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Original Article

Active use of local exercise facilities can improve physical performance of community-dwelling older adults

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Abstract. [Purpose] In this study, we investigated the effects of local exercise facility use on physical function of Japanese community-dwelling older adults. [Participants and Methods] We analyzed data obtained from a cohort project initiated in 1991. The study included approximately 4,800 individuals from suburban areas of central Japan; we investigated 322 older individuals residing in Municipality A, who underwent physical fitness assessments in 2018 and 2019. We recorded participants' exercise facility use frequency and physical performance, based on hand-grip strength, open-eye single-leg standing, timed up-and-go, and walking speed tests. [Results] Baseline values in the open-eye single-leg standing test were significantly higher in the no-use than in the low- and high-use groups. Follow-up assessments revealed that grip strength was significantly higher in the high-use than in the no- and low-use groups. [Conclusion] Active use of exercise facilities was positively correlated with maintenance and improvement in physical fitness among participants, which highlights the benefits of easily accessible exercise facilities in maintaining long-term physical function. Future studies should focus on functions that extend beyond physical fitness to develop effective support programs that address the evolving health needs of the aging population.
Key words: Aging, Exercise habits, Physical fitness

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INTRODUCTION

Prioritizing care for older individuals has a crucial policy component in countries with aging populations and declining birth rates, particularly relating to implementing measures that promote health[1, 2)]. Frailty is an emerging public health concern that is characterized by decreased physiological reserve capacity, reduced stress resistance, and increased vulnerability to adverse events[3–6)]. As the preliminary stage of functional deterioration, frailty is considered reversible with appropriate interventions[7, 8)]. Frailty is multifactorial, encompassing physical, psychological, and social aspects. Sarcopenia, the age-related decline in skeletal muscle and muscle function, is a core component of physical frailty[9, 10)].

Various municipalities have implemented health promotion initiatives to establish effective community care systems that integrate physical function, psychological aspects, and social participation[11, 12)]. Previous preventive care programs have

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mostly focused on improving locomotor system function[13–16]. Continuous engagement in moderate exercise and physical activity have been shown to be beneficial for health maintenance and promotion[17], improving motor function[18], subjective well-being, and quality of life[19], preventing depression[20] and dementia[21], and increasing survival rates[22]. The success and feasibility of programmed exercise follow-up relies on several common factors, including proximity, continuity, and individualization. While numerous studies have verified the effectiveness of short-term interventions, information on the long-term dynamics of promoting physical fitness remains limited, specifically those related to exercise facilities utilization frequency, availability, and self-determination.

Therefore, this study aimed to examine the effects of active exercise facilities use on the long-term maintenance and improvement of physical fitness among community-dwelling older adults.

PARTICIPANTS AND METHODS

This longitudinal study analyzed population data from the "community empowerment and care for well-being and healthy longevity (CEC) study", a cohort project initiated in 1991 that involved approximately 4,800 individuals residing in suburban areas in central Japan. The participants of this project were administered a questionnaire every 3 years to investigate well-being and longevity-related factors. Specifically, the data (n=322) from older individuals who participated in the 2018 and 2019 physical fitness assessments in Municipality A were included in the present study. The survey measured the frequency of exercise facilities usage and the physical functional performance of participants using various fitness assessments.

To increase exercise opportunities for older individuals, the target municipalities established "exercise practice rooms" that offered physical function assessments and individual guidance from health professionals, including nurses, health and fitness instructors, physical therapists, and occupational therapists. Local older individuals could use these rooms as a dedicated exercise base, enjoying the benefits of personalized guidance from professionals at a self-determined frequency, with opportunities for periodic functional check-ups.

The frequency and duration of exercise are determined through discussions between the elderly and the professionals, depending on the initial assessment of physical function, health needs, and daily living conditions. Although each exercise program is proposed differently, generally a combination of exercises at home and in "exercise practice rooms" is provided. Exercises are mainly muscle strengthening exercises using machines in the exercise practice room. At home, 10 minutes of exercise once or twice a week is recommended, and once a month to the commuting "exercise practice rooms" is recommended. In addition, periodic evaluations are conducted every six months, and each time, the goals are set and the content, frequency, and duration of the exercise program are re-set as the program progresses.

The participants were divided into the "no-use" (never used), "low-use" (1–48 uses in 2 years), and "high-use" (≥48 uses in 2 years) groups, based on the exercise practice room's usage chart. Five physical function-related items were measured: grip strength (kg), open-eye single leg standing time (s), timed up-and-go (TUG) test completion time (s), and 5-m walking time at normal and maximum speeds (s). Measurements adhered to the Manual for the Prevention of Long-Term Care (Revised Edition) guidelines[23]. Grip strength was measured using a Smedley grip strength dynamometer (TKK5401; Takei Kikai Kogyo, Niigata, Japan). After a short rest period, two maximal effort trials were performed separately on the left and right sides, and the average of the higher values on each side was used. The open-eye single leg standing test measured how long the participant could stand on only one leg unassisted, with their eyes open, for a maximum of 10 and 20 s in females and males, respectively. Either leg could be raised; however, the opposite leg, also known as the axis leg, was not to be used for support in any way. The time was stopped when the axis foot moved. The measurements were rounded to the first decimal place, and the value was taken as the whole number. The TUG test recorded the time taken (s) for participants to stand up from a chair, walk 3 m, turn around, and return to the chair to sit down. The 5-m walking time was measured twice, each at normal and maximum speeds, and the higher value for each was recorded.

Physical functional performance was rated on a 5-point scale from 1 to 5. This grading was based on the "Manual of Motor Unit Function" of the Ministry of Health, Labour and Welfare of Japan. This grading system takes into account the effects of gender and age. The lowest level is 1 and the highest level is 5, allowing comparison of persons of different genders and ages.

The changes in scores were compared over a 2 year opt-out period. The association between changes in functional performance and the frequency of exercise facilities use was assessed using the Wilcoxon signed-rank test. All statistical analyses were conducted using SPSS Statistics 27 (IBM Japan, Ltd., Tokyo, Japan).

This study was approved by the ethics committee of the Morinomiya University of Medical Sciences (approval number: 2018-054; date: Aug. 10, 2018) and performed in accordance with the ethical principles outlined in the Declaration of Helsinki. The requirement for written informed consent was waived because anonymous data was used in the analysis and the participants could opt out from the study according to the Ethical Guidelines for Medical and Health Research Involving Human Subjects in Japan.

RESULTS

A total of 322 participants with a mean age of 76.7 ± 6.7 years were included in this study, comprising 122 males (37.9%) and 200 females (62.1%). Among them, 173 (53.7%), 94 (29.2%), and 55 (17.1%) participants were categorized into the no-use, low-use, and high-use groups, respectively.

A comparison of motor function according to frequency is shown in Table 1. At baseline, the open-eye single leg standing time was significantly longer in the no-use group than in the low- and high-use groups. At follow-up, grip strength was significantly higher in the high-use group than in the low- and no-use groups.

Changes in motor function scores for the entire cohort and subgroups stratified by frequency of facility use are outlined in Table 2.

In the high-frequency group, the time to stand on one leg with closed eyes increased from 2.9 to 3.2, while the other items did not change significantly. The low frequency group showed no significant change in all items. The no-use group showed significant decreases in two items: grip strength from 4.0 to 3.5 and TUG test from 4.5 to 4.3.

DISCUSSION

The Japanese Ministry of Health, Labour and Welfare plans to establish a comprehensive regional support and service delivery system by 2025, with the goal of preserving the dignity of older individuals and supporting independent living[23].

Table 1. Comparison of the group profiles at baseline (2018) and follow up (2019)

		High-use group		Low-use group		No-use group			Multiple comparisons
		Average	SD	Average	SD	Average	SD		(Bonferroni)
2018	Age (years)	75.7	5.0	77.6	6.5	76.5	7.2		
	Grip (kg)	4.0	1.1	3.7	1.2	4.0	1.2		
	Open-eye single leg standing (s)	2.9	0.9	3.0	0.7	3.1	0.9	*	High-use< No-use
	TUG test (s)	4.5	0.9	4.5	1.0	4.5	0.9		
	5-m walk (normal) (s)	4.3	1.1	4.5	1.0	4.5	0.8		
	5-m walk (maximum) (s)	4.5	1.0	4.5	1.0	4.6	0.8		
2019	Grip (kg)	4.1	1.1	3.5	1.5	3.5	1.5	*	High-use >Low-use High-use >No-use
	Open-eye single leg standing (s)	3.2	0.9	3.2	0.9	3.3	0.9		
	TUG test (s)	4.5	1.0	4.3	1.1	4.3	1.2		
	5-m walk (normal) (s)	4.5	0.9	4.6	0.8	4.6	0.9		
	5-m walk (maximum) (s)	4.6	0.8	4.5	0.9	4.5	0.9		

All comparisons were assessed using the Kruskal–Wallis test. *p<0.05.
SD: standard deviation; TUG: timed up-and-go.

Table 2. Changes in motor function performance according to groups stratified based on the frequency of exercise facility use

		High-use group		Low-use group		No-use group	
		Average		Average		Average	
Grip (kg)	2018	4.0		3.7		4.0	*
	2019	4.1		3.5		3.5	
Open-eye single leg standing (s)	2018	2.9	*	3.0		3.1	
	2019	3.2		3.2		3.3	
TUG test (s)	2018	4.5		4.5		4.5	*
	2019	4.5		4.3		4.3	
5-m walk (normal) (s)	2018	4.3		4.5		4.5	
	2019	4.5		4.6		4.6	
5-m walk (maximum) (s)	2018	4.5		4.5		4.6	
	2019	4.6		4.5		4.5	

All comparisons were assessed using the Wilcoxon signed-rank test. *p<0.05.
TUG: timed up-and-go.

In addition, it seeks to enable local governments to develop similar community-based comprehensive care systems based on regional characteristics.

This study focused on municipalities with established health programs and revealed that continued use of exercise facilities was effective in improving and maintaining physical function. While numerous studies have reported the effects of health initiative-based short-term training on physical function, this study elucidated the long-term efficacy of the municipality-wide program.

These findings align with the WHO's 2010 Global Recommendations on Physical Activity for Health[24], which define physical activity for older adults as recreational and leisure activities associated with daily routines, home and community, mobility (e.g., walking or cycling), occupational activities (if employed), housework, play, games, and sports. These guidelines specify the frequency and intensity of aerobic exercise required to improve general endurance, muscle strength, bone health, and functional health and prevent non-communicable diseases, depressive symptoms, and dementia. They also provide methods for staying active, at least to the extent that physical capacity and health status permit. Furthermore, the WHO guidelines on Physical Activity and Sedentary Behavior[25] state that regular physical activity is the most effective way to reduce the risk of heart disease, type 2 diabetes, and cancer, which account for nearly 75% of deaths worldwide. Physical activity also reduces the symptoms of depression and anxiety and improves thinking, learning, and overall well-being. Individuals ≥65 years of age should incorporate a physical activity in their routine that emphasizes balance and coordination, while strengthening muscles to prevent falls and improving overall health. In 2017, the WHO Integrated Care for Older People framework highlighted the importance of addressing comprehensive needs in the care of older people[26].

The present study compared the results with those of other studies[27–30]. Those findings are consistent with the results of this study and may serve as a basis for implementing future health supports for older individuals.

This study had several limitations. First, all data was obtained from participants before the COVID-19 pandemic. Hence, the impact of the pandemic should be followed up and verified. Second, the study was conducted in a limited geographical area, which may have affected the generalizability of the results due to the small sample size. Thus, the findings should be verified in a more detailed qualitative study with a larger sample size. Third, the background of the participants was limited to age and gender, and social factors such as differences in living environment, pet buying habits, and employment status were excluded from the analysis. Therefore, confounding factors such as lifestyle and social participation may be present and should be investigated in future studies. Fourth, the programs did not have the same content. Therefore, the results do not indicate the effect of program implementation, but only that having a place where a program that suits one's needs is offered and a place to go to is effective in maintaining exercise function. Detailed examination of the factors that contribute to the maintenance of exercise function by analyzing the duration and frequency of exercise is an issue to be addressed in the future.

In conclusion, this study found that active daily use of exercise facilities was effective in maintaining physical function among community-dwelling older adults, highlighting the positive long-term impact that having an exercise base within the community has on physical function. Future efforts should extend beyond physical fitness and include supportive policies, planning, and regulatory frameworks to meet the increasing health care needs of the aging population, while promoting integrated, person-centered care systems and empowering older adults to make decisions related to health management.

Author contributions

Conceptualization, Y.S., N.H., M.N., and H.M.; methodology, Y.S., N.H.; software, Y.S., N.H., M.N.; validation, Y.S., N.H.; formal analysis, Y.S., N.H.; investigation, Y.S., M.N.; resources, Y.S.; data curation, Y.S., M.N.; writing—original draft preparation, Y.S; writing—review and editing, Y.S., N.H., M.N., and H.M.; supervision, H.M.; project administration, Y.S.; funding acquisition, Y.S. All authors have read and agreed to the published version of the manuscript.

Funding and Conflict of interest

None.

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