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Brief Communication

# Walking and Sitting Time among Urban-Living Middle-Aged and Older Japanese

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SUMMARY

Population aging may increase chronic disease prevalence in Japan without widespread health behavior change. Walking and sitting are common behaviors that are amenable to intervention. This study examined age-related variations in daily walking and sitting time among middle-aged and older Japanese who live in urban areas. An online survey including validated measures was administered with a representative sample of 4,000 middle-aged and older adults from five large cities. Walking time showed a significant association with age, and the oldest cohort walked 25% more per day compared to those in early middle age, $F$ (3, 3996) = 8.04, $p$ < .001. Sitting time showed a significant decline with age, $F$ (3, 3996) = 3.83, $p$ < .001, although gender differences were evident among the oldest cohorts. Early middle age (45–54 years) appears to be associated with less walking and more sitting time in Japan. This study has implications for healthy aging and successful transitions to retirement in Japan. Occupational and environmental interventions are recommended to facilitate increases in activity and reductions in sedentary behavior.



## 1. Introduction

Reducing sitting time and increasing walking time among middle-aged and older cohorts may help Japan to reduce the rising prevalence of chronic diseases associated with population aging. Long periods of sitting (> 6 hours per day) are associated with higher rates of chronic health problems, including cardiovascular disease (CVD),[1] while regular walking confers measurable protection against common lifestyle-related morbidities.[2] Recent reports suggest that there may be age variations in certain activity related parameters among Japanese adults,[3,4] which warrant investigation. The aim of this research was to explore and compare walking and sitting time among representative samples of middle-aged and older Japanese.

## 2. Methods

A population survey was conducted with online administration among a representative sample of middle-aged and older residents of five large and geographically diverse Japanese cities. G*Power software was used to compute the required sample size based on a minimum effect size of 0.25 and five geographic areas. Respondents were selected using stratified-random sampling from a pool of individuals who responded to banner advertisements on a Japanese shopping website. Respondents were provided with information about the study and informed that submission of online data indicated consent for the reporting of aggregated and deidentified data. The study was reviewed and approved by the ICU Research Ethics Committee (reference 2018-35).

Outcome variables included mean daily sitting and walking minutes, which were measured using scales from a validated Japanese-language version of the International Physical Activity Questionnaire (IPAQ-SF). Walking included moderate-intensity activities undertaken in the context of work, travel or exercise. Sitting included sedentary behaviors associated with seated work, watching television, reading/study or socializing. Demographic data were also collected, including gender, age, living situation, employment status and self-rated health. Means and standard deviations were calculated for daily walking and sitting time (in minutes). Age cohorts were categorized as early middle-age (45–54), late middle age (55–64), young-old (65–74) and oldest-old (75+). Analysis of variance was used to examine potential age- and gender-related variations. All statistical tests were conducted using SPSS (version 25).

## 3. Results

In total, 4,000 respondents completed the online survey. There was equal representation of males and females from Sapporo, Tokyo, Nagoya, Osaka and Fukuoka. Age cohorts included those aged 45–54 ($n$ = 1,150), 55–64 ($n$ = 850), 65–74 ($n$ = 1,737) and 75 years and older ($n$ = 263). Mean scores were high for self-rated mobility ($M$ = 4.05, $SD$ = 1.13) and overall health ($M$ = 4.12, $SD$ = 1.11) on five-point, Likert-type scales. Among the sample, 45% were regularly employed (either full or part time) and 78% lived with a spouse or family members.

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### 3.1. Walking time

Mean daily walking (for exercise, transport or work) across the entire cohort was 51 minutes (*SD* = 47.29), although 31% of respondents walked for less than 30 minutes per day. There was a significant difference in walking time across age groups, $F$ (3, 3996) = 8.04, $p < .001$. Post-hoc tests (Turkey) revealed significant differences in daily walking between the 65–74 and 75+ cohorts and those aged 45–54. The oldest cohort (75+) walked for 11 minutes (25%) more per day than those in early middle age (45–54). Among the early middle age cohort, 40% reported walking for less than 30 minutes per day. There were no significant variations in walking minutes with regards to gender.

### 3.2. Sitting time

Mean daily sitting time across the entire cohort was 363.67 minutes (> 6 hours) (*SD* = 243.80). Among the respondents, 32% reported sitting for 8 hours or more per day. There was a statistically significant difference in sitting time across age groups, $F$ (3, 3996) = 3.83, $p < .001$. Post-hoc tests revealed a significant difference between those aged 65–74 and those aged 45–54. Adults in early old age (65–74 years) sat for 29 minutes (8%) per day less than those in early middle age. Among the early middle age cohort, 36% reported sitting for more than 8 hours per day. Reduced sitting time at older ages was complicated by gender variations, with older women sitting for significantly less time than older men, $F$ (1, 3999) = 5.21, $p$ = .022.

**Table 1**
Mean walking and sitting time by age cohort and gender.

| Age cohort | Gender | Mean | Std. deviation | *N* |
|---|---|---|---|---|
| Walking minutes per day | | | | |
| 45–54 years | Female | 44.38 | 51.22 | 627 |
| | Male | 46.67 | 47.83 | 523 |
| | Total | 45.42 | 49.70 | 1150 |
| 55–64 years | Female | 52.51 | 51.32 | 373 |
| | Male | 49.06 | 47.82 | 477 |
| | Total | 50.57 | 49.39 | 850 |
| 65–74 years | Female | 51.05 | 43.46 | 881 |
| | Male | 55.76 | 46.29 | 856 |
| | Total | 53.37 | 44.93 | 1737 |
| 75+ years | Female | 58.13 | 46.58 | 119 |
| | Male | 55.35 | 39.36 | 144 |
| | Total | 56.61 | 42.72 | 263 |
| Sitting minutes per day | | | | |
| 45–54 years | Female | 376.09 | 245.48 | 627 |
| | Male | 379.54 | 264.99 | 523 |
| | Total | 377.66 | 254.43 | 1150 |
| 55–64 years | Female | 365.42 | 241.77 | 373 |
| | Male | 380.05 | 266.91 | 477 |
| | Total | 373.63 | 256.14 | 850 |
| 65–74 years | Female | 334.19 | 211.89 | 881 |
| | Male | 364.41 | 246.88 | 856 |
| | Total | 349.08 | 230.23 | 1737 |
| 75+ years | Female | 344.08 | 233.01 | 119 |
| | Male | 385.26 | 242.19 | 144 |
| | Total | 366.63 | 238.51 | 263 |

## 4. Discussion

Differences in walking and sitting times across Japanese age cohorts have clinical significance. Older adults participated in significantly more daily walking than those in early middle age, which was equivalent to one additional bout of physical activity. The World Health Organization defines 10 minutes of physical activity as a clinically important bout and recommends at least 30 total minutes on five or more days per week to support health.[5] Early middle age appears to be a comparatively problematic phase of life for walking, which may be related to work or lifestyle pressures. These results are consistent with national step count findings and hand grip strength data, which show comparatively better performance among older age cohorts in Japan.[3,4]

Although most respondents reported sitting for more than six hours per day, those in early middle age sat for significantly longer than other age groups. Sitting time fell sharply after 65 years, although it increased again after 75 years of age, particularly among older men. This may be related to functional decline, illness or the six-year gender difference in life expectancy. International reviews of epidemiological data suggest that sitting for more than 6 hours per day is associated with CVD risk, while sitting for more than 8 hours per day is associated with all-cause mortality.[1] The prevalence of sitting work styles and long hours in Japan may contribute negatively to higher rates of sedentary behavior among middle-aged cohorts. The work environment in Japan has previously been identified as a contributing factor to chronic health problems and premature mortality.[6] Prolonged sitting may be implicated in this relationship.

### 4.1. Limitations and implications

It is possible that activity levels were overreported and sitting time underreported as such outcomes has previously been identified in studies based on self-reported data.[7] Follow-up investigations are recommended with objective measures, including accelerometry. Longitudinal data collection would also be useful to support future trend analyses. This will be relevant as Japan prepares to host international sports events from 2021, including the Olympics, Paralympics and World Masters Games, which may inspire population activity changes. Our data suggest that those in early middle age walk less and sit more than individuals in retirement ages. Early middle-age and occupational settings may be appropriate targets for public health interventions. Strategies to increase walking and reduce sitting may include implementation of standing workstations, incentivized active transport (walk-to-work schemes) or improvements in pedestrian infrastructure in Japanese urban areas. Efforts to reduce total sitting time among older Japanese men may also be advantageous as part of a broader strategy to address the health and life expectancy disparities towards the end of life.

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## Declaration

The authors declare no financial or non-financial conflicts of interest.

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