-10 min ( stretching exercises)

**OUTCOME MEASURES:**

Rowland Universal Dementia Assessment Scale (RUDAS) <sup>(8)</sup>

TRAIL Making Test<sup>(9)</sup>**RESULT:**

OUTCOME MEASURE	BASELINE MEASUREMENT	AFTER 6 WEEKS MEASUREMENTS
RUDAS SCALE	24/30	26/30
TRAIL MAKING TEST	Part A – 1.34min	Part A – 1.26min
	Part B – 4.48 min	Part B – 4. 37min

**DISCUSSION :**

The present study was undertaken with the intention to see the effect of functional exercise circuit on cognitive function in elderly population. A case study was done on a 73 year old female who participated in this study.

The result of present study showed that functional exercise circuit is effective in improving cognitive function in elderly population. The result indicated that 6 weeks functional exercise circuit training led to improvement in RUDAS scale score as well as trail making test.

Studies have shown that physical exercise positively affects brain function and productivity.

Some studies states that physical exercise may enhance resistance against oxidative stress, aids recovery from it and maintain cognitive function. Prefrontal and hippocampal areas are more affected by physical activity than any other structures of brain. They suggests that physical activities promotes endogenous pharmacology of brain to improve cognitive and emotional functions in late life.<sup>(7)</sup>

Another study explains that physical activities may reduce damage in the grey matter and in addition contribute to the release of neurotrophic factors, enhance blood flow, cerebrovascular health and benefits glucose and lipid metabolism for the brain.<sup>(7)</sup>

Scherder et al.( 2005) did a study on 43 participants with inclusion criteria of resident in a home for the elderly, 15 participants were given walking for 30 min/week, 6 weeks and hand and face exercises including bending and stretching the fingers, producing different facial expressions were given for 13 participants for 6 weeks and 15 participants were there in control group. They found category naming trails A and B were better in the walking group and the hand face group than control group.<sup>(10)</sup>

Similarly, in our study as well we found improvement in trail making test Stevens and Killeen (2006) did a randomized control trial was done on 120 participants where inclusion criteria was mild-to-moderate dementia, able to respond to verbal requests, physically capable of regular exercise, nursing home resident. Group 1, n = 24 received strength-training 3 × 30 min/week, 12 weeks and group 2 received, n = 21: social visits/interactive group discussion 3 × 30 min/week, 12 weeks and group 3, n = 30: control, group no intervention, follow-up: after 12 week. They found increased average score in clock drawing test.<sup>(11)</sup>

Hanna Ohman et.al(2014) did a systemic review on 22 RCTs , out of which 7 RCTs examining the efficacy of exercises in subjects with MCI showed some positive cognitive outcomes on global cognition, executive function and attention.<sup>(12)</sup>

Similarly in present study we found the improvement in memory and judgement parameters of scale, also difference was noted in completion time of trail making test(part A and B).

Joseph Michael Northey et.al (2017) in their meta-analysis showed that physical exercise interventions are effective at improving cognitive function of older adults regardless of baseline status.<sup>(13)</sup> Here we can relate the effect of exercises in improving cognitive function.

**CONCLUSION:**

The present study shows functional exercise circuit is effective in improving cognitive function in elderly population over the period of 6 weeks with respect to RUDAS scale and Trail making test. Hence we accept the alternate hypothesis.

**FUTURE SCOPE OF STUDY:**

Study can be conducted on larger population.

Long term effect of intervention can be measured.

Study can be done on patients with dementia and Alzheimer disease.

Study can also be performed on the population with neurological conditions having cognitive impairments.

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