



EFFECTIVENESS OF DUAL TASK TRAINING ON COGNITION IN COMMUNITY DWELLING OLDER ADULTS BY THE END OF FOUR WEEKS:- AN EXPERIMENTAL STUDY

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Abstract: Cognition is critical for functional independence. Cognitive impairments, particularly in the old age are pervasive and occur because of both normal and pathological senescence. Engaging in dual task training appears beneficial in increasing cognitive resistance to degenerative processes in the brain in older adults. Dual task training (DTT) by combining motor and cognitive activities causes improvement in various domains of cognition.

Index Terms - Dual task training, cognition, MoCA

I. INTRODUCTION

Cognition is defined as any and all process by which a person becomes aware of his/her situation, needs, goals, and required actions, and uses this information to implement problem solving strategies for optimal living. ⁽¹⁾ Cognition is critical for functional independence as people age such as in community dwelling older adults (ie. Adults greater than 60 years of age and living independently) ⁽⁴⁾ India's geriatric population is on the rise [1]. Around 10 crore Indians are more than 60 years of age. Approximately 18 million people worldwide are said to be dealing with age-related mental health concerns. Aging-related degenerative processes affect brain structure and function. Cognitive decline is practically ubiquitous among elderly people, and it worsens as they become older [5]. Cognitive function (CF) is a mental process in humans that includes attention, perception, reasoning, knowledge, and memory [6-9]. Additionally, cognitive processes such as perception, learning, memory, attention, problem-solving activities, and psychomotor functions (reaction time, movement timing, and action speed) can be thought of as phases in information processing [2,6]. For functional independence, cognition is crucial [10]. CF is influenced and affected by many factors throughout a person's life. Reduced CF is linked to a sedentary lifestyle and physical inactivity [11] Cognition deteriorates as people age, which may represent normal part of age-related cognitive decline. Cognitive change as a normal process of aging has been well documented in the scientific literature. ⁽²⁾As people age, there are declines in cognition that impact functional abilities and independence. Memory loss, deterioration in executive functioning and poor motor speed and precision are some of the cognitive deficits people would most certainly encounter as they get older. Lack of physical activity and mentally challenging activities are two main modifiable risk factors that cause cognitive decline [5].

Physical activity improves the brain's cognitive reserve capacity, thus reducing the harmful impact of aging as well as the chance of acquiring neurological disorders and dementia. The ability to execute two tasks concurrently or at the same time is necessary and commonly used by older adults in the performance of various activities of daily living such as meal preparation, financial management, housework and medicine administration. As a result, it's critical to concentrate on motor activities requiring attention and combine both physical and cognitive abilities (dual task). Dual task refers to the execution of two distinct tasks concurrently or in quick order. A rehabilitation strategy increasingly used is dual task training which combines a cognitive and motor task and seeks to facilitate the ability to synchronize different tasks so as to cause improvement in cognitive functions such as working memory, divided attention, executive functions.

NEED OF STUDY

It is imperative to understand the effects of age on cognition because of the rapidly increasing number of adults over the age of 65 and the increasing prevalence of Mild Cognitive Impairment of upto 14% in India. ⁽⁶⁾ Simultaneous performance of motor and cognitive tasks (dual-tasking) places demands on attentional resources and reflects an increasing cognitive challenge for older adults ⁽⁷⁾ when the processing level of two actions begins to deteriorate due to decline in cognitive or executive functions, it becomes a potential threat to the older persons independence. There are studies regarding dual task training that demonstrate efficacy in Parkinson's population on balance and executive function. ⁽⁹⁾ But since there is limited availability of evidences that focus solely on the effectiveness of dual task training on Cognition in community dwelling older adults the study becomes imperative. Knowing that dual task training is a low cost resource and extremely rich in possibilities of application, this study is justified to encourage research on effect of dual task training on Cognition in community dwelling older adults.

REVIEW OF LITERATURE

1) Soo Borson, MD. In their study “. Cognition, Aging and Disabilities: conceptual Issues” states that ‘Cognition is defined as any and all process by which a person becomes aware of his/her situation, needs, goals, and required actions, and uses this information to implement problem solving strategies for optimal living.’

(PMC journal 2011May1)

2) Caroline N. Haradaa, Marissa C. Natelson Lovec, et.al. in their study “Normal cognitive ageing” states that ‘the majority of adults over the age of 65 will not develop dementia or MCI, and more work is needed to better understand how we can maximize cognitive function and quality of life for these individuals’.

(Clin Geriatric Med. 2013 November)

3) Ziad S Nasreddine et al. in their study “The Montreal Cognitive Assessment, MoCA: a brief screening tool for mild cognitive impairment” states that ‘The MoCA is a brief cognitive screening tool with high sensitivity and specificity for detecting MCI as currently conceptualized in patients performing in the normal range on the MMSE. MoCA detected 90% of MCI subjects.

(J Am Geriatr Soc. 2005 Apr)

4) Susan W. Muir-Hunter, Laura Graham et.al. in their study “Reliability of the Berg Balance Scale as a Clinical Measure of Balance in Community-Dwelling Older Adults with Mild to Moderate Alzheimer Disease: A Pilot Study” states that, ‘The BBS achieved relative reliability values that support its clinical utility of ICC = 0.98’.

(PMC journal-2015)

AIM

To study the effectiveness of dual task training on cognition in community dwelling older adults by the end of four weeks.

OBJECTIVE

To study effectiveness of dual task training on cognition in community dwelling older adults by the end of four weeks using Montreal cognitive Assessment scale.

HYPOTHESES

NULL HYPOTHESIS- There will be no significant effect of dual task training on cognitive function in community dwelling older adults by the end of four weeks.

ALTERNATE HYPOTHESIS- There will be significant Effect Of dual task training on cognitive function in community dwelling older adults by the end of four weeks.

MATERIALS

- 1.Consent form
2. Pen
- 3.Outcome measures (MoCA)
4. Image
5. Ball

METHODOLOGY

Sample size- 67

Study design –pre post experimental Study

Sample method- convenient sampling

Study duration- 6 months

Study population- 60- 79 years

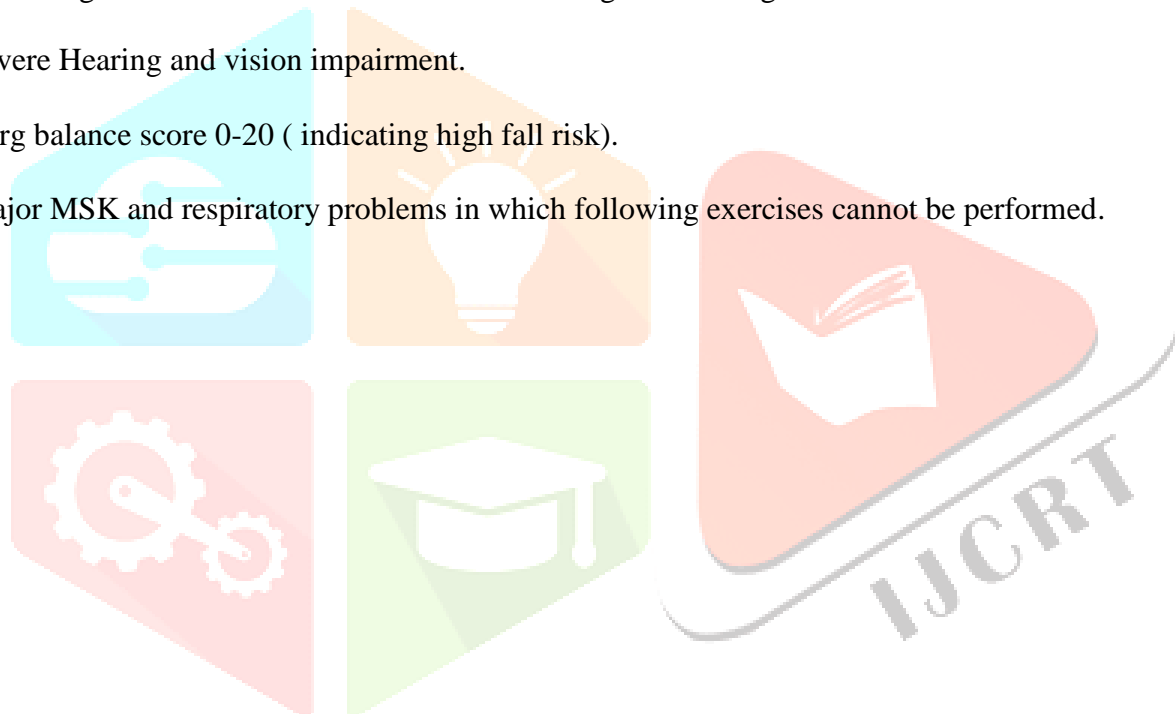
Study place- In and around city

INCLUSION CRITERIA

1. Older adults in age Group of 60-79.³
2. MoCA score range of 19-25 indicating mild cognitive impairment.
3. Visual acuity of 20/30 on snellens chart.
4. Both males and females.
5. Berg Balance score (score 41-56=low fall risk)
6. Minimum literacy- Elementary school Education.

EXCLUSION CRITERIA

1. Diagnosed neurological conditions like TBI, stroke, Depression, Dementia etc
2. Score of greater than 26 on MoCA scale indicating normal Cognition.
3. Severe Hearing and vision impairment.
4. Berg balance score 0-20 (indicating high fall risk).
5. Major MSK and respiratory problems in which following exercises cannot be performed.



PROCEDURE

THE STUDY BEGAN WITH PRESENTATION OF SYNOPSIS TO THE ETHICAL COMMITTEE OF MODERN COLLEGE OF PHYSIOTHERAPY

THE PARTICIPANTS WERE SELECTED ACCORDING TO THE INCLUSION EXCLUSION CRITERIA.

PURPOSE OF THE STUDY WAS EXPLAINED TO THE PARTICIPANTS AND WRITTEN CONSENT WAS OBTAINED.

PRE- TREATMENT ASSESSMENT WAS DONE USING MONTREAL COGNITIVE ASSESSMENT SCALE.

PARTICIPANTS RECEIVED DUAL TASK TRAINING PROTOCOL FOR 4 WEEKS (3 TIMES /WEEK) FOR 60 MIN PER DAY.

PROTOCOL

The dual task protocol will be of duration 60 minutes for 4 weeks, 3 days/week on alternate day with rest time of 5 minutes in between the training.

MOTOR TASKS	COGNITIVE TASKS
1. Walking on a narrow path	Backward digit span
2. Waist rotation while holding a ball	Image description
3. Backwalking	Nomination e.g naming objects, fruits
4. Single leg standing with support	Description of their day
5. Spot marching	Executing 7 serial subtractions
6. Sitting and drawing letters of the alphabet with foot.	Naming words starting with the same letter.

OUTCOME MEASURES**MONTREAL COGNITIVE ASSESSMENT (MoCA)**

Reliability= 0.92

Validity= 0.75

The Montreal cognitive Assessment scale was designed as rapid screening instrument for mild cognitive dysfunction.

It assesses different cognitive domains: attention, concentration, executive functions, memory, language, orientation.

The total score is 30 points, score of 26 or above is considered normal.



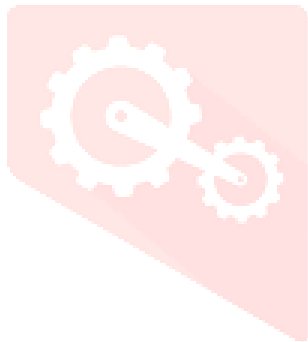
Sitting , drawing any letter of the alphabet with foot and naming objects from the image





Walking on narrow path and backward digit span

Single leg standing with support and description their day



MONTREAL COGNITIVE ASSESMENT SCALE (MOCA)	PRE-TREATMENT MEAN SCORE + SD	POST-TREATMENT MEAN SCORE +SD	T VALUE	P VALUE	RESULT
	21.93+2.02	24.94+2.49	16.7664	<0.0001	EXTREMELY SIGNIFICANT

Statistical Analysis

- The study included 67 participants both males and females aged 60 years and above. The subjects were taken and their pre post MoCA scores that determined their cognition level was assessed using montreal cognitive assessment scale.
- The dual task training protocol was carried out 3 days/ week for 4 weeks.
- The data collected was statistically analysed using Microsoft excel sheet.
- Paired T test was used to get the difference between pre and post values.
- The various statistical measures such as mean, standard deviation (SD) and test of significance were utilized to analyse the data. The results were concluded to be statistically significant if, p value is less than 0.0001 . The data was represented in both tabular and graphical format.

RESULTS AND DISCUSSION

Total of 67 participants participated in the study. Paired T test was done. The results obtained for effectiveness of dual task training protocol to improve cognition were found to be significant with p value <0.0001 and t value 16.7664.

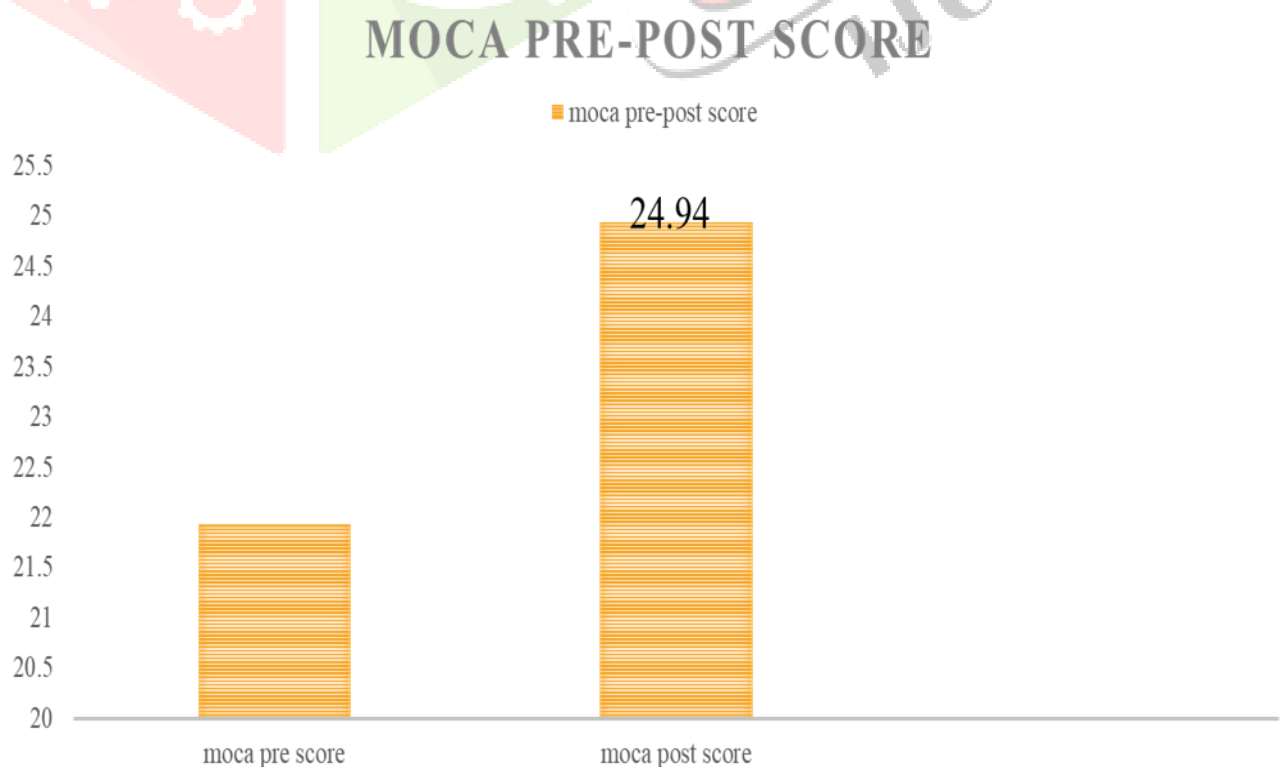


Table no. 1

- Total 67 participants of both male and female gender of age group above 60y/o were recruited for this study.
- According to the MoCA scale individuals falling within the MCI(mild cognitive impairment) were categorized.
- Dual task training is a rehabilitation strategy that combines a cognitive and a motor task and seeks to facilitate the ability to synchronize different tasks so as to cause improvement in cognitive functions.
- There have been previous articles that study “ the comparison of DTT versus aerobics training in improving cognition in healthy elderly population”.
- There are articles such as” the aging mind: neuroplasticity in response to cognitive training” that show DTT improves cognition by neuroplasticity in the aging brain.
- DTT places substantial and sustained demands on the cognitive system that manifests plasticity via increase in volume of neural structures and neural re-organization of structures.
- There is evidence that aging brain is malleable and has the capacity to increase neural activity and develop neural scaffolding to regulate cognitive function in response to dual tasks in DTT.
- Given the necessity of dealing with DT on a routine basis as well as observed deterioration in performance as the individual ages, it in performance as the individual ages, it appears that DTT training is beneficial in addressing DT situations
- Dual task training by combining cognitive and motor task causes improvement particularly in executive function, working memory and divided attention.
- Betterment in these cognitive domains was evident after four weeks of DTT intervention.

CONCLUSION

This study concludes that dual task training is effective in improving cognition in community dwelling older adults by the end of 4 weeks.

LIMITATIONS

specific cognitive domains were not focused on in this study.

FUTURE SCOPE

The study can focus on specific cognitive functions.

CLINICAL IMPLICATION

Cognition encompasses a wide range of mental functions that are critical for human existence. These functions are known to deteriorate as people age, however intervention in the form of dual task training in group sessions in the community are effective in increasing cognition in community dwelling older adults. The Dual task training intervention helps to improve cognition by increasing their ability to perform in everyday ADL's dual task situationsADL's such as ability to walk and postural control while dealing with cognitive function or addressing dual task situations.

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