

Effectiveness of Physical Activity on Cognitive Performance in Older Adults

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ABSTRACT

BACKGROUND AND PURPOSE: Ageing refers to change in the ability to think, learn and remember that occur as individuals age. Resistance exercise and Tai Chi exercise program for older adults undergoing cognitive aging and to examine the effectiveness of physical activity on cognitive performance in older adults.

AIM: The aim of the study was to the effectiveness of physical activity on cognitive performance in older adults.

METHOD: A sample of 30 patients within age group of 50-70 years were randomly divided into two groups, Group A was 15 subjects and Group B was 15 subjects which were taken on basis of inclusion and exclusion criteria and method of quasi randomized sampling. The subjects in group A were treated as control group followed by any kind of activities as they want to do, group B treated with resistance exercise and Tai Chi exercise for 5 months. The subjects' cognitive performance was assessed by Time Up and Go and Mini Mental State Examination. The pre and post-test result were tabulated and assessed.

RESULTS: The study concluded that after 5 months the Resistance exercise and Tai Chi exercise program were significantly improving the cognitive performance in older adults.

CONCLUSION: The result of the study suggested that physical activity shows improvement in cognitive performance apparently caused positive effects improved in cognition flexibility, working memory, verbal fluency and learning and avoiding negative impacts on quality of life, sleep quality and possibly on muscular strength and mental confusion in older adults.

KEY WORDS: Resistance exercise, Tai Chi exercise, Time Up and Go (TUG) and Mini Mental State Examination (MMSE).

INTRODUCTION

Ageing is a natural phenomenon characterized by loss of neurons and decrements in neurotransmitter and physiological function.¹ The aging process is accompanied by deterioration of cognitive functions such as memory, attention, reaction time and speed of information process.² The neurotransmitter systems play an important role in the process of cognition and deterioration of the transmitter systems

causes cognitive decrement in aging. In 2017, the number of people aged 60 years or over was 962 million worldwide; this figure is expected to reach nearly 2.1 billion by the year 2050.³ Dementia is characterized by difficulties with memory, language, thinking and activities of daily living. Currently, 35.6 million people worldwide are living with dementia.⁴ Mild cognitive impairment (MCI) is an intermediate stage in the continuum from cognition to dementia; it is estimated

that 60-65% of people with MCI will develop clinical dementia during their lifetime.⁵With age, the grey and white matter regions of the human brain begin to atrophy, particularly in the prefrontal cortex and hippocampus.⁶In aging adults, microglia and cytokines stimulate the production of pro inflammatory markers, which promote changes in blood vessel permeability, endothelial cell function and micro vascular structure, resulting in damage to neurons.⁷ Resistance exercises is a form of exercise that improves muscular strength and endurance during the resistance training workout, you move your limbs against resistance.⁸Tai Chi is a series of gentle physical exercises and stretches. The movements are paired with breathing exercise to help the entire body and mind stay connected. Another mechanism by which exercise could improve cognitive function via the HPA axis. As individual age, their ability to adapt and cope with stress diminishes.⁹Tai Chi has the positive effects on both anxiety and depression.¹⁰ Mind- body exercises is an effective intervention for improving cognition among older adults, possibly by reducing stress level and restoring parasympathetic-sympathetic nervous system balance. A recent meta-analysis of 16 prospective studies found that physical exercise reduced the relative risk of dementia by 28% .¹¹

METHOD

The study was conducted at outpatient department in JKKMMRF College of Physiotherapy and Bharath Neuro hospital under the supervision of concerned authority. Samples of 30 patients with in the age group of 50-70 years were randomly divided into two groups. A total number of 30 subjects were selected by random sampling method after due to consideration to inclusion criteria. They were divided into two groups that is Group A and group B with 15 subjects in each group. Group A considered as a control group followed by any kind of activities as they want to do and group B received resistance exercise and Tai

Chi exercise for a total duration of 5 months for 45 minutes/ 5 sessions / week. The parameter used for the study was Time Up and Go and Mini Mental State Examination for both males and females are included in the study. Exclusion criteria of cardiovascular disease, acute metabolic disease, vision impairment, internal otitis, history of spinal injury/surgery or lower limb surgery severe osteoporosis, major psychological illness.

PROCEDURE

30 subjects who met inclusion criteria were recruited for the study by purposive sampling method. After the informed consent was obtained, they were divided into two groups, group A and group B. Group A have 15 subjects and group B have 15 subjects. Group A were followed their normal routine activities and group B were given with physical activity only for 45 minutes to 5 sessions / week for 5 months. And pre and post treatment values are measured before and after 5 months.

TECHNIQUE

GROUP - A

Group A was considered as control group followed by any kind of activities as they want to do. They won't restricted by giving exercises.

GROUP - B

Warming up can get your focus, intent and breathing on track before you get into exercise.

WARMUP EXERCISE

Stand with feet flat on the floor slightly wider than hip- width distance apart.

Relax arms by sides.

Rotate hip to the right and the left while letting arms hang loosely. With each rotation, arms should flap against body as rotate.

Repeat for 1-2 minutes or when we feel like our body has warmed up. Then include

Head rolls

Simple stretch

Shoulder rolls
Picking fruit
Knee circles

A) RESISTANCE EXERCISE

Resistance band exercises were performed using Theraband elastic tubing of different resistance levels (red, green).

The hand to hand length of the elastic tubing was individually adjusted.

Duration: 3 sets of 10 repetitions (5 sessions per week for 5 months).

Rest period: 1 minute between exercise sets.

EXERCISE	REPETITION	SETS	POSITION
Lumbar extension	10	3	Prone lying
Leg press	10	3	Supine lying
Rowing	10	3	High sitting

B) TAI CHI EXERCISE

TOUCH THE SKY

INSTRUCTION

- Position: Sit straight in a comfortable chair.
- Place their hands in their lap with palms turned upward and fingertips pointing towards one another.
- As they inhale slowly and deeply, raise hand to chest level in front of them, turn their palms outward and lift their hand above their head.
- Do not reach too far with their arms; keep their elbows relaxed and slightly bent.
- As they exhale slowly and deeply, relax their arms further and gently lower them to your sides.
- At the end of the breath, return their hands to the starting position with their palms turned upward.

WINDMILL EXERCISE

INSTRUCTION

- Position: Stand with their feet flat on the floor and slightly wider than shoulder-width apart.
- Release tension and relax their shoulders.

- Bring their hands in front of their body with your fingers pointing down toward the floor.
- Inhale and raise their arms up towards the center of their body and bring it over their head, fingers pointing as they go.
- Stretch toward the ceiling and arch their spine slightly backward.
- Exhale and slowly bend their back forward to the floor, moving their hands down through the center of their body.
- Bend forward from their hip and let their arms to hang loosely in front of them. Inhale and return to their starting position.

SHOOTING THE BOW

INSTRUCTION

- Position: Stand with their feet spread about shoulder-width apart and their arms hanging loosely at their sides.
- Round their back and bend their knees slightly, looking straight ahead with a relaxed posture.
- Ball their fists and place them directly in front of their face with fingers facing them and the heels of their palms touching the sides.
- Breathe in slowly and deeply.
- As they inhale slowly and deeply, rotate the waist to face to their left while extending their left hand directly in front of them.
- Their left hand should open with their palm facing outward; their left arm should be relaxed slightly bent.
- Simultaneously, pull back slightly with their right fist as if shooting a bow and arrow.
- Exhale slowly and deeply as they return to their starting position. On their next breath, repeat another side.

Duration: 3 sets of 10 repetitions (5 sessions per week for 5 months).

Rest period: 1 minute between exercise.

RESULTS AND TABLES

TUG- GROUP-A

S. NO	Group A	Time Up and Go			Paired tvalue
		Mean	Mean Difference	Standard Deviation	
1	Pre test	18.56	1.907	0.063	14.42
2	Post test	19.46			

The paired t-value of pre and post- test of Group A was 14.42 at 0.05 level of significance which was greater than the tabulated t value 2.05. This showed that there was statistically significant difference between pre Vs. post test result. The pre-test mean was 18.56 and the post-test mean was 19.46 and the mean difference was 1.907 which showed that there was significant improvement in post-test values in response to Time Up and Go.

TUG- GROUP-B

S. NO	Group B	Time Up and Go			Paired tvalue
		Mean	Mean Difference	Standard Deviation	
1	Pre test	7.36	5.57	0.471	11.83
2	Post test	12.94			

The paired t-value of pre and post- test of Group B was 11.83 at 0.05 level of significance which was greater than the tabulated t value 2.05. This showed that there was statistically significant difference between pre Vs. post test result. The pre-test mean was 7.36 and the post-test mean was 12.94 and the mean difference was 5.57 which showed that there was significant improvement in post-test values in response to Time Up and Go.

MMSE- GROUP-A

S. NO	Group A	Mini Mental State Examination			Paired t value
		Mean	Mean Difference	Standard Deviation	
1	Pre test	16.20	1.67	0.232	7.17
2	Post test	17.87			

The paired t-value of pre and post- test of Group A was 7.17 at 0.05 level of significance which was greater than the tabulated t value 2.05. This showed that there was statistically significant difference between pre-Vs post test result. The pre-test

mean was 16.20 and the post-test mean was 17.87 and the mean difference was 1.67 which showed that there was significant improvement in post-test values in response to Mini Mental State Examination.

MMSE- GROUP – B

S. NO	Group B	Mini Mental State Examination			Paired tvalue
		Mean	Mean Difference	Standard Deviation	
1	Pre test	19.20			11.93
2	Post test	24.87	5.67	0.47	

The paired t-value of pre and post- test of Group B was 11.93 at 0.05 level of significance which was greater than the tabulated t value 2.05. This showed that there was statistically significant difference between pre-Vs post test result. The pre-test mean was 19.20 and the post-test mean was 24.87 and the mean difference was 5.67 which showed that there was significant improvement in post-test values in response to Mini Mental State Examination.

DISCUSSION

Results of present study shows that “Physical activity that is Resistance Exercise and Tai Chi Exercise program apparently cause positive effect which are improved sleep quality, posture, balance, mobility, increase strength, improve heart condition specifically significant improvements in global cognition, cognition flexibility, working memory, verbal fluency, and learning in older adults and avoiding negative impacts on quality of life and possibly on muscular strength and mental confusion.¹² The Time Up and Go and Mini Mental State Examination was taken as the parameters of quality the effectiveness of physical activity on cognitive performance in older adults.

In the analysis and interpretation of Time Up and Go for Group A and Group B

The paired t test value of Group A was 14.42 and Group B was 11.83 were greater than tabulated t value of 2.15 which shows statistically significant difference at 0.05

levels between the pre and post test results of both group. The pre-test mean value for Group A was 18.56 and post-test mean was 19.46 and mean difference was 0.90 and the pre-test mean value for Group B was 7.36 and post-test mean was 12.94 and mean difference was 5.57 which showed that there was statistically significant improvement of cognitive performance by doing physical activity in Group B.

In the analysis and interpretation of Mini Mental State Examination for Group A and Group B

The paired t test value of Group A was 7.17 and Group B was 11.93 were greater than tabulated t value of 2.15 which shows statistically significant difference at 0.05 levels between the pre and post test results. The pre-test mean value for Group A was 16.20 and post-test mean was 17.87 and mean difference was 1.67 and the pre-test mean value for Group B was 19.20 and post-test mean was 24.87 and mean difference was 5.67 which showed that there was statistically significant improvement of cognitive performance by doing physical activity in Group B.

Based on the statistically analysis and interpretation the result of the study showed that there was significantly improving cognitive performance by doing physical activity in older adults. Therefore, the present study was rejected the null hypothesis and accepting the alternate hypothesis.

CONCLUSION

This study concluded that 5 months intervention involving Resisted Exercise and Tai Chi Exercise result in long lasting improvement of cognitive function and memory power, language and learning process and reducing the stress and level of disability, fitness, functional quality of life, sleep quality, posture, and balance in the individuals of older adult. In older adults, Exercise training induces neurogenic adaptations which contribute to improvements in cognitive function. After

physical activity, neurobiological changes such as changes in cerebral blood flow, neurotransmitter functioning or increased cell complexity, might occur in different brain regions and contribute to CNS integrity.

The effect of Group B (Physical activity) appears to be most beneficial for the sub-functions of mental flexibility and immediate recall. This is consistent with the praxis of physical activity, which involves the recalling and planning of movements.

Through the results, alternate hypothesis is accepted and also the study could be concluded that Group B was effective on cognitive performance in older adults when compared to the Group A.

Declaration by Authors

Ethical Approval: Approved

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