Effectiveness of Traditional Thai Exercise (Ruesi Dadton) on Preventing Cognitive Impairment in Older Adults: A Quasi-Experimental Study

Pongsaton Silangirn, MPH[1], Sarinthorn Thummayot, PhD[2], Peeranut Pholvicha, MD[3], Sakesun Thongtip, PhD[4]

[1] Department of Applied Thai Traditional Medicine, School of Public Health, University, University of Phayao, Phayao, Thailand; [2] Division of Anatomy, School of Medical Sciences, University of Phayao, Phayao, Thailand; [3] Department of Emergency Medicine, School of Medicine, University of Phayao, Phayao, Thailand; [4] Department of Environmental Health, School of Public Health, University of Phayao, Phayao, Thailand

Background: Cognitive impairment is a common issue afflicting the geriatric population and may lead to increased rates of morbidity and mortality. Traditional Thai exercise (Ruesi Dadton) can help reduce the risk of health problems and improve the quality of life (QoL).

Objective: To evaluate the efficacy of traditional Thai exercise (Ruesi Dadton) in preventing cognitive impairment in older adults.

Materials and Methods: A quasi-experimental design was used for a posttest design. One hundred ninety-five eligible participants were recruited, including members of the elderly club in the elderly school for the intervention group and community-dwelling older adults for the control group. They were divided into two groups, with 65 as experimental group participants that were assigned to an 8-session intervention group, and 130 control group participants that received conventional care. The mini-mental state examination Thai version 2002 (MMSE-Thai 2002) was used to screen for cognitive impairment, and the Barthel activities of daily living (ADL) was used for assessing basic ADL function.

Results: There were statistically significant differences between the post-test scores of the two groups in MMSE (p<0.001), lower primary school (p=0.002), and higher primary school (p<0.001). The post-interventional analysis revealed that the mean value of the MMSE scores was 25.0±4.9 in the experimental group as compared with a mean value of 21.8±3.3 in the control group.

Conclusion: The traditional Thai exercise (Ruesi Dadton) program was effective in protecting against cognitive decline or dementia in the older population.

Keywords: Ruesi Dadton stretching exercise; Cognitive impairment; Older adults

Cognitive impairment is one of the most common geriatric syndromes, which may range from mild to severe to dementia[1,2]. According to the World Health Organization (WHO), dementia worldwide affects over 55 million people, with a prevalence estimated to be over 60% in low- and middle-income countries and 16% of mild cognitive impairment (MCI) without dementia[3,4]. A recent meta-analysis and systematic review found that the global prevalence of MCI is reported to be over 15% of community dwellers[5].

MCI or mild neurocognitive disorder is an intermediate stage between normal cognitive aging and dementia, which is a major neurocognitive disorder[2]. Neurocognitive disorder is a clinical syndrome that causes a progressive decline in cognitive functions[6]. Previous studies have found several risk factors associated with cognitive impairment and increase in a person's risk of developing dementia, such as increased aging, less education, hypertension, diabetes mellitus, smoking, excessive alcohol consumption, obesity, traumatic brain injury, depression, physically inactivity, and social isolation[2,3,7,8]. Dementia causes a decline in learning, memory, thinking, and the ability to perform activities of daily living (ADL)[3]. WHO recommended interventions for improving cognitive decline and decreasing the risk of dementia, such as physical activity, tobacco cessation, nutritional, alcohol use disorders, and social activity[8]. Importantly, a primary goal is to protect against cognitive decline or dementia by

Correspondence to:

Thongtip S.
School of Public Health, University of Phayao, Phayao 56000, Thailand.
Phone: +66-81-5912510
Email: sakesun.th@up.ac.th

multi-components cognitive interventions[8-10].

Traditional Thai exercise (Ruesi Dadton) is a traditional comprehensive mind-body exercise. This exercise can help improve physical and mental health by regulating blood flow, building strength, and reducing stress. It can also improve cognitive functions in MCI and enhance quality of life (QoL)[11-13]. Previous studies have found that physical activity interventions or multicomponent physical activity and social engagement can positively impact cognitive function, dementia, and QoL in older adults[8,14]. Therefore, the present study evaluated the efficacy of the combined activity in elderly schools and the Thai traditional medicine program for the cognitive impairment prevention program in older adults.

Materials and Methods
Design and sample
A quasi-experimental study design was used to test the efficacy of a traditional Thai exercise (Ruesi Dadton) program. Participants were recruited from members of the elderly club in the elderly school for the intervention group and community-dwelling older adults for the control group, in Maeka Sub-district, Phayao Province, Thailand. The participant selection occurred between March 2022 and May 2022. The inclusion criteria were age 60 years or older, members of the elderly club for the intervention group, community-dwelling older adults for the control group, and ADL score of 5 or greater. The exclusion criteria were neurological disorders and an inability to communicate in the Thai language.

The general criteria for a quasi-experimental design with an intervention is that it allows a lower limit of 30 participants[15]. Therefore, the present study consisted of 195 participants randomly selected from the baseline survey conducted with members of the elderly club in the elderly school for the intervention group and community-dwelling older adults for the control group. The intervention group consisted of 65 older adults, and the control group consisted of 130 older adults. The groups were matched for gender, age, and ADL score (Figure 1).

Measures
Barthel activities of daily living (ADL)
ADL is a tool used for evaluating ADL impairments in cognitive disorders[16,17]. The Barthel ADL includes 10 questions on cognitive functioning that consist of 10 domains, as feeding, grooming, transfer, toilet use, mobility dressing, stairs, bathing, bowels, and bladder[18]. The Barthel ADL was used
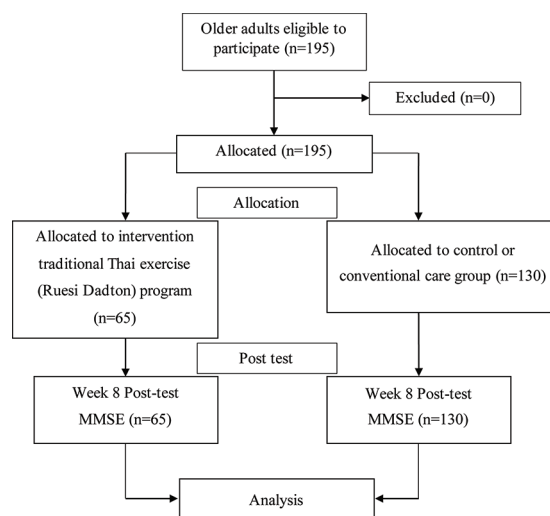

Figure 1. Flow chart of study procedure.

in the present study. The cut-off scores were 4 or less for total dependence, 5 to 11 for moderately severe dependence, and 12 or more for mildly severe dependence[19].

Mini-mental state examination (MMSE)

MMSE is widely effective in a clinical and screening tool for MCI or to screen for dementia[20,21]. The MMSE is 30 questions for cognitive functioning and the evaluation included 11 cognitive domains, as orientation for time, orientation for place, registration, attention/calculation, recall, naming, repetition, verbal command, written command, writing and visuoconstruction. The MMSE-Thai 2002 of Thai MMSE is used as the criteria to diagnose MCI in the present study. The cut-off score for lower primary school is 17 or less, for higher primary school is 22 or less[22,23].

Intervention program
Eligible older adults were enrolled in the intervention and control group after screening with inclusion and exclusion criteria. The intervention group was subjected to activities at the elderly school and Ruesi Dadton stretching exercise, while the control group received conventional care. The first session focused on education on health care behaviors for 60 minutes per week. The second session focused on traditional Thai exercise named "Ruesi Dadton stretching exercise". Each session included 15 postures of the Ruesi Dadton stretching exercise. This lasted 60 minutes. The exercises were done three times per week, over seven weeks. The final assessment was performed by the MMSE test

for comparison between the experimental and the control groups.

Ethical considerations

Participants provided written informed consent prior to participating in the study. The study was approved by the University of Phayao Human Ethics Committee, University of Phayao, Thailand (UP-HEC 1.3/068/64).

Data analysis

Demographic variables were analyzed using descriptive statistics. Data were analyzed using jamovi for Windows[24]. The differences between the groups were evaluated using the independent-sample test. The chi-square test analysis was used to analyze relationships between categorical variables. Statistical significance was accepted for p-values less than 0.05.

Results

The results revealed that the 195 participants in the present study, with 65 in the experimental group and 130 in the control group had a mean age of 69.8±5.5 years in the experimental group and 65.5±3.9 years in the control group. There were statistically significant differences between the two groups in terms of age (p<0.001) and income (p=0.001). There was a statistically significant relationship between the two groups in terms of age (p=0.009), and marital status (p=0.013) (Table 1).

Table 2 revealed that the mean of overall MMSE scores was 25.0±4.9 in the experimental group and 21.8±3.3 in the control group. The mean of MMSE scores in lower primary school was 23.8±4.7 in the experimental group and 21.5±3.25 in the control group. The mean of MMSE scores in higher primary school was 28.4±3.4 in experimental group and 23.1±3.0 in control group. There were statistically significant differences between the two groups in MMSE (p<0.001), lower primary school (p=0.002), and higher primary school (p<0.001) (Table 2).

Discussion

This experimental study found that the social activity at the elderly school and physical activity in the form of traditional Thai exercise (Ruesi Dadton) significantly improved overall MMSE scores to 25.0±4.9 versus 21.8±3.3 (p<0.001), at lower primary school with 23.8±4.7 versus 21.5±3.25 (p=0.002), and at higher primary school with 28.4±3.4 versus 23.1±3.0 (p<0.001) at the eight-week follow-up

Table 1. Demographic characteristics of study subjects

Variables	Experimental group (n=65)	Control group (n=130)	p-value
Sex; n (%)			0.913[a]
Male	21 (32.39)	41 (31.5)	
Female	44 (67.7)	89 (68.5)	
Age (years); n (%)			
<65	17 (26.2)	59 (45.4)	0.009**[a]
≥65	48 (73.8)	71 (54.6)	
Mean±SD	69.8±5.5	65.5±3.9	<0.001***[b]
Income; mean±SD	6,270.8±8,218.4	3,031.5±5,097.2	0.001**[b]
ADL; n (%)			0.105
<19	7 (10.8)	26 (20.0)	
≥19	58 (89.2)	104 (80.0)	
Mean±SD	19.5±0.9	19.3±1.1	0.168
BMI (kg/m^2); n (%)			0.313[a]
<18.5	8 (12.3)	8 (6.2)	
18.5 to 24.9	40 (61.5)	75 (57.7)	
25.0 to 29.9	13 (20.0)	38 (29.2)	
≥30.0	4 (6.2)	9 (6.9)	
Mean±SD	23.1±4.3	24.0±3.9	0.132[b]
Marital status; n (%)			0.013*[a]
Single	11 (16.9)	35 (26.9)	
Married	30 (46.2)	33 (25.4)	
Divorce	24 (36.9)	62 (47.7)	
Education; n (%)			0.628[a]
Primary school or lower	49 (75.4)	102 (78.5)	
Higher than primary school	16 (24.6)	28 (21.5)	
Occupation; n (%)			
Unemployed	30 (46.2)	71 (54.6)	0.265[a]
Work (agriculture, own business and others)	35 (53.8)	59 (45.4)	
Smoking; n (%)			0.151[a]
No	62 (95.4)	116 (89.2)	
Yes	3 (4.6)	14 (10.8)	
Alcohol; n (%)			0.685[a]
No	55 (84.6)	107 (82.3)	
Yes	10 (15.4)	23 (17.7)	
Lower primary school; n (%)	(n=49)	(n=102)	0.395[a]
Low (≤17 scores)	6 (12.2)	18 (17.6)	
High (>17 scores)	43 (87.8)	84 (82.4)	
Higher primary school; n (%)	(n=16)	(n=28)	0.221[a]
Low (≤22 scores)	2 (12.5)	8 (28.6)	
High (>22 scores)	14 (87.5)	20 (71.4)	

BMI=body mass index; SD=standard deviation
[a] Chi-square test, [b] Independent-sample t-test, * p<0.05, ** p<0.01, *** p<0.001

compared to the control group. Therefore, the activity in elderly school and the Ruesi Dadton stretching exercise program can increase MMSE levels significantly compared with the mean value of the experimental and control groups. Similarly, previous studies found multi-component intervention

Table 2. Comparison of the experimental and the control groups

Variables	Experimental group	Control group	p-value
Overall MMSE scores	(n=65)	(n=130)	
Mean±SD	25.0±4.9	21.8±3.3	<0.001**a
Lower primary school; n (%)	(n=49)	(n=102)	0.395b
Low (≤17 scores)	6 (12.2)	18 (17.6)	
High (>17 scores)	43 (87.8)	84 (82.4)	
Mean±SD	23.8±4.7	21.5±3.25	0.002*a
Higher primary school; n (%)	(n=16)	(n=28)	0.221b
Low (≤22 scores)	2 (12.5)	8 (28.6)	
High (>22 scores)	14 (87.5)	20 (71.4)	
Mean±SD	28.4±3.4	23.1±3.0	<0.001**a

a Independent-sample t-test, b Chi-square test, * p<0.01, ** p<0.001

was positively associated with effects on cognitive functions and dementia[9,10]. Previous evidence showed that physical activity could help reduce the risk of non-communicable diseases (NCDs), especially cognitive impairment and dementia[8,25]. Another study showed that social activity could help prevent cognitive decline and dementia because these resulted in alleviation of neuropathology in the brain through reduced stress, increased social support, healthier lifestyle, healthy behaviors, and enhanced cognition[8,26,27].

The present study shows a significant relationship between age, marital status, and educational level in both the experimental and control groups. A previous study had reported that age-related changes certainly result in cognitive decline, especially in adults aged 60 and over[28,29]. Another finding consistent with previous studies showed that a low educational level is associated with an increased risk of severe cognitive impairment[30,31]. Several factors may lead to a lack of physical and social resources, especially in rural areas[31]. Further, previous studies have found that a non-married status is associated with an increased risk of severe cognitive impairment, and that married people may have better mental and physical health[30,32]. Other factors that may confound the results include poor social relationships and weak interpersonal relationships[30,33].

Importantly, previous studies have revealed that cognitive impairment in older adults is likely to be severe in the presence of risk factors such as older age, obesity, comorbidities, dementia, including Alzheimer's disease, and physical frailty can result from physiological and pathological changes in older adults[34-36]. A limitation of this study was the use of a MMSE questionnaire, and the study did not investigate other confounding variables, such as obesity, Alzheimer's disease, and physical frailty.

Conclusion

The activities and the Ruesi Dadton stretching exercise program in the elderly school were effective in protecting the older population against cognitive decline or dementia. This finding suggests that multi-component intervention is suitable for reducing cognitive impairment in older adults.

What is already known on this topic?

Ruesi Dadton stretching exercise can relieve some symptoms of muscles pain and relieve muscular pain.

What does this study add?

The results showed the Ruesi Dadton stretching exercise program can prevent cognitive decline levels.

Acknowledgement

Conflicts of interest

The authors declare no conflict of interest.

References

1. Cheung JTK, Yu R, Wu Z, Wong SYS, Woo J. Geriatric syndromes, multimorbidity, and disability overlap and increase healthcare use among older Chinese. BMC Geriatr 2018;18:147.
2. Hugo J, Ganguli M. Dementia and cognitive impairment: epidemiology, diagnosis, and treatment. Clin Geriatr Med 2014;30:421-42.
3. World Health Organization (WHO). Dementia [Internet]. 2023 [cited 2023 Aug 2]. Available from: https://www.who.int/news-room/fact-sheets/detail/dementia.
4. World Health Organization (WHO). Evidence profile: cognitive impairment [Internet]. 2017 [cited 2023 Aug 2]. Available from: https://apps.who.int/iris/bitstream/handle/10665/342246/WHO-MCA-17.06.02-eng.pdf.
5. Bai W, Chen P, Cai H, Zhang Q, Su Z, Cheung T, et al. Worldwide prevalence of mild cognitive impairment among community dwellers aged 50 years and older: a meta-analysis and systematic review of epidemiology studies. Age Ageing 2022;51:afac173.
6. Sachdev PS, Blacker D, Blazer DG, Ganguli M, Jeste

DV, Paulsen JS, et al. Classifying neurocognitive disorders: the DSM-5 approach. Nat Rev Neurol 2014;10:634-42.

7. World Health Organization (WHO). Risk reduction of cognitive decline and dementia: WHO guidelines [Internet]. 2019 [cited 2023 Aug 2]. Available from: https://www.who.int/publications/i/item/9789241550543.

8. Livingston G, Huntley J, Sommerlad A, Ames D, Ballard C, Banerjee S, et al. Dementia prevention, intervention, and care: 2020 report of the Lancet Commission. Lancet 2020;396:413-46.

9. Mao HF, Tsai AY, Chang LH, Tsai IL. Multi-component cognitive intervention for older adults with mixed cognitive levels: implementation and preliminary effectiveness in real-world settings. BMC Geriatr 2021;21:543.

10. Juárez-Cedillo T, Gutiérrez-Gutiérrez L, Sánchez-Hurtado LA, Martínez-Rodríguez N, Juarez-Cedillo E. Randomized controlled trial of multi-component cognitive stimulation therapy (SADEM) in community-dwelling demented adults. J Alzheimers Dis 2020;78:1033-45.

11. Khanthong P, Sriyakul K, Dechakhamphu A, Krajarng A, Kamalashiran C, Tungsukruthai P. Traditional Thai exercise (Ruesi Dadton) for improving motor and cognitive functions in mild cognitive impairment: a randomized controlled trial. J Exerc Rehabil 2021;17:331-8.

12. Sawangwong P, Tungsukruthai S, Nootim P, Sriyakul K, Phetkate P, Pawa KK, et al. The effects of 12-week traditional Thai exercise (Ruesi Dadton) on glycemic control and inflammatory markers in prediabetes: A randomized controlled trial. Life (Basel) 2023;13:2166.

13. Wang R, Zhang H, Li H, Ren H, Sun T, Xu L, et al. The influence of exercise interventions on cognitive functions in patients with amnestic mild cognitive impairment: A systematic review and meta-analysis. Front Public Health 2022;10:1046841.

14. Tcymbal A, Abu-Omar K, Hartung V, Bußkamp A, Comito C, Rossmann C, et al. Interventions simultaneously promoting social participation and physical activity in community living older adults: A systematic review. Front Public Health 2022;10:1048496.

15. Hill R. What sample size is "enough" in internet survey research [Internet]. 1998 [cited 2023 Aug 2]. Available from: https://cadcommunity.pbworks.com/f/what%20sample%20size.pdf.

16. De Vriendt P, Mets T, Petrovic M, Gorus E. Discriminative power of the advanced activities of daily living (a-ADL) tool in the diagnosis of mild cognitive impairment in an older population. Int Psychogeriatr 2015;27:1419-27.

17. Cornelis E, Gorus E, Beyer I, Bautmans I, De Vriendt P. Early diagnosis of mild cognitive impairment and mild dementia through basic and instrumental activities of daily living: Development of a new evaluation tool. PLoS Med 2017;14:e1002250.

18. Saisana M. Barthel index. In: Michalos AC, editor. Encyclopedia of quality of life and well-being research [Internet]. 2014 [cited 2023 Aug 2]. Available from: https://link.springer.com/referenceworkentry/10.1007/978-94-007-0753-5_147.

19. van Almenkerk S, Depla MF, Smalbrugge M, Eefsting JA, Hertogh CM. Pain among institutionalized stroke patients and its relation to emotional distress and social engagement. Int J Geriatr Psychiatry 2015;30:1023-31.

20. Folstein MF, Folstein SE, McHugh PR. "Mini-mental state". A practical method for grading the cognitive state of patients for the clinician. J Psychiatr Res 1975;12:189-98.

21. Kurz AF, Leucht S, Lautenschlager NT. The clinical significance of cognition-focused interventions for cognitively impaired older adults: a systematic review of randomized controlled trials. Int Psychogeriatr 2011;23:1364-75.

22. Thai Cognitive Test Development Committee. Mini-mental state examination-Thai 2002 [Internet]. 2002 [cited 2023 Aug 2]. Available from: http://www.rbpho.moph.go.th/upload-file/doc/files/12012023-110644-8561.pdf.

23. Shim YS, Yang DW, Kim HJ, Park YH, Kim S. Characteristic differences in the mini-mental state examination used in Asian countries. BMC Neurol 2017;17:141.

24. The jamovi project. jamovi (Version 2.3) [software]. 2023 [cited 2023 Aug 2]. Available from: https://www.jamovi.org/.

25. Blondell SJ, Hammersley-Mather R, Veerman JL. Does physical activity prevent cognitive decline and dementia?: A systematic review and meta-analysis of longitudinal studies. BMC Public Health 2014;14:510.

26. Sommerlad A, Kivimäki M, Larson EB, Röhr S, Shirai K, Singh-Manoux A, et al. Social participation and risk of developing dementia. Nat Aging 2023;3:532-45.

27. Lydon EA, Nguyen LT, Nie Q, Rogers WA, Mudar RA. An integrative framework to guide social engagement interventions and technology design for persons with mild cognitive impairment. Front Public Health 2021;9:750340.

28. Murman DL. The impact of age on cognition. Semin Hear 2015;36:111-21.

29. Randhawa SS, Varghese D. Geriatric evaluation and treatment of age-related cognitive decline. In: StatPearls [Internet]. Treasure Island, FL: StatPearls Publishing; 2022 [cited 2023 Aug 2]. Available from: https://www.ncbi.nlm.nih.gov/books/NBK580536/.

30. Sun N, Jia R, Guo C, Sun T, Dong X, Li L, et al. Synergistic influence of education and marriage on the risk for cognition loss among the older people in China. Nurs Open 2021;8:2616-21.

31. Takasugi T, Tsuji T, Hanazato M, Miyaguni Y, Ojima T, Kondo K. Community-level educational attainment

and dementia: a 6-year longitudinal multilevel study in Japan. BMC Geriatr 2021;21:661.

32. Jennings EA, Farrell MT, Liu Y, Montana L. Associations between cognitive function and marital status in the United States, South Africa, Mexico, and China. SSM Popul Health 2022;20:101288.

33. Piolatto M, Bianchi F, Rota M, Marengoni A, Akbaritabar A, Squazzoni F. The effect of social relationships on cognitive decline in older adults: an updated systematic review and meta-analysis of longitudinal cohort studies. BMC Public Health 2022;22:278.

34. Jin M, Cai SQ. Mechanisms underlying brain aging under normal and pathological conditions. Neurosci Bull 2023;39:303-14.

35. Jin J. Screening for cognitive impairment in older adults. JAMA 2020;323:800.

36. Han F, Luo C, Lv D, Tian L, Qu C. Risk factors affecting cognitive impairment of the elderly aged 65 and over: A cross-sectional study. Front Aging Neurosci 2022;14:903794.