

Recent Trend of Exercise Prescription for Dementia and Mild Cognitive Impairment (MCI)

Bando H^{a,b*}

^aTokushima University / Medical Research, Tokushima, Japan

^bIntegrative Medicine Japan (IMJ), Shikoku Island division, Tokushima, Japan

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***Corresponding author:** Bando H, Tokushima University, Medical Research, Tokushima, Japan; Tel: +81-90-3187-2485; DOI:

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Abstract

Adequate exercise prescription for dementia and mild cognitive impairment (MCI) may be effective in terms of psychological, mental, and cognitive functions in addition to the usual physical effects. Recommended usual exercise for them would be >45 minutes in duration, >5 times/week, moderate or higher for intensity. According to a systematic review of 98 randomized controlled trials (RCTs), common kinds of training were aerobic 43%, combined 27%, resistance 16%, mind-body such as yoga and tai chi 9% and so on. Improved cognitive function was observed as processing speed/attention 66%, executive function 62%, visual-spatial and memory process 50%, and working memory 37%.

Keywords: Exercise Prescription; Dementia; Mild Cognitive Impairment (MCI); Cognitive Function Cognicise; Japan-Multimodal Intervention Trial for Prevention of Dementia (J-MINT)

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Commentary

Exercise and rehabilitation are important for people of all ages with various physical situations [1]. The role of medical staffs would be to help them perform adequate exercise effectively and safely [2]. Exercise prescriptions vary depending on the subjects [3]. They include general healthy people, sportsmen, injured sportsmen, elderly people, or elderly with dementia. Among these, exercise for dementia can have various effects in terms of psychological, mental, and cognitive functions in addition to the usual physical effects [4]. This paper describes recent trend related to dementia and exercise prescription.

Conventionally, aerobic exercise is often prescribed as exercise for improving cognitive function. However, it is also effective in strength training and combined training [5]. Among them, the recommended exercise time is 45 minutes or more and the frequency is 5 times or more a week associated with high effect. In addition, the exercise intensity would be moderate or higher level. Such effect can be observed when the exercise period may be rather short of 4-12 weeks.

Furthermore, there is a systematic review that summarizes 98 randomized controlled trials (RCTs). Statistically common kinds of training were aerobic exercise (43%), combined training (27%), resistance training (16%), mind-body such as yoga and tai chi (9%), and so on. Exercise intensity level was at 66% of maximum heart rate in average. The average data included 56 minutes in exercise time, the frequency was 3 times a week in frequency, 25 weeks in implementation period, 160 minutes/week in total

exercise time. Total exercise time showed the association with improvement in cognitive function, in which at least 52 hours of exercise was recommended [6]. Cognitive function was observed in the following percentage of the studies; processing speed and attention 66%, general cognitive function 66%, executive function 62%, visual-spatial and memory process 50%, and working memory 37%. Clinical effects were found on cognitive functions other than memory [6].

From these research results, it is recommended to set a complex content including aerobic exercise and resistance training as an exercise prescription for improving cognitive function [3]. As for the details, it is necessary to aim for medium intensity or higher, exercise time is about 60 minutes at a time, frequency is 3 times or more a week, and this should be continued for 4-5 months. However, if you stop exercising, you are likely to lose the improved functionality you have gained so far. Therefore, it will be important to make daily exercise a habit in daily life. Furthermore, when exercising promotes improvement of memory function, training including cognitive tasks is desirable.

As one of the methods, a combination of exercise and cognitive training has been devised in Japan, which is called as “cognicise”. For the actual procedure, the calculation is repeated while stepping, and a quiz is provided using words is performed while stepping. At that time, it is better to use music so that everyone can enjoy it in rhythm. These are estimated as dual tasks, and brain activation can be more expected compared to only exercise. Previous report of multiple RCTs have confirmed the improvement of cognitive function including memory, and to the suppression of brain atrophy

[7]. These results were observed from 3-year follow-up for elderly people. The hazard ratio (HR) for developing dementia was 2.06 in impaired cognitive function, 1.13 in physical frailty, and 3.34 for cognitive frailty [7]. These results can be expected to be more effective by introducing cognition when performing exercise intervention as an effort to improve cognitive function.

Furthermore, a question has been raised when to start exercising to prevent dementia. There are reports of 28-years follow-up in average. Among them, no difference was observed in the physical activity status 10 years or more before the onset of dementia between both groups with and without dementia. However, from 9 years ago, a significant difference was found in physical activity of moderate or higher between both groups [8]. From these results, it would be medically meaningful to start exercise in early stage for preventing dementia even if no symptoms are observed.

Acquiring exercise habits reduces the risk of developing dementia. It seems to be one of the useful methods to maintain the medical condition of patients with dementia. In the future, large-scale intervention studies will be required to clarify the delayed effect of exercise on the onset of dementia [9]. On the contrary, it will be necessary to proceed with research on behavior change methods in elderly people who do not exercise. Regarding the risk factors for dementia, several modifiable matters have been reported throughout the lifespan [10]. They include i) early life: unsatisfactory education career, ii) midlife; hypertension, obesity, alcohol consumption, hearing loss, brain injury, iii) later life; depression, physical inactivity, social isolation, diabetes, smoking, circumstance pollution.

There is a significant study of J-MIND-Diabetes, which means Japan-Multi-domain Intervention Trial for Prevention of Dementia in Older Adults with Diabetes [11]. The purpose was to identify whether certain intervention may prevent cognitive decline for elderly patients with T2DM. Primary outcome includes several domains such as cognitive function, executive function, attention, memory, language and processing speed. Elderly T2DM patients with MCI (70-85 years, n=300) were investigated for intervention and control groups [12]. The former group received multi-domain programs including i) metabolic/vascular risk factors, ii) physical exercise, iii) its self-monitoring, iv) nutritional guidance, iv) participation for social activity. The control group was provided general instructions and usual care for T2DM on dementia prevention. Both groups were compared in detail. This was the study of the Japan-Multimodal Intervention Trial for Prevention of Dementia (J-MINT). From various studies, it is atherosclerotic cardiovascular disease (ASCVD) that would bring the occurrence and aggravation of cognitive frailty [13].

In summary, the problems of aging, dementia, exercise and rehabilitation have become crucial issues. Various attempts have been made based on several evidences, and it is expected that they will be developed in the future.

References

1. Bando H. Home Rehabilitation with Bio-Psycho-Social Axes Developing by Interprofessional Work (IPW). *J Nov Physiother.* 2021; 11: e108.
2. Gelius P, Tcymbal A, Abu-Omar K, Mendes R, Tribuzi Morais S, Whiting S, et al. Status and contents of physical activity recommendations in European Union countries: a systematic comparative analysis. *BMJ Open.* 2020; 10: e034045.
3. American College of Sports Medicine (ACSM). Riebe D, Ehrman JK, Liguori G (eds). ACSM's guidelines for exercise testing and prescription 10th ed. Lww, Philadelphia, 2017.
4. Tsutsumimoto K, Doi T, Nakakubo S, Kim M, Kurita S, Ishii H, et al. Cognitive Frailty as a Risk Factor for Incident Disability During Late Life: A 24-Month Follow-Up Longitudinal Study. *J Nutr Health Aging.* 2020; 24: 494-499.
5. Northey JM, Cherbuin N, Pumpa KL, Smee DJ, Rattray B. Exercise interventions for cognitive function in adults older than 50: a systematic review with meta-analysis. *Br J Sports Med.* 2018; 52: 154-160.
6. Gomes-Osman J, Cabral DF, Morris TP, McInerney K, Cahalin LP, Rundek T, et al. Exercise for cognitive brain health in aging: A systematic review for an evaluation of dose. *Neurol Clin Pract.* 2018; 8: 257-265.
7. Shimada H, Doi T, Lee S, Makizako H, Chen LK, Arai H. Cognitive Frailty Predicts Incident Dementia among Community-Dwelling Older People. *J Clin Med.* 2018; 7: 250.
8. Sabia S, Dugravot A, Dartigues JF, Abell J, Elbaz A, Kivimaki M, et al. Physical activity, cognitive decline, and risk of dementia: 28 year follow-up of Whitehall II cohort study. *BMJ.* 2017; 357: j2709.
9. Merchant RA, Chan YH, Hui RY, Lim JY, Kwek SC, Seetharaman SK, et al. Possible Sarcopenia and Impact of Dual-Task Exercise on Gait Speed, Handgrip Strength, Falls, and Perceived Health. *Front. Med.* 2021; 8: 660463.
10. 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: 413-446.
11. Sugimoto T, Araki A, Fujita H, Honda K, Inagaki N, Ishida T, et al. The Multi-Domain Intervention Trial in Older Adults With Diabetes Mellitus for Prevention of Dementia in Japan: Study Protocol for a Multi-Center, Randomized, 18-Month Controlled Trial. *Front Aging Neurosci.* 2021; 13: 680341.
12. Sugimoto T, Sakurai T, Akatsu H, Doi T, Fujiwara Y, Hirakawa A, et al. The Japan-Multimodal Intervention Trial for Prevention of Dementia (J-MINT): The Study Protocol for an 18-Month, Multicenter, Randomized, Controlled Trial. *J Prev Alzheimers Dis.* 2021.
13. Nguyen QD, Odden MC, Peralta CA, Kim DH. Predicting Risk of Atherosclerotic Cardiovascular Disease Using Pooled Cohort Equations in Older Adults with Frailty, Multimorbidity, and Competing Risks. *J Am Heart Assoc.* 2020; 9: e016003
14. Hori K, Saito O, Hashimoto S, Matsui T, Akter R, Takeuchi K. Projecting population distribution under depopulation conditions in Japan: scenario analysis for future socio-ecological systems. *Sustain Sci.* 2021; 16: 295-311.