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Original Article

# Low Back Pain, Lower Physical Activity, and Loneliness Associated with Decreased Frequency of Going Out during COVID-19 in Japanese Older Adults

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SUMMARY

*Background:* This study investigated the association of frequency of going out with physical activity, low back pain, and loneliness among urban Japanese community-dwelling older adults affected by the coronavirus disease 2019 pandemic.
*Methods:* This cross-sectional study recruited older adults aged 65 and over residing in apartment buildings in an urban area of Japan as participants. The questionnaire comprised items on participants' frequency of going out, musculoskeletal pain, physical activity, mobility, loneliness, and sociodemographic characteristics. Multiple logistic regression analysis was performed to explore the associations of decreased frequency of going out (less than once a week) during the pandemic with musculoskeletal pain, physical activity, and loneliness after controlling for age, sex, living alone, comorbidity, and social activity as confounding factors.
*Results:* This study analyzed 236 older adults (mean age: 75.5 years; females 54.2%) who went out more than two to three days a week before the pandemic. Participants who went out less than once a week during the pandemic (14%) had more arthritis than those who went out more. They also had a higher prevalence of reduced physical activity, low back pain, gait disability, and loneliness. Additionally, decreased frequency of going out was associated with lower physical activity [adjusted odds ratio (OR) = 3.91, 95% confidence interval (CI): 1.78–8.61], low back pain (OR = 2.79, 95% CI: 1.08–7.24), and loneliness (OR = 1.50, 95% CI: 1.14–1.98).
*Conclusions:* This study indicated that reduced physical activity, loneliness, and low back pain are associated with a decreased frequency of going out during the pandemic among older adults.



## 1. Introduction

The coronavirus disease 2019 (COVID-19) pandemic has considerably affected the physical and mental health of older adults. As countermeasures for the pandemic, governmental measures have resulted in lockdowns and restrictions.[1] For older adults, going out less than once a week, defined as "homebound," is associated with depressive symptoms, cognitive impairments, and functional limitations.[2–4] Additionally, homebound older adults have a high risk of mortality,[5] and high rates of healthcare service utilization.[6]

Several studies have reported decreased physical activity (PA) among older adults during the COVID-19.[7–9] Lower levels of PA are associated with risks of incident activities of daily living (ADL)/instrumental activities of daily living (IADL) disability, mortality, poor mental health,[10] and chronic low back pain (LBP) and knee pain.[11] In addition, older adults experience more loneliness compared to the pre-pandemic period.[12,13] Loneliness is a risk factor for mortality and ADL disability,[14] and is associated with depression among older adults.[15] Furthermore, a longitudinal study reported the bidirectional associations between loneliness and musculoskeletal pain in older people.[16] Therefore, decreased PA, loneliness, and musculoskeletal pain are interrelated among older adults. Although studies have identified the adverse effects of musculoskeletal pain during the pandemic among middle-aged adults,[17] the effect of musculoskeletal pain on community-dwelling older adults owing to COVID-19 countermeasures has yet to be elucidated.

Musculoskeletal pain is a widespread and problematic health concern among older adults, and is significantly associated with decreased physical and mental function.[11] Moreover, chronic back pain, knee pain, and arthritis are associated with high sedentary behavior in older adults.[18,19] Due to the COVID-19 measures, older adults who went out less frequently may have been associated with not only lower levels of PA and loneliness, but also musculoskeletal pain. However, to the best of our knowledge, no previous studies have reported the effects of musculoskeletal pain during the pandemic among older adults who go out less frequently.

Older adults going out less than once a week have been reported to be associated with mental and physical limitation compared to counterparts.[4] If the COVID-19 pandemic is prolonged, these vulnerable individuals may be at increased risk of ADL/IADL disability and healthcare service utilization. Older people with extremely low frequency of outing during the pandemic are concerned about more serious reductions in PA, higher loneliness, and adverse effects on musculoskeletal pain compared to those who do not. This study aimed to clarify the association of decreased frequency of

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going out (i.e., less than once a week) during the COVID-19 pandemic with musculoskeletal pain, PA, and loneliness among community-dwelling older adults. It is important to reveal the adverse effects during the COVID-19 on more vulnerable populations to consider more specific and effective interventions for them in the future.

## 2. Methods

### *2.1. Study participants and data collection*

This cross-sectional study was conducted in an urban area of Japan. Older adults aged 65 years and over residing in apartment buildings were targeted. Since it was not known in which apartments older adults resided, anonymous self-administered questionnaires were distributed to all households in the apartment buildings. A total of 2200 questionnaires, which clearly stated that responses must be made by individuals aged 65 and over, were enclosed in envelopes and distributed from October 30th–31st, 2020. The survey period was from November 1st–30th, 2020; the completed questionnaires were returned by mail. Questionnaires from respondents under the age of 65 years and those who went out less than once a week before the COVID-19 pandemic were excluded. The present study was conducted in accordance with the tenets of the Declaration of Helsinki. This study protocol was reviewed and approved by the Graduate School of Comprehensive Rehabilitation, Osaka Prefecture University (2020-104). The return of completed questionnaires was considered to imply consent to participate in the study.

### *2.2. Questionnaire*

The questionnaire comprised items on participants' sociodemographic data and physical and mental variables. Sociodemographic variables included age, sex, living arrangement (living alone or together), comorbidity, and participation in social activities. Physical and mental variables included musculoskeletal pain (LBP and knee pain), PA, loneliness, and walking ability during the ongoing self-restriction period.

#### *2.2.1. Frequency of going out*

Participants were asked the following question to assess the frequency of going out before and during the COVID-19 pandemic:[4] "How often do you usually go outside the house?" Examples of going out included going shopping, taking a walk, and visiting a hospital. The frequency of going out was categorized as: (1) almost every day, (2) once every two to three day, (3) once a week, and (4) seldom.

#### *2.2.2. Musculoskeletal pain*

LBP and knee pain were assessed separately using the following question: "How severe has been your (low back or knee) pain during COVID-19?" Participants selected one of the following response options: (1) very painful, (2) painful, (3) not so painful, and (4) not painful at all. Those who answered (1) or (2) were defined as having low back or knee pain. Moreover, participants who had selected (1) or (2) for both LBP and knee pain, were defined as having both.

#### *2.2.3. Physical activity*

The International Physical Activity Questionnaire-Short Form (IPAQ-SF)[20] was used to evaluate PA as minutes per day or days per week and time spent doing activities at any time of the day during the COVID-19 pandemic. The participants reported the frequency and duration of activities at varying levels of intensity: vigorous (e.g., heavy lifting, performing intense aerobic exercises, or using a bike or treadmill), moderate (e.g., carrying light loads and bicycling at a regular pace, gardening), and walking activities. Responses were converted to metabolic equivalent task minutes per week (METs-min/week) based on the IPAQ-SF scores. Following the IPAQ scoring recommendations, participants were classified into three groups based on their METs-min/week of the sum of walking activities, moderate-intensity PA, and vigorous-intensity PA: low PA (< 600 METs-min/week); moderate PA (≥ 600 METs-min/week) and high PA (≥ 3000 METs-min/week).

#### *2.2.4. Loneliness*

Loneliness was measured using the three-item version of the UCLA Loneliness Scale.[15,21] Participants were asked how frequently they "felt left out," "isolated from others," and "felt lonely," and were rated on a three-point scale (one = *hardly ever*; two = *sometimes*; and three = *often*). The scores on all items were summed up to generate a loneliness score ranging from three to nine, with higher scores indicating higher loneliness levels.

#### *2.2.5. Mobility*

Mobility was assessed using the question, "Are you able to walk one kilometer on a level surface without any difficulty during the COVID-19 pandemic?"[22] The response categories were as follows: (1) able to walk but with difficulty, (2) unable to walk, and (3) able to walk. Those who answered (1) or (2) were defined as having a walking disability.

#### *2.2.6. Social activity*

Participants' participation in social activities before the pandemic was investigated using the Scale of Social Activities among Community-dwelling Elderly People.[23] This scale consists of six items related to volunteer activities, physical and cultural activities, and talking with people other than those living together. Participation in these activities was evaluated on a three-point scale (one = *never in the past*, two = *before the last six months*, and three = *within the last six months*). The scores on all items were summed up to obtain a social activity score ranging from 6–18, with higher scores indicating higher social activity levels.

### *2.3. Statistical analysis*

Multiple imputations were performed to address the potential bias of missing data under the missing data at random assumption.[24] Twenty multiple imputed datasets that included all variables were created using the multiple imputations by chained equations procedure and the results were pooled using the standard Rubin's rule.[25] To clarify the characteristics of the population affected by ongoing self-restriction, participants were divided into two groups according to changes in the frequency of going out. Those who went out "once a day or more" or "once every two to three day" during COVID-19, as they did before COVID-19, were assigned to the "maintenance group." Those whose frequency decreased to "once a week" or "seldom" were classified as the "decreased group." To compare the two groups, a $\chi^2$-test was performed for categorical variables and a Mann-Whitney U-test for continuous variables. Furthermore, multiple logistic regression analysis was performed using the forced entry method to explore independent associations between the change in frequency of going out during COVID-19 and physical and mental outcomes, controlling for the following confounding factors: age (years as a continuous variable), sex (0 = male, 1 = female), living arrangement (0 = living with, 1 = living alone), comorbidity (0 = no,

1 = yes), and social activity before the COVID-19 (score as a continuous variable). All statistical analyses were carried out using IBM SPSS Statistics for Windows, version 26 (IBM Corp., Armonk, NY, USA). p-values of < 0.05 indicated statistical significance.

## 3. Results

A total of 266 questionnaires were returned. Of those, three were excluded because the respondents were under the age of 65 years. In addition, seven respondents were excluded because of inadequate answers to the IPAQ-SF. Finally, 20 participants who reported their frequency of going out before COVID-19 as "once a week" or "seldom" were also excluded. The final sample size was 236 (Figure 1).

Table 1 shows the comparison of the sociodemographic characteristics and social activity between the maintained and decreased groups. There were 203 (86%) and 33 (14%) participants in the maintenance and decreased group, respectively. Further, the decreased group had a higher proportion of comorbidities and arthritis than the maintenance group and a lower prevalence of diabetes.

Table 2 shows the comparisons of both groups' IPAQ-SF scores, pain severity, and physical and mental conditions during the COVID-19 pandemic. The decreased group reported lower PA, more severe LBP, more loneliness, and more gait disturbances compared to the maintenance group.

Table 3 presents the adjusted odds ratios (OR) for the significant factors in the univariate analysis based on the frequency of going out. During the pandemic, lower PA levels [OR = 3.91, 95% confidence interval (CI) = 1.78–8.61], LBP (OR = 2.79, 95% CI = 1.08–7.24), and increased loneliness (OR = 1.50, 95% CI = 1.14–1.98) were significantly associated with decreased outings. Furthermore, another logistic regression model was analyzed that included the having both LBP and knee pain as independent variables, adjusted for confounding factors. As a result, it was not significantly associated with a decreased outings (OR: 2.75, 95% CI: 0.79–7.86, p = 0.124).

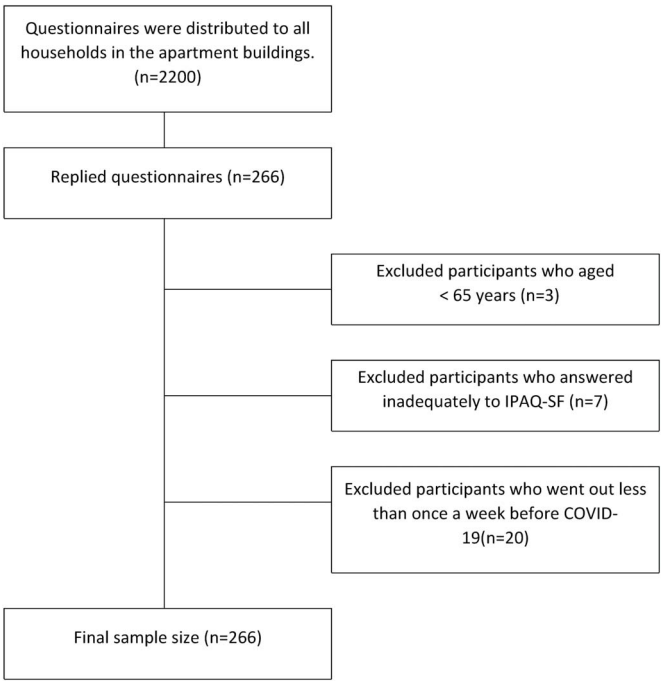


**Figure 1.** The flow chart of participants selection.

**Table 1**
Comparison of the two groups with regard to sociodemographic characteristics.

| | Overall (n = 236) | Maintained the frequency of going out during COVID-19 (n = 203, 86%) | Decreased the frequency of going out during COVID-19 (n = 33, 14%) | p-value |
|---|---|---|---|---|
| Age (years), mean ± SD | 75.5 ± 5.9 | 75.4 ± 5.8 | 76.5 ± 5.6 | 0.314 |
| Female | 128 (54.2) | 111 (54.7) | 17 (51.5) | 0.735 |
| Living alone | 130 (55.1) | 110 (54.2) | 20 (60.6) | 0.492 |
| Comorbidity | 174 (73.7) | 145 (71.4) | 29 (87.9) | 0.046 |
| Hypertension | 82 (34.7) | 71 (35.0) | 11 (33.3) | 0.854 |
| Arthritis | 69 (29.2) | 54 (26.6) | 15 (45.5) | 0.027 |
| Diabetes | 32 (13.6) | 31 (15.3) | 1 (3.0) | 0.039 |
| Heart disease | 28 (11.9) | 22 (10.8) | 6 (18.2) | 0.176 |
| Malignant tumor | 7 (3.0) | 4 (2.0) | 3 (9.1) | 0.059 |
| Stroke | 6 (2.5) | 6 (3.0) | 0 (0.0) | 0.401 |
| Lung disease | 5 (2.1) | 4 (2.0) | 1 (3.0) | 0.532 |
| Visual disability | 5 (2.1) | 5 (2.5) | 0 (0.0) | 0.468 |
| Kidney failure | 5 (2.1) | 5 (2.5) | 0 (0.0) | 0.468 |
| Others | 33 (14.0) | 31 (14.8) | 2 (6.0) | 0.057 |
| Residence years | | | | 0.808 |
| Under 4 years | 57 (24.2) | 48 (23.6) | 9 (27.3) | |
| 5–9 years | 53 (22.5) | 45 (22.2) | 8 (24.2) | |
| 10–19 years | 43 (18.2) | 39 (19.2) | 4 (12.1) | |
| Over 20 years | 83 (35.2) | 71 (35.0) | 12 (36.4) | |
| Residential floor | | | | 0.834 |
| First or second floor | 16 (6.8) | 15 (7.4) | 1 (3.0) | |
| Third or fifth floor | 57 (24.2) | 49 (24.1) | 8 (24.2) | |
| Sixth–Ninth floor | 70 (29.7) | 60 (29.6) | 10 (30.3) | |
| Tenth floor and above | 93 (39.4) | 79 (38.9) | 14 (42.4) | |
| Social activity before the COVID-19 pandemic | | | | 0.204 |
| SSAC score | 8.0 (7.0–12.0) | 9.0 (7.0–12.0) | 8.0 (6.0–11.0) | |

*Note.* Categorical variables are given as the number (%) and analyzed by the $\chi^2$-test. Continuous variables are expressed as a median and interquartile range and analyzed by the Mann-Whitney U-test.
COVID-19, coronavirus disease 2019; SD, standard deviation; SSAC, The Scale of Social Activities among Community-dwelling Elderly People.

**Table 2**
Comparison between two groups for each variable under COVID-19.

| | Overall (n = 236) | Maintained the frequency of going out during COVID-19 (n = 203, 86%) | Decreased the frequency of going out during COVID-19 (n = 33, 14%) | p-value |
|---|---|---|---|---|
| Musculoskeletal pain | | | | |
| Low back pain | 50 (21.2) | 35 (17.2) | 15 (45.5) | < 0.001 |
| Knee pain | 43 (18.2) | 35 (17.2) | 8 (24.2) | 0.334 |
| Both low back pain and knee pain | 20 (8.5) | 13 (6.4) | 7 (21.1) | 0.011 |
| IPAQ-SF | | | | |
| Total amount of PA (METs-min/week) | 1458.0 (594.0–3292.5) | 1584.0 (792.0–3564.0) | 396.0 (198.0–933.0) | < 0.001 |
| PA Level | | | | < 0.001 |
| High PA | 61 (25.8) | 60 (29.5) | 1 (3.0) | |
| Moderate PA | 79 (33.5) | 74 (36.5) | 5 (15.2) | |
| Low PA | 96 (40.7) | 69 (34.0) | 27 (81.8) | |
| Loneliness | 3.5 (3.0–5.0) | 3.0 (3.0–5.0) | 5.0 (4.0–6.0) | < 0.001 |
| Walking disability | 45 (19.1) | 34 (16.7) | 11 (33.3) | 0.024 |

*Note.* Categorical variables are given as the number (%) and analyzed by the $\chi^2$-test. Continuous variables are expressed as a median and interquartile range and analyzed by the Mann-Whitney U-test.
COVID-19, coronavirus disease 2019; IPAQ-SF, Inter-national Physical Activity Questionnaire Short Form; METs-min/week, metabolic equivalent task minutes per week; PA, physical activity.

**Table 3**
Associations between the decreased frequency of going out and each variable during COVID-19.

| Independent variables | Odds ratio | 95% CI | p-value |
|---|---|---|---|
| Physical activity level (low) | 3.911 | 1.78–8.61 | < 0.001 |
| Low back pain (1; yes) | 2.792 | 1.08–7.24 | 0.035 |
| Loneliness (score) | 1.500 | 1.14–1.98 | 0.004 |

*Note.* Logistic regression model adjusted for age, sex, living arrangement, comorbidity, social activity before the pandemic, and walking disability; dependent variable: the frequency of going out (0: maintained, 1: decreased).
COVID-19, coronavirus disease 2019.

## 4. Discussion

LBP, lower PA, and higher loneliness were independently associated with a decreased frequency of going out owing to COVID-19 countermeasures among older adults. The findings suggest that immediate measures are needed to improve PA and reduce loneliness and LBP for such older adults.

A novel finding of this study is that it clarified the factors associated with community-dwelling older adults' decreased going out during the pandemic. The mean age of our study participants was 75.5 ± 5.9 years, and those of 14% went out less than once a week owing to the COVID-19 countermeasures. The severity and mortality rates of COVID-19 are higher in those aged 65 and over.[26] A recent report showed that the prevalence of homebound older adults is 14.4%.[27] Moreover, homebound older people are a vulnerable population.[2–6] Therefore, this study provides data on a more vulnerable population concerning their health outcomes during the COVID-19.

The prevalence of LBP was associated with decreased going out during the pandemic. The findings showed that the prevalence of LBP was 45.5% in the decreased group. It was higher than that reported among Japanese older adults in a previous systematic review.[28] In this study participants who went out less than once a week during the COVID-19 had more arthritis than participants who went out more. A previous population-based study reported that arthritis of the spine is significantly associated with homebound older adults.[3] On the other hand, this is the first study to investigate the association between lower frequency of going out and having both LBP and knee pain among older adults during the pandemic, however there was no statistically significant difference. This result may be due to the small sample size and the prevalence of both LBP and knee pain was less than half the prevalence of LBP.

Thus, the results of the present study call for immediate measures to manage LBP in older adults with arthritis who are unable to go out.

The results also showed that lower PA was associated with going out less than once a week during COVID-19 compared to going out more often. It is known that PA has decreased for all generations during the pandemic.[7] In a previous online survey, the total amount of PA among older people during the pandemic was 1473.0 METs-min/week.[8] In this study, the total amount of PA was 1584.0 METs-min/week among the maintained group, whereas it was as low as 396.0 METs-min/week in the decreased group. Older adults with a lower frequency of going out and a lower level of PA as a result of the COVID-19 pandemic may have been adversely affected on their mobility, ADL/IADL, and mental health.[2,4,10]

Loneliness was also associated with decreased frequency of going out during COVID-19. In this study, the median UCLA Loneliness Scale scores of the decreased group was 5.0. In previous studies that used the same scale, the scores were reported to be 3.89 for American older adults[15] and 4.30 for Japanese older people.[21] Older adults who went out less frequently in this study were lonelier than in previous studies.[15,21] Furthermore, previous studies have investigated loneliness among older people before and during the COVID-19, showing an increase in loneliness.[12,13,29] The COVID-19 pandemic has halted various social activities and interactions with friends and families, which may have resulted in older adults becoming isolated. Specifically, newly homebound older adults may perceive more loneliness during the pandemic.

Prevalence of diabetes was significantly less in the decreased group in this study. A study conducted by a Japanese group showed that older people with decreased PA during COVID-19 were not significantly associated with diabetes.[30] Since the decrease in going out during COVID-19 was caused by behavioral restrictions due to requests for self-restraint, the associated factors may differ from those of homebound, which occur gradually as a result of the decline in physical and psychological functions. This study has a small sample size to solve this problem. Therefore, future research should be considered.

There are several limitations to this study. First, this study was limited to community-dwelling older adults in an urban area of Japan. Second, the cross-sectional design precludes causal inferences about newly homebound status due to COVID-19 and LBP. Third, participants were asked to recall how often they went out before April 7, 2020, when the state of emergency was issued seven months before the investigation. Thus, the subjective frequency of going out may have been underestimated or overestimated. Finally, since this self-reported survey was conducted via mail, selection bias must be considered because the sample was not randomized.

## 5. Conclusion

During COVID-19, countermeasures, such as self-restriction, have been effective in preventing the spread of infection, whereas considerable reductions in the outings have resulted in the emergence of high-risk groups among older adults. In this study, lower PA, loneliness, and LBP were associated with a decreased frequency of going out during COVID-19 among Japanese older people. These findings warrant the need for more attention to and interventions for newly homebound older adults. A multicomponent program is being planned that includes physical exercise, health education, providing information related to social support/activities, and group work interacting with other people.

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## Declaration of interest

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