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Prevention of Dementia onset with Targeting at Physical Activity and Social Participation Among Japanese Community-Dwelling Older Adults

Yuta Nemoto[1], Katsuhiko Suzuki[2]*

Graduate School of Sport Sciences, Waseda University, Saitama, Japan.
Faculty of Sports Sciences, Waseda University, Mikajima, Tokorozawa, Saitama, Japan.
katsu.suzu@waseda.jp

***Corresponding Author:** Katsuhiko Suzuki, Faculty of Sports Sciences, Waseda University, Mikajima, Tokorozawa, Saitama, Japan.*

Abstract

The number of dementia patients is rapidly increasing; therefore, developing dementia prevention measures are urgently needed. It is important to identify the factors related to dementia onset or cognitive decline and to develop intervention program focusing on the relevant factors of dementia. Previous studies reported that ≥150 minutes/week of Moderate to Vigorous Physical Activity (MVPA) and high frequency of social group participation reduce the risk of dementia onset or cognitive decline. However, nearly half of Japanese older adults living in rural community (46.3%) did not meet the ≥150 min/week of MVPA. Moreover, the effective approach to increase physical activity has not been developed. Promotion of social participation could be new approach to increase physical activity for community-dwelling older adults, because social participation is accompanied with going outdoor regardless of their attitude toward physical activity. There are substantial "potential participants" who do not still participate in social activity with having willingness to participate in the activity. Hence, increasing the number of social group members may increase physical activity and prevent dementia onset.

Keywords: *dementia, subjective cognitive complaints, prevention, physical activity, social participation, community-dwelling, older adults*

Introduction

Advancement of aging society with declining birthrates, producing the shortage of working population, has been becoming one of the major public health issues during the last decades in Japan. Japanese government reported that people over 65 years old accounted for only 6.3 percent of the total Japanese population, with 9.1 working-age people (20 to 64 years old) taking care of one elderly person aged 65 and over in 1965, 2.4 working-age people in 2012, and will be 1.2 working-age people in 2050 (1). These data strongly indicate that the burden on the nation will be increased and that social security systems including healthcare insurance systems will be on the brink of collapse for the next few decades. To maintain these systems, particularly long-term care insurance system, decreasing the number of older adults requiring long-term care through promoting their health status is needed.

However, the number of older adults certificated to need long-term care has been increased from 3.7 million in 2003 to 5.9 million in 2014 (2). The major causing factors of long-term care are "cerebrovascular disease" (17.2%) and "dementia" (16.4%). The number of dementia patients has been rapidly increasing during the last few decades in Japan, and is postulated to reach approximately 7 million in the year 2025 (2). The physical and economic burdens of dementia influence on not only patients, but also on their caregivers including family members. From 2007 to 2012, approximately 500 thousands people retired from their jobs, because of providing nursing care at home (3). Therefore, the amount of economic loss

from dementia postulated to be 1.5 billion yen ($14 million) in 2014, and will be increased to 2.4 billion yen ($22 million) by 2060 (4).

These findings suggest that the health insurance cost will increase rapidly from years to come, and that taking measures to prevent dementia or cognitive decline in older adults has become an urgent global public health issue. To reduce the health care insurance cost, developing efficient population approach and prevailing the intervention program to prevent dementia onset across local community are necessary.

Relevant Factors of Dementia

It is important to identify the factors related with dementia onset or cognitive decline for prevention of dementia, and to develop effective intervention program focused on the relevant factors of dementia.

Some systematic reviews and meta-analyses have examined the factors related with incidence of dementia (5, 6) and suggested that those factors are comprised of related factors which are unmodifiable factors (e.g. age, gender, educational attainment, and household income) and risk factors which are modifiable factors (e.g. physical inactivity, lower level of social participation, insufficient nutrition intake, smoking, alcohol intake, physical and/or psychological stress). They also showed that among these risk factors, physical inactivity and lower level of social participation are strongly related to the incidence of dementia (7,8) Previous study also reported that 12.7% of Alzheimer's disease cases are potentially attributable to physical inactivity (9). Although the mechanism of reduced prevalence of dementia or cognitive function in response to physical activity or exercise is incompletely understood, previous studies showed that physical exercise training produced a larger volume of hippocampus (10) and increased blood flow in the brain (11) and that physical activity enhanced psychological well-being, which is a strong predictor of dementia onset or cognitive decline (12) but greater efforts are required to reduce frailty and dependency and to maintain independent physical and cognitive function and mental health and well-being.

These physiological and psychological changes in response to exercise seem to be a part of the mechanisms involved in reducing the prevalence of dementia. Moreover, previous systematic review suggested that prolonged sedentary behavior might be a risk factor of lower cognitive function (13); however, some studies have shown a positive association between sedentary behavior and cognitive function (14,15). These inconsistent results could have occurred by difference in the influence of sedentary behavior on cognitive function according to type of activity. Sedentary behavior consisted of passive sedentary behavior (e.g., television viewing) and mentally active sedentary behavior (e.g., reading, and computer use) (16). Hence, authors examined the association of sedentary behavior and physical activity with subjective cognitive complaints (SCC) among community-dwelling older adults (17). The results showed that physical activity and reading books or newspapers were associated with low risk of SCC and that the combined group who reported ≥150 min/week physical activity and ≥30 min/day reading showed 60% lower SCC than the combined group who reported <150 min/week physical activity and <10 min/day reading. Therefore, promoting physical activity and the mental activities which stimulate the cognitive function may be effective for preventing dementia onset or cognitive decline.

On the other hand, older adults engaging in social group activity have lower risk of dementia compared with non-participants [RR: 1.41, 95% CI: 1.13-1.75] [8]. This finding suggests that increasing the number of individuals who participate in social group activity would contribute to the prevention of dementia in population level. Although the mechanisms of social participation for prevention of dementia have not been identified, the following physiological and psychological effects might be considered. The increases in physical activity with the increase in frequency of going out of door (18) and in experiences of various activities stimulating the cognitive function (19) in social participation might produce above-mentioned physiological effects on brain. The increase in the frequency of contact with others (20) through group activities could produce the improvement of self-esteem and self-confidence which contribute to the reduction of the psychological stress. However, Kawachi and his colleagues suggested that high frequency of social participation might cause mental health decline and the effects of social capital on health are not always positive [21]. Although high frequency of social participation increases physical activity, it also induces excessive stress, resulted

in poor mental health, by increasing the burden of group activity. Since poor mental health including depression is strongly associated with dementia onset, the relationship between social participation and dementia onset might largely differ by the types of group activity or the position and/or situation within the organization. Authors examined the relationships between SCC and types of social group activity. The results showed that volunteer work was related to lower risk of cognitive decline in female (17). Moreover, having leading role in the group also has positive effect on cognitive function among older adults aged 65-74 years (22). These findings suggest that promoting social group participation and more active style of social participation for community-dwelling older adults may contribute to preventing dementia.

Prevalence of Physical Activity and Social Participation in Japan

World Health Organization (WHO) released the guideline of physical activity for prevention of non-communicative diseases, and recommended the amount of 150 min for moderate-to-vigorous physical activity (MVPA) per week. However, nearly half of Japanese older adults living in rural community (46.3%) did not meet the recommendation of physical activity by WHO (23). Although there have been some studies evaluated the effect of community intervention using population strategy for promotion of physical activity, systematic review reported inconsistency of the effect of the intervention (24). Therefore, new approach for promotion of physical activity among older adults is necessary.

Promotion of social participation could be new approach to increase physical activity for community-dwelling older adults, because social participation is accompanied with going out of door. Kikuchi and the colleagues (25) in older adults and compared physical activity between individuals with higher level of social participation and with lower level of social participation. They reported that individuals with higher frequency of social participation spent more time for physical activity and less time for sitting time than the counter parts. This result suggests that promotion of social participation may increase physical activity in older adults, regardless of their willingness to increase physical activity. Then, promoting social participation could be a new approach to promote physical activity and to reduce physical inactivity for the older adults having a wide range of stage of physical activity.

According to Japanese national data (26), 39.0% of older adults aged 60 years and over did not participate in any social activity for the past year. However, there are substantial"potential participants" who do not still participate in social activity with having willingness to participate in the activity. Increasing the number of social group members may increase physical activity and maintain the cognitive function.

Conclusion

Dementia onset is a major public health issue in Japan, and prevention strategy is urgently required. Previous studies reported higher physical activity and mentally active sedentary behavior were related to lower risk of cognitive decline. Also participating in social group activity and having leadership in the organization could be important approach for the prevention of dementia in young-old ages. Therefore, developing and implementing the measure for promoting physical activity and social participation based on the relevant factors should be important practical approaches for prevention of dementia among older adults in a community.

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