



Cover Page



EFFECT OF CO-ORDINATION TRAINING AND TAI CHI QIGONG ON COGNITION AND ACTIVITIES OF DAILY LIVING IN ELDERLY WITH MILD COGNITIVE IMPAIRMENT

Dr. Harshal Dixit and Dr. Anuradha Pai

Master's in Occupational Therapy (Neurosciences), Occupational Therapy Dept., LTMMC & GH, Sion, Mumbai
 India Assistant Professor, Occupational Therapy Dept., LTMMC & GH, Sion, Mumbai, India

ABSTRACT

Mild cognitive impairment (MCI) is a clinical stage on the continuum of cognitive decline between normal ageing and dementia which affects the daily living. **Co-ordination training (CT)** involves constant repetition of a few motor activities with the use of sensory cues and varying speed to enhance motor performance. **Taichi Qigong (TCQ)** which combine slow movements, meditation, and breathing exercises has been effective in improving the cognitive, physical and functional abilities in patients with various diseases. The study aimed to assess the effectiveness of CT and TCQ in improving cognitive functions and functional independence of MCI patients. A Prospective Experimental Study was conducted in Community Rehab setup in Mumbai, India. Initially, 17 participants were screened using MMSE, and 8 met the inclusion criteria for an 8-week protocol. Due to the COVID-19 pandemic, a revised 4-week protocol was implemented with 15 participants. Both protocols included warm-up exercises, CT for 20 minutes, TCQ for 30 minutes, and cool-down exercises. Patients were assessed on MoCA, FIM and DSRS scale as outcome measures. Results showed significant improvements in MoCA scores, indicating enhanced memory, attention, and visuospatial skills. DSRS scores demonstrated reduced dementia severity, particularly in memory and speech components. FIM scores revealed improved functional independence, with notable gains in cognitive and motor domains. CT combined with TCQ was associated with improvement in cognitive function and functional independence in elderly individuals with MCI. Larger controlled studies are required to establish its effectiveness.

Keywords: Activities of daily living, cognition, co-ordination training, mild cognitive impairment, Tai Chi Qigong



Cover Page



INTRODUCTION

Mild cognitive impairment (MCI) represents a state of cognitive decline that is greater than expected for age but does not necessarily prevent independent daily functioning. It may remain stable, revert to normal cognition, or progress to dementia, making early management clinically relevant.^[1,2] Age-related reductions in cognitive processing, memory and executive function may also interact with physical limitations and reduced functional independence.^[1,3] Exercise-based interventions are of interest because physical activity is associated with better physical function in older adults.^[3] **Co-ordination Training (CT)** requires attention, instruction following, sequencing, sensory integration and motor planning. Previous work has reported improvement in cognitive function following co-ordination exercise in older adults.^[4] **Tai Chi Qigong (TCQ)** and related mind-body practices combine slow controlled movement, balance, breathing and concentration, and have been investigated for cognitive and physical outcomes in older adults and people with MCI.^[5-9] Although CT and Tai Chi have each been studied separately, the thesis identified a gap regarding their combined use to address both cognition and functional independence in elderly individuals with MCI. Therefore, the present study examined the effect of combined CT and Tai Chi Qigong (TCQ) on cognition and activities of daily living.



Cover Page



Materials and Methods

A prospective experimental study was conducted in the Occupational Therapy Department of a tertiary care hospital in a metropolitan city. The study duration was one year. The study protocol, informed consent documents and case record forms were reviewed and approved by the Institutional Ethics Committee.

Participants of either sex aged 60–75 years with MCI, identified by an MMSE score of 18–23, were eligible. Individuals with associated neurological, musculoskeletal or psychiatric disorders, or speech, hearing or visual deficits, were excluded.

Outcome Measures:

Cognition was assessed using the Montreal Cognitive Assessment (MoCA) and Dementia Severity Rating Scale (DSRS). Functional independence was assessed using the Functional Independence Measure (FIM). MoCA is a 30-point cognitive screening instrument assessing multiple cognitive domains. DSRS evaluates cognitive and functional abilities including memory, orientation, judgement, language, home activities and mobility. FIM consists of 18 items scored from 1 to 7, with higher scores indicating greater independence.

Methodology:

The study received approval from the Institutional Ethics Committee and Maharashtra University of Health Sciences (MUHS). Participants were referred from the Neuro-Medicine and Geriatric Outpatient Department to the Occupational Therapy Department of a Tertiary Care Hospital, with additional patients from a nearby community centre.

Cognition and functional independence were assessed using MoCA, DSRS, and FIM scales. Initially, 60 patients were planned, but 17 individuals aged 60-75 were screened using the MMSE. Eight participants, scoring between 18-23 on the MMSE, met the inclusion criteria and were included. Informed consent was obtained in English, Hindi, or Marathi, based on participant preference.

Participants were assessed at baseline, 4 weeks, and 8 weeks. They underwent Co-ordination Training (CT) and Tai Chi Qigong (TCQ) for 1 hour, twice a week. Each session included a



Cover Page



5-minute warm-up, 20 minutes of CT, 30 minutes of TCQ, and 5 minutes of cool-down exercises.

Week	Co-ordination Training (The movements will be repeated 10 times followed by rest period of 1min; 1st week with eyes opened and 2nd week with eyes closed.)	Tai Chi Qigong (Each movement will be repeated 5 times followed by rest period of 1 minute)
0 – 2	1. Looking forward when head moves 2. Varying eye movement when head moves 3. Pointing nose with fingers	1. Tai Chi start 2. Opening Chest 3. Rainbow Dance 4. Separating the clouds 5. Repulse the monkey
2 – 4	4. Touching ears with fingers 5. Palm switching facing upwards and downwards 6. Fingers pointing to designated parts of the body according to coach instruction	6. Rowing the boat 7. Lifting the ball 8. Turning to look at the moon 9. Pushing palm
4 – 6	7. Fingers pointing to each other according to coach instruction 8. Straightening Fingers 9. Forming hand gestures according to coach instruction	10. Cloud hands 11. Touching the sea, looking at the sky 12. Pushing the wave 13. Flying pigeon 14. Punching
6 – 8	10. Forming body gestures according to coach instructions 11. Heel and toe touching the ground	15. Flying wild goose 16. Turning like a wheel 17. Marching while bouncing a ball 18. Settling and Balancing Qi



Cover Page



Until March 2020, 8 patients included in the study completed the 8week protocol. Out of which 3 participants completed the protocol in December 2019, while other 2 participants finished the protocol by February 2020 and the remaining 3 patients dropped out of the study after completing 3 weeks of the protocol, as the site of the Study witnessed a nationwide lockdown in view of the COVID-19 Pandemic on 25th March,2020.

A revised Protocol of 4 weeks with changes was proposed, in view of the ongoing COVID-19 Pandemic. The changes were accordingly made in the Patient Information Sheet, Case Record Form and Consent Form as well. Approval for the Revised Protocol was issued in November,2020 with the following mentioned changes to the previously approved Protocol in June,2019.

Sr No.	Components in Project	Approved in June 2019	Approved in November 2020
1.	Sample size	60	15
2.	- Duration - Session/week - Frequency of follow up	8 weeks 1 hour twice/week Baseline, 4 th week and 8 th week	4 weeks 1 hour once/week Baseline and end of 4 th week
3.	Protocol	Exercises were changed every week instead of 2 weeks	Exercises were changed every week instead of 2 weeks.

21 patients, fulfilling the inclusion criteria were screened using MMSE. Out of which 15 scored within the range of 18-23 on MMSE and were further included in the Study. The Revised protocol was given for 1hour per week for 4 weeks. Assessment using Outcome Measures i.e MOCA, DSRS and FIM Scales, was performed at the commencement of the protocol and a Follow-up assessment was performed at the end of the protocol (end of 4th week). Further, the Study had 1 drop out in the 2nd Week as the participant had an alleged Medical History of fall at Home and subsequent admission in the Hospital, for the same.



Cover Page



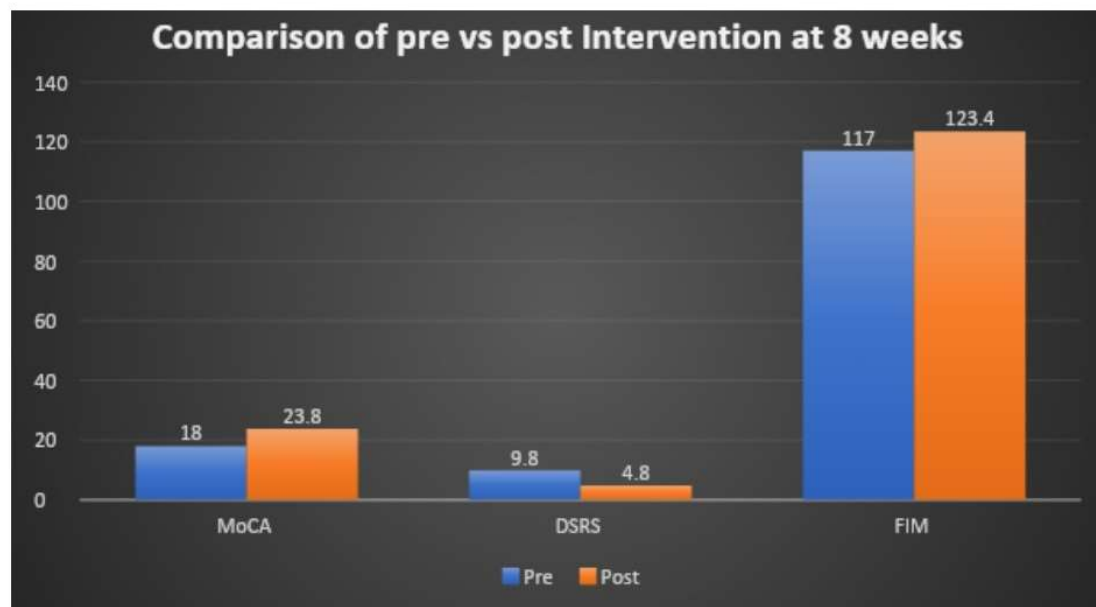
Statistical Procedures:

Data were analysed using SPSS version 26. Descriptive statistics were expressed as mean and standard deviation. Intra-group comparisons were performed using paired t-tests. Statistical significance was set at $p < 0.05$.

Original 8-Week Protocol

Five participants completed the original protocol. All participants were female, with a mean age of 67.60 ± 3.65 years. Mean MoCA scores increased from 18.00 ± 2.24 at baseline to 23.80 ± 2.78 at week 8, showing a significant improvement ($p = 0.001$). Mean DSRS scores decreased from 9.80 ± 2.68 to 4.80 ± 3.96 ($p = 0.003$), indicating improvement in cognitive and functional status. FIM scores increased from 117.00 ± 4.64 to 123.40 ± 2.88 ($p = 0.036$).

Significant improvements were observed in DSRS memory ($p = 0.004$), speech and language ($p = 0.002$), and ability to get from place to place ($p = 0.016$). FIM cognitive-domain scores also improved, particularly comprehension and memory.



Revised 4-Week Protocol



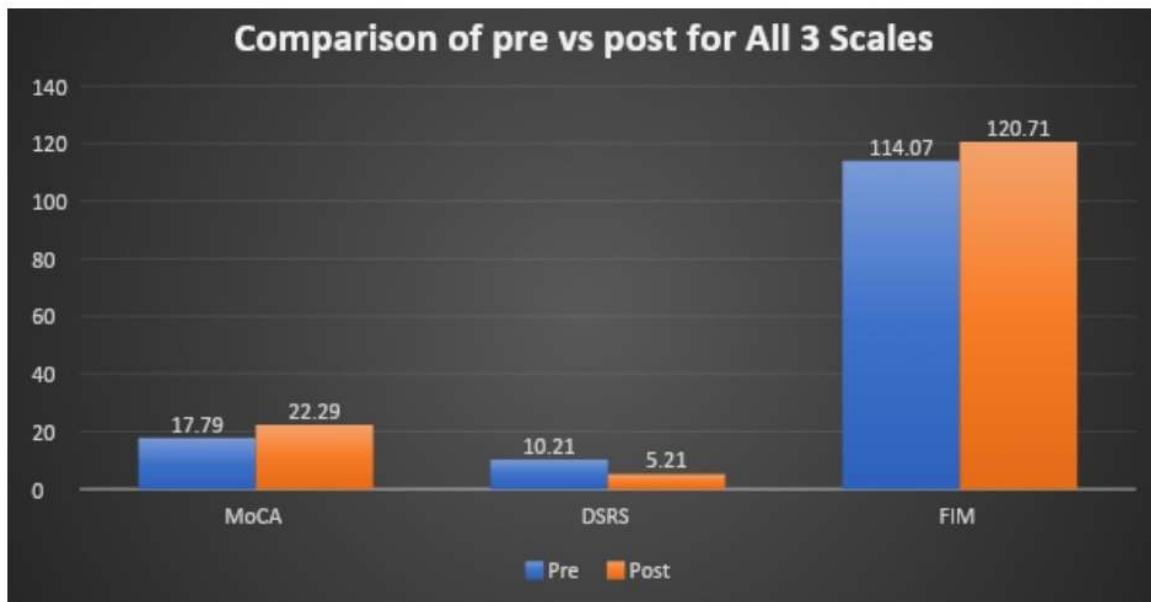
Cover Page



Fourteen participants completed the revised protocol, with a mean age of 66.44 ± 4.84 years. Mean MoCA increased from 17.79 ± 2.19 to 22.29 ± 2.23 , DSRS decreased from 10.21 ± 3.33 to 5.21 ± 3.60 , and FIM increased from 114.07 ± 6.20 to 120.71 ± 5.73 . All three changes were highly statistically significant ($p < 0.001$).

Significant improvements were observed in several FIM components, including self-care, comprehension, expression, social interaction, problem solving and memory.

A moderate negative correlation was observed between MoCA and DSRS ($r = -0.735$, $p = 0.003$), while MoCA demonstrated a moderate positive correlation with FIM ($r = 0.578$, $p = 0.030$). FIM and DSRS also demonstrated a moderate negative correlation ($r = -0.709$, $p = 0.004$).





Cover Page



DISCUSSION

The present study found significant pre-post improvements in cognition, cognitive/functional status and functional independence following combined CT and TCQ. The increase in MoCA scores is consistent with evidence that co-ordination exercise can improve cognitive performance in older adults.^[4] CT in the present protocol required participants to attend to instructions, sequence movements, coordinate visual and proprioceptive information, and perform increasingly challenging tasks. These cognitive-motor demands provide a plausible explanation for the observed cognitive improvement.

TCQ may have provided an additional cognitive and physical stimulus through slow, controlled movement, balance, breathing, concentration and learning of movement sequences. Previous studies have reported beneficial effects of Tai Chi on cognition and instrumental activities of daily living in community-dwelling older people with MCI,^[5] as well as improvements in cognition and fall-related outcomes following Tai Chi interventions.^[6] Other trials have also reported improvements in cognitive and physical function in older adults.^[7,8] Systematic review evidence supports a potential beneficial effect of Tai Chi on cognitive performance, although the magnitude and consistency of benefit vary across studies.^[9]

The reduction in DSRS scores suggests improvement in overall cognitive/functional impairment. The significant changes in memory, speech and language, orientation, home activities and mobility-related items are clinically relevant because cognitive impairment may affect everyday participation and independence. The present findings are also compatible with evidence linking cognitive and physical performance in older adults with MCI.^[12]

Improvement in FIM suggests that the intervention may have extended beyond cognitive screening to functional performance. The combined programme included motor planning, bilateral co-ordination, postural control, balance and weight shifting, while the cognitive components required comprehension, sequencing and problem solving. The improvement in FIM cognitive and selected motor domains is therefore consistent with the multidimensional nature of the intervention. Previous research has reported transfer of benefits from cognitive



Cover Page



and physical training to activities of daily living, supporting the relevance of exercise-based approaches to functional independence.^[13]

The significant correlations among MoCA, DSRS and FIM further indicate that better cognitive performance was associated with lower impairment severity and greater functional independence. These findings are associative and should not be interpreted as evidence that cognitive improvement caused functional improvement. An important finding was that significant changes were observed after the revised four-week programme. This suggests that a relatively brief, structured combined intervention may produce measurable changes; however, the result cannot establish the optimal duration or superiority of the intervention because there was no control group. The original eight-week phase also showed significant pre-post improvements in MoCA, DSRS and FIM among five completers, but interpretation is limited by the very small sample and attrition caused by the COVID-19 lockdown.

Overall, the findings support the feasibility of combining cognitive-motor CT with TCQ as an occupational-therapy-based approach addressing both cognitive and functional domains in older adults with MCI. Hence, the present study state that Exercise has definite effects on the health of older people, as aging is usually accompanied by a significant decline in organ function. Reports in the literature, suggest that Tai-chi Qigong can provide all that is required by elderly people from exercise. Tai Chi Qigong and Co-ordination Training improves the physical as well as cognitive functions. In addition, it has the potential to reduce expenditure generated by poor health, because it facilitates a lifestyle that promotes wellbeing among people of all ages.



Cover Page



CONCLUSION

The results and findings of the present study concluded that the Co-ordination Training along with Tai Chi Qigong can be used as an intervention to improve the cognition and activities of daily living in elderly with Mild Cognitive Impairment and can be helpful in delaying the process of cognitive decline.

The study has also shown that improving the cognitive functions also improves the functional independence of an individual.

LIMITATIONS AND RECOMMENDATIONS OF THE STUDY

1. The study was conducted on a small sample size. Hence, a study can be conducted on a larger population.
2. The study can also be conducted among the patients with different socio-economic stratae.
3. A multi-centric study can be conducted.
4. A long-term study can be conducted to find out whether the improvements are consistent or not.
5. A specific screening of the IADL scale can be included in a further study.



Cover Page



REFERENCES

1. Murman DL. The Impact of Age on Cognition. *Semin Hear.* 2015;36(3):111-121. doi:10.1055/s-0035-1555115.
2. Eshkoor SA, Hamid TA, Mun CY, Ng CK. Mild cognitive impairment and its management in older people. *Clin Interv Aging.* 2015;10:687-693. doi:10.2147/CIA.S73922.
3. Paterson D, Warburton D. Physical activity and functional limitations in older adults: a systematic review related to Canada's physical activity guidelines. *Int J Behav Nutr Phys Act.* 2010;7:38.
4. Kwok TC, Lam KC, Wong PS, et al. Effectiveness of coordination exercise in improving cognitive function in older adults: a prospective study. *Clin Interv Aging.* 2011;6:261-267. doi:10.2147/CIA.S19883.
5. Siu MY, Lee DTF. Effects of tai chi on cognition and instrumental activities of daily living in community dwelling older people with mild cognitive impairment. *BMC Geriatr.* 2018;18:37. doi:10.1186/s12877-018-0720-8.
6. Sungkarat S, Boripuntakul S, et al. Effects of Tai Chi on cognition and fall risk in older adults with mild cognitive impairment: a randomized controlled trial. *J Am Geriatr Soc.* 2017;65(4):721-727.
7. Ji Z, Li A, et al. The benefits of Tai Chi and brisk walking for cognitive function and fitness in older adults. *PeerJ.* 2017;5:e3943. doi:10.7717/peerj.3943.
8. Sun J, Kanagawa K, et al. Tai chi improves cognitive and physical function in the elderly: a randomized controlled trial. *J Phys Ther Sci.* 2015;27(5):1467-1471. doi:10.1589/jpts.27.1467.
9. Wayne PM, Walsh JN, Taylor-Piliae RE, et al. Effect of tai chi on cognitive performance in older adults: systematic review and meta-analysis. *J Am Geriatr Soc.* 2014;62(1):25-39. doi:10.1111/jgs.12611.
10. Mitchell JC, Dick MB, et al. The utility of the Dementia Severity Rating Scale in differentiating mild cognitive impairment and Alzheimer's disease from controls. *Alzheimer Dis Assoc Disord.* 2015;29(3):222-228.
11. Ottenbacher KJ, Hsu Y, et al. The reliability of the Functional Independence Measure: a quantitative review. *Arch Phys Med Rehabil.* 1996;77:1226-1232.
12. McGough EL, Kelly VE, et al. Associations between physical performance and executive function in older adults with mild cognitive impairment: gait speed and the Timed "Up & Go" test. *Phys Ther.* 2011;91(8):1198-1207. doi:10.2522/ptj.20100372.



Cover Page



13. Hagovska M, Nagyova I. The transfer of skills from cognitive and physical training to activities of daily living: a randomised controlled study. *Eur J Ageing*. 2017;14(2):133-142. doi:10.1007/s10433-016-0395-y.