

ORIGINAL ARTICLE
BIOLOGY

Change in subjective health status among frail older Japanese people owing to the coronavirus disease pandemic and characteristics of their responses

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Received: 11 May 2021

Revised: 20 August 2021

Accepted: 24 August 2021

Aim: The coronavirus disease 2019 (COVID-19) pandemic remains a major global public health issue, and it has led to restrictions in physical and social activities among community-dwelling people, including frail older adults. This study aimed to determine the impact of the pandemic on the subjective health status and characteristics of community-dwelling frail older adults by assessing their knowledge of infection, behaviors and negative psychological response.

Methods: During October 2019, 720 older adults participated in “The Otassha Study.” A year after the COVID-19 outbreak, between June 29 and July 31, 2020, a health status questionnaire, comprising questions concerning knowledge about infection, behaviors and psychological responses during the pandemic, was sent to all participants of the health examination in 2019. Respondents were divided into the robust and frail groups, and their responses were compared.

Results: Although the self-reported health status of the older adults in both groups was worse in 2020 than in 2019, differences were not observed in the degree of deterioration between the groups. Those in the frail group had fewer resources of information related to COVID-19 and had fewer coping behaviors for health maintenance compared with the robust group.

Conclusion: Information gathering and actions aimed at health maintenance tended to be weaker among older adults with frailty, although the influence of COVID-19 on subjective health status did not differ significantly between robust and frail adults. Therefore, robust and frail older adults may need to adopt different countermeasures to prevent worse health during this pandemic. *Geriatr Gerontol Int* 2021; 21: 1053–1059.

Keywords: behaviors, COVID-19, frail, questionnaire, self-reported health status.

Introduction

The coronavirus disease (COVID-19) outbreak was first reported in Wuhan, China in 2019, and the infection has subsequently spread worldwide. As of December 1, 2020, >63 million people have been infected, and >1.4 million COVID-19-related deaths have been reported.¹ In Japan, during the latter half of March

2020, the number of cases increased, and the Japanese government declared a state of emergency on April 7. Following the first wave and subsequent peak in case numbers, the number of new infections decreased; however, this trend then changed, and the number increased again in June.

In Japan, social distancing to prevent the spread of infection was implemented; however, the “stay-at-home” instructions were not as

severe as the lockdown and social distancing strategies implemented in other countries. The Japanese government recommended that people avoid the “three Cs” (closed spaces, crowded places, and close-contact settings) for protection against infection.² Although the government did not force citizens to stay home, restrict economic activities such as work or meetings with friends, or dining in closed restaurants, people with comorbidities and older adults were advised to avoid crowded places and going out as much as possible.³ However, even this lenient and effortless recommendation of the government is considered to have a negative impact on the physical and mental health due to decreased physical activity.⁴

Generally, sedentary lifestyle and low physical activity induce cardiovascular and stroke risk, and result in high mortality rates of several diseases.⁵ Moreover, decreased physical activity among older people could result in sarcopenia,⁶ falls and fracture.⁷ Contrastingly, an increase in physical activities, such as walking, prevents frailty.⁸ Therefore, the World Health Organization (WHO) and several academic associations have recommended that older adults should increase their physical activity level.^{4,9} According to a survey comparing physical activity between the pre- and post-spread periods of COVID-19 in Japan, physical activity decreased in all older adults and not just frail older adults.¹⁰ Furthermore, in a subsequent survey, those living alone and socially inactive people, typically frail older adults, had low physical activity levels, which did not improve compared to that before the pandemic.¹¹ These results suggest that frail older adults do not recuperate easily from a repressive situation.

Knowledge on COVID-19 was associated with prevention practices¹² and behaviors.¹³ Loneliness induced by social distancing was associated with limited health literacy.¹⁴ Contrastingly, loneliness and social isolation have significantly affected subjective health in older people.¹⁵ Frail older adults have low physical and psychological function and different sociodemographic characteristics compared with robust older adults.¹⁶ Knowledge, behaviors and psychological responses regarding the COVID-19 pandemic may differ between the two groups.

This study aimed to determine the impact of the COVID-19 pandemic on the subjective health status and characteristics of community-dwelling frail older adults with respect to their knowledge about the infection, behaviors and negative psychological responses. Evaluation of an individual's own health based on self-reported health status may be suitable for eliciting the impact of this pandemic on older people, particularly those with frailty.

Methods

Participants

We surveyed community-dwelling older adults living in Itabashi Ward, Tokyo, who had participated in a cohort study in the Tokyo Metropolitan Geriatric Hospital and Institute of Gerontology, “The Otassa Study” in 2011.¹⁷ In September 2019, 720 (men, $n = 266$; women, $n = 454$) older participants underwent a comprehensive health survey at the venue. We assessed frailty based on the Kihon Checklist (KCL),¹⁸ but 109 participants were excluded because they did not complete the KCL and some of the items had inadequate responses (Table S1). On June 29, 2020, we sent the mail survey to all individuals who participated in the 2019 survey and instructed them to return the completed questionnaire by July 31. At the beginning of the survey period, only 110 daily new cases of COVID-19 were being reported in Japan, and this number increased each day, reaching 1090 on July 31. The peak

in the new infection rate during the second wave occurred on July 30, with 1762 new infections being reported,¹ coinciding with our survey dates.

In the 2020 survey, 533 of 618 participants completed the KCL and were included. The response rates of robust and frail older adults in the final data set were 89.6% and 82.8%, respectively (Fig. 1). The number of participants was lower in the frail group than in the robust group.

Our study was approved by the Ethics Committee of the Tokyo Metropolitan Institute of Gerontology (approval no. 2020-2, 2019-E32). Before study participation, all the participants provided written informed consent for participation in both the 2019 and 2020 surveys.

Assessment of frailty

The KCL was used to determine the need for long-term care and categorize participants who had been assessed for frailty. The KCL comprises 25 items (instrumental, 3; social, 4; activities of daily living [ADL] and physical functions, 5; nutritional status, 2; oral function, 3; cognitive function, 3; and depressive mood, 5). Participants with a KCL score <4, between 4 and 7, and ≥ 8 were considered robust, prefrail, and frail, respectively.¹⁹ The participants were then divided into the frail (including prefrail, KCL ≥ 4) and robust groups (KCL <4) based on answers in the 2019 survey.

Subjective health status

Self-reported health, mental health and social network statuses were assessed in the 2019 and 2020 surveys. Participants were asked questions concerning their self-reported health status, such as “How healthy do you usually feel?” and they responded using one of the following options: 1 (very healthy), 2 (healthy), 3 (not so healthy), and 4 (not healthy). Participants also completed the WHO-Five Well-Being Index-Japanese version (WHO-5-J)²⁰ and the abbreviated Lubben Social Network Scale-Japanese version (LSNS-6-J).²¹

Knowledge about infection, behaviors and negative psychological response to the COVID-19 pandemic

In the 2020 survey, knowledge about infection, behaviors and negative psychological response to the spread of COVID-19 were examined. Details on each question are shown in Table 2. Participants were asked questions related to the spread of COVID-19, such as “What are your responses concerning the effects of COVID-19 spread on self-reported health status?,” “What type of disease is COVID-19?,” “What actions do you think are effective in preventing COVID-19?,” “Where do you obtain information on COVID-19 from?,” “Are you anxious about contracting COVID-19?,” “Do you feel anxious in social situations due to COVID-19?,” “What efforts have you taken to maintain your physical and mental health during the requested stay-at-home period?,” “What actions are you taking to avoid contracting infection?,” and “What activities can you not participate in that you would like to, due to the closure of a company or facility?”

Other variables

Participants responded to questions concerning comorbidity and educational levels and underwent the Tokyo Metropolitan Institute of Gerontology, Index of Competence (TMIG-IC) assessment.²² Anthropometric and physical function (grip strength, 5-m walk test) parameter measurements and the Mini-Mental State

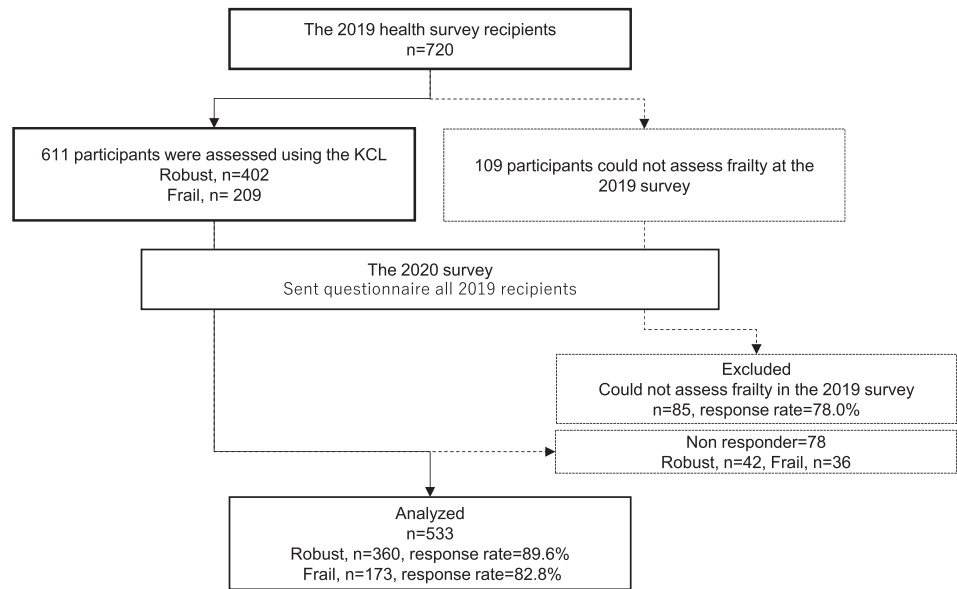


Figure 1 Flow chart of study participant enrolment. KCL, Kihon Checklist.

Examination-Japanese version were also employed.²³ These variables were measured in the 2019 survey.

Statistical analyses

Data are expressed as mean (95% confidence interval) and *n* (%). We used Student’s *t*- or Mann–Whitney *U*-tests for continuous variables and chi-squared or Fisher’s exact tests for categorical variables to compare the robust and frail groups. To compare the results of the 2019 and 2020 surveys, self-reported health status, the WHO-5-J, and the LSNS-6-J were analyzed using a linear mixed model. The change in the number of low WHO-5-J (<13) and LSNS-6-J (<12) scores between the 2019 and 2020 surveys was compared using McNemar’s test. Data were statistically analyzed using SPSS version 26 (IBM Corp., Armonk, NY, USA).

Results

Comparison of baseline data between frail and robust older adults in 2019

Table S2 shows the baseline data (2019, before the COVID-19 pandemic) in each group. Age, the 5-m walk test time and KCL scores were higher, and height, educational duration and grip strength values, and TMIG-IC scores were lower in the frail group than in the robust group ($P = 0.044 - <0.001$). A larger number of participants in the frail group had heart disease, compared with

those in the robust group ($P = 0.049$), and the number of negative responses to questions concerning vision and hearing disturbances was higher in the frail group than in the robust group ($P = 0.006$ and $P = 0.025$, respectively).

Changes in self-reported health status, well-being and social isolation responses between the 2019 and 2020 surveys

Table 1 shows the results of the participants’ self-reported health status, their WHO-5-J, and LSNS-6-J scores. For all the variables, the changes showed worsening effects in the frail group compared with the robust group (all variables, $P < 0.001$); the scores were lower in 2020 than in 2019 ($P = 0.024$, $P < 0.001$, and $P = 0.032$, respectively). However, the interaction was not significant for all variables.

Response difference between robust and frail adults

Table 2 shows the results of the comparison between robust and frail older adults in response to the nine items in the main questionnaire, which relate to the direct effects of the COVID-19 pandemic on participants’ self-reported health status.

Based on the response, the effects of COVID-19 pandemic on self-reported health status was worse in the frail group than in the robust group ($P < 0.001$). The response rate among the participants in each group was high, and there was no difference in the

Table 1 Changes in 2019 and 2020 survey self-reported health status responses and WHO-5-J and LSNS-6-J scores

Parameters	2019		2020		Group	Time	Interaction
	Robust	Frail	Robust	Frail			
Self-reported health status	1.9 (1.8–1.9)	2.2 (2.1–2.3)	1.9 (1.9–2.0)	2.3 (2.2–2.4)	<0.001	0.024	0.747
WHO-5-J	17.8 (17.3–18.3)	14.4 (13.7–15.1)	16.3 (15.8–16.8)	12.6 (11.9–13.3)	<0.001	<0.001	0.368
LSNS-6-J	16.6 (16.0–17.2)	13.2 (12.3–13.0)	15.8 (15.3–16.4)	13.0 (12.2–13.9)	<0.001	0.032	0.138

Response of those items in the 2019 and 2020 surveys were compared using a general linear mixed model. Data are expressed as estimated mean (95% confidence interval). LSNS-6-J, Lubben Social Network Scale-Japanese version; WHO-5-J, World Health Organization-Five Well-Being Index-Japanese version.

Table 2 Responses to each of the questions

	Overall (<i>n</i> = 534)	Robust (<i>n</i> = 360)	Frail (<i>n</i> = 173)	<i>P</i>
Question 1 Responses concerning the effects of COVID-19 spread on self-reported health status (<i>n</i> = 520)				
Very good	23 (4.4)	21 (6.0)	2 (1.2)	<0.001
Fairly good	66 (12.7)	53 (15.1)	13 (7.6)	
No change	336 (64.6)	228 (65.1)	108 (63.5)	
A little worse	87 (16.7)	45 (12.9)	42 (24.7)	
Very worse	8 (1.5)	3 (0.9)	5 (2.9)	
Question 2 What type of disease is COVID-19? (<i>n</i> = 519)				
Often asymptomatic or mild	336 (64.7)	230 (65.7)	106 (62.7)	0.504
Some have severe pneumonia	485 (93.4)	332 (94.9)	153 (90.5)	0.062
It not an airborne infection	169 (32.6)	123 (35.1)	46 (27.2)	0.071
Older people are more likely to be severe than younger people	487 (93.8)	327 (93.4)	160 (94.7)	0.580
People with chronic illnesses are more likely to contract severe COVID-19	497 (95.8)	335 (95.7)	162 (95.9)	0.939
May infect other people even if asymptomatic	478 (92.1)	323 (92.3)	155 (91.7)	0.822
No suitable items	10 (1.9)	7 (2.0)	3 (1.8)	>0.999
Question 3 What actions do you think are effective in? (<i>n</i> = 520)				
Cover your mouth when coughing or sneezing	477 (91.7)	323 (92.0)	154 (91.1)	0.728
Avoid eating while face to face with someone	455 (87.5)	309 (88.0)	146 (86.4)	0.596
Wash hands with soap often	495 (95.2)	334 (95.2)	161 (95.3)	0.956
Wash hands after coughing or blowing your nose	352 (67.7)	238 (67.8)	114 (67.5)	0.936
Disinfect with ethanol	472 (90.8)	319 (90.9)	153 (90.5)	0.897
Keep a distance when speak with people	486 (93.5)	329 (93.7)	157 (92.9)	0.719
Avoid the "Three Cs"	512 (98.5)	345 (98.3)	167 (98.8)	0.648
Consult the COVID-19 Hotline if the symptoms of fever and cough persist	473 (91.0)	324 (92.3)	149 (88.2)	0.142
No suitable items	10 (1.9)	6 (1.7)	4 (2.4)	0.735
Question 4 Where do you obtain information on COVID-19 from? (<i>n</i> = 521)				
TV broadcast	512 (98.3)	344 (98.0)	168 (98.8)	0.502
Radio	151 (29.0)	111 (31.6)	40 (23.5)	0.056
News paper	398 (76.4)	282 (80.3)	116 (68.2)	0.002
Magazine	65 (12.5)	52 (14.8)	13 (7.6)	0.020
Internet	183 (35.1)	144 (41.0)	39 (22.9)	<0.001
Social network service	49 (9.4)	41 (11.7)	8 (4.7)	0.011
Municipality	120 (23.0)	88 (25.1)	32 (18.8)	0.112
Hospital/nursing facility	55 (10.6)	38 (10.8)	17 (10.0)	0.774
Organization/institution	38 (7.3)	27 (7.7)	11 (6.5)	0.615
Friends/neighbors	174 (33.4)	119 (33.9)	55 (32.4)	0.725
Family/relatives living together/separated family	242 (46.4)	163 (46.4)	79 (46.5)	0.995
Other	7 (1.3)	6 (1.7)	1 (0.6)	0.297
Question 5 Are you anxious about contracting COVID-19? (<i>n</i> = 529)				
Contracting infection by accident	426 (80.5)	287 (80.6)	139 (80.3)	0.941
Reception of COVID-19 from youth	208 (39.3)	142 (39.9)	66 (38.2)	0.701
Pass the COVID-19 to someone	258 (48.8)	177 (49.7)	81 (46.8)	0.532
Contracting severe COVID-19	398 (75.2)	260 (73.0)	138 (79.8)	0.092
Does not know where I consult about own symptom related to infection	107 (20.2)	67 (18.8)	40 (23.1)	0.248
Cannot get tested even if I have symptoms of infection	251 (47.4)	171 (48.0)	80 (46.2)	0.699
Unable to get hospital admission despite having infection	253 (47.8)	177 (49.7)	76 (43.9)	0.211
Close relatives will be quarantined due to my infection	261 (49.3)	177 (49.7)	84 (48.6)	0.802
May be subject quarantine due to infection or being a close contact	344 (65.0)	235 (66.0)	109 (63)	0.496
Own illness worsens due to refraining from going out	64 (12.1)	41 (11.5)	23 (13.3)	0.556
No anxiety	23 (4.3)	15 (4.2)	8 (4.6)	>0.999
Question 6 Do you feel anxious in social situations due to COVID-19? (<i>n</i> = 529)				
Shortage of daily necessities such as masks and toilet paper	126 (23.8)	74 (20.7)	52 (30.2)	0.022

(Continues)

Table 2 Continued

	Overall (<i>n</i> = 534)	Robust (<i>n</i> = 360)	Frail (<i>n</i> = 173)	<i>P</i>
Not be able to receive the necessary medical care and long-term care	321 (60.7)	209 (58.5)	112 (65.1)	0.147
Economic downturn due to self-restraint and state of emergency	364 (68.8)	243 (68.1)	121 (70.3)	0.596
Medical collapse occurs when the number of infected people increases	444 (83.9)	303 (84.9)	141 (82)	0.395
Increasing rate of crimes such as fraud by people who take advantage of infection	125 (23.6)	82 (23)	43 (25)	0.607
Infrastructure services stagnate due to an increase in the number of infected people	327 (61.8)	223 (62.5)	104 (60.5)	0.657
Community security gets worse	134 (25.3)	86 (24.1)	48 (27.9)	0.344
Be discriminated against when infected	285 (53.9)	190 (53.2)	95 (55.2)	0.664
No anxiety	22 (4.2)	14 (3.9)	8 (4.7)	0.694
Question 7 What efforts have you taken to maintain your physical and mental health during the requested stay-at-home period? (<i>n</i> = 530)				
Watching TV program at home	378 (71.3)	249 (69.7)	129(74.6)	0.250
Hobby activities at home	228 (43.0)	173 (48.5)	55 (31.8)	<0.001
Conversation with family living together	209 (39.4)	156 (43.7)	53 (30.6)	0.004
Call with friend	198 (37.4)	140 (39.2)	58 (33.5)	0.204
Walking	344 (64.9)	253 (70.9)	91 (52.6)	<0.001
Exercise and strength training at home	293 (55.3)	206 (57.7)	87 (50.3)	0.114
Being careful about food intake	277 (52.3)	193 (54.1)	84 (48.6)	0.234
Actively gathered information on COVID-19	178 (33.6)	128 (35.9)	50 (28.9)	0.112
Avoid information related to COVID-19	56 (10.6)	40 (11.2)	16 (9.2)	0.492
Hobby activities using the Internet	66 (12.5)	54 (15.1)	12 (6.9)	0.007
Use of mail-order sale	56 (10.6)	35 (9.8)	21 (12.1)	0.412
Did not do anything in particular	54 (10.2)	24 (6.7)	30 (17.3)	<0.001
Question 8 What avoiding actions do you avoid to contract infection? (<i>n</i> = 529) (<i>n</i> = 529)				
Meet others in person	282 (53.3)	184 (51.7)	98 (56.6)	0.283
Hobby gathering	277 (52.4)	194 (54.5)	83 (48)	0.159
Long-term care prevention activities	93 (17.6)	56 (15.7)	37 (21.4)	0.109
Shopping at a large commercial facility	270 (51.0)	183 (51.4)	87 (50.3)	0.810
Eating out	374 (70.7)	256 (71.9)	118 (68.2)	0.380
Use of day care and day service	27 (5.1)	13 (3.7)	14 (8.1)	0.029
Visit a medical institution	118 (22.3)	75 (21.1)	43 (24.9)	0.326
Acupuncture and moxibustion massage	85 (16.1)	56 (15.7)	29 (16.8)	0.762
Use of public transportation	272 (51.4)	184 (51.7)	88 (50.9)	0.860
Use a taxi	129 (24.4)	84 (23.6)	45 (26)	0.544
Go out	279 (52.7)	183 (51.4)	96 (55.5)	0.377
Not particularly	47 (8.9)	29 (8.1)	18 (10.4)	0.392
Question 9 What activities can you not participate in that you would like to, due to the closure of a company or facility? (<i>n</i> = 521)				
Shopping	199 (38.2)	133 (37.7)	66 (39.3)	0.772
Community closeness	145 (27.8)	104 (29.5)	41 (24.4)	0.229
Use of sports gyms and health promotion facilities	200 (38.4)	153 (43.3)	47 (28.0)	0.001
Long-term care prevention activities	31 (6.0)	21 (5.9)	10 (6.0)	0.999
Use of day care and day service	11 (2.1)	8 (2.3)	3 (1.8)	0.721
Going out	350 (67.2)	241 (68.3)	109 (64.9)	0.441
Welfare services such as public halls and classrooms	130 (25.0)	90 (25.5)	40 (23.8)	0.678
Visits close relatives in medical institutions and long-term care facilities	91 (17.5)	57 (16.1)	34 (20.2)	0.250
Use of restaurants and cafeterias	306 (58.7)	209 (59.2)	97 (57.7)	0.750
Use of karaoke and entertainment facilities	136 (26.1)	101 (28.6)	35 (20.8)	0.059
Use of taverns and bars	132 (25.3)	101 (28.6)	31 (18.5)	0.013
Not constrained at all	38 (7.3)	22 (6.2)	16 (9.5)	0.177

Data are expressed as *n* (%).

response about a “TV broadcast” being a source of information on COVID-19. Contrarily, a lower proportion of the participants in the frail group mentioned “newspapers,” “magazines,” “internet”, and “social network services” as sources of information than those in the robust group (*P* = 0.020 to <0.001). Those in the frail

group responded to the question about being anxious regarding the “shortage of daily necessities such as masks and toilet paper” more than the robust group, but the responses were low in each group (*P* < 0.022). Fewer participants in the frail group responded to the question about engaging in “hobby activities at home,”

“conversations with family,” “walking”, and “hobby activities on the Internet” as a way to maintain physical and mental health during the requested stay-at-home period, compared with those in the robust group ($P = 0.007 - <0.001$). A larger number of participants in the frail group responded to the question about “day care and day services” being a means of avoiding infection, compared with the robust group; however, the response rate was significantly low in both groups. A lower proportion of participants in the frail group responded to the question about activities related to “sports gyms and health promotion facilities” and “taverns and bars” as limitations experienced from the closure of a company or facility ($P = 0.013-0.001$).

Discussion

One of the main aims of this study was to determine the impact of the pandemic on the subjective health status among frail adults. Public health measures such as physical distancing aimed at preventing the spread of COVID-19 can decrease infection risk but may also decrease the number of opportunities for people to meet, go out, and converse, leading to social isolation and loneliness. These changes in social situations have been reported to result in collateral adverse consequences, such as depression, cognitive decline and exacerbations in chronic diseases.²⁴ In a previous study that was conducted following the Great East Japan Earthquake, approximately 60% of the participants who were socially isolated (<12/30 LSNS-6-J) remained the same even after 2 years,²⁵ and they experienced more psychological distress compared with other groups. In our survey, on comparing the self-reported health status data and the WHO-5-J and LSNS-6-J scores between September 2019 and July 2020, the self-reported health status was reported to be worse in both the robust and frail groups after the COVID-19 pandemic. The interaction was not significant; therefore, both groups might have had worse health status owing to the pandemic. However, the true pandemic effect could not be determined because we did not make comparisons with the pre-pandemic period.

The WHO-5-J and LSNS-6-J scores decreased in our study, indicating worsening of the participants’ psychological health; their level of social connection with other people decreased. Although this decrease may be due to aging, there are usually not that many changes in the WHO-5-J scores during a year; thus, we believe that this could be associated with the lost opportunities of going out owing to the COVID-19 pandemic.

Public knowledge concerning COVID-19 was an important aspect of this period. The characteristics of COVID-19 and knowledge of the prevention measures were well-understood, and the level of knowledge did not greatly differ between the two groups, except in terms of knowledge pertaining to airborne contamination. According to a previous report, higher knowledge scores regarding COVID-19 were observed in participants aged >50 years.²⁶ One questionnaire study in Japan conducted in May 2020 at the onset of the first wave regarding the level of knowledge on COVID-19 and anxiety reported that approximately 13% of respondents had a low level of understanding.²⁷ However, there was a tendency for respondents in the older age groups to have a greater level of understanding of COVID-19. Even frail older adults in our study had a stronger interest in countermeasures that should be taken for COVID-19.

Different responses about information sources for COVID-19 were observed between the groups. The usage rate of newspapers, magazines, internet, and social network services was lower among frail participants than among robust participants. As our participants

had a larger number of visual and hearing disadvantages, these results could be expected. To deliver important information, such as that required for COVID-19 response, the government, local bodies, and media should provide appropriate methods of information dissemination for frail older adults, considering their characteristics such as inaccessibility to advanced information technology, poor vision, hearing loss, and insufficient social connectivity.

Anxiety about contracting COVID-19 and social situations was reported in a large population study conducted in Japan. The study showed that >50% of older adults noted high anxiety levels concerning disease severity due to COVID-19 and its spread.²⁷ In terms of anxiety related to the participants’ risk of infection and their social situation, we expected that frail older adults would have higher anxiety levels due to their current situation because they are more likely to be negatively affected by the pandemic. However, the response to anxiety-related risk of infection in both groups was not high (approximately ≤50%), and fewer responses were noted, except in terms of the issues concerning consultations following infection and the risks of contamination from young people. Even these responses did not differ between the two groups. The number of population-adjusted daily test-positive cases and deaths due to COVID-19 in Asian countries, including Japan, was low.²⁸ Our participants may have felt that the risk of COVID-19 infection was not high for Asians as our survey was conducted after the first wave.

Coping behaviors to maintain physical and mental health during activity restrictions were important aspects of this period. Some differences were observed in the responses to the question “What efforts have you taken to maintain your physical and mental health during the requested stay-at-home period?” between the groups. The number of responses to items such as hobby activities at home, conversations with family, walking and hobby activities using the internet were consistently lower among the frail participants than among the robust participants. In contrast, the proportion of those that answered “Did not do anything in particular” was larger among the frail group than among the robust group, suggesting that it is difficult for frail older adults to adopt coping behaviors to maintain their health under restrictions.

Moreover, regarding the question “What activities can you not participate in that you would like to, due to the closure of a company or facility?” the responses concerning the use of sports gyms and health promotion facilities were lower among the frail participants than among robust participants. This appears to have been due to the differences between the groups in terms of pre-COVID-19 daily behaviors, actions, and instrumental ADL in addition to not feeling the need to perform these activities. The participants in the frail group appeared not to be as committed to the maintenance of their physical and mental health as their robust counterparts. Frail older adults require a higher degree of support to increase their physical activity, particularly during the pandemic.

Coronavirus infection remains a worldwide burden, even at the time of writing, and this situation will last for months or years. In particular, frail elderly people have low mental and physical functions; thus, they are largely affected by the restrictions on social events. Physical activity, including going out, is clearly reduced in frail older people. Going out is associated with health outcomes such as ADL and worsening self-care among the elderly.²⁹ In previous studies, going out at least once a week is important for maintaining physical function.³⁰ Therefore, it is necessary to balance infection prevention and physical activity. It is possible to engage in specific exercise indoors and encourage outdoor activity while preventing infection.

This study has several limitations. Almost all our participants had participated in our study for several years or on several occasions.

Generally, they had a higher level of awareness of their own health. Moreover, the number of frail participants was significantly lower than that of robust participants in 2020; therefore, it is possible that selection bias influenced this result. The situation concerning COVID-19 spread is variable, with people's actions influencing it. Yamada *et al.* reported in a physical activity survey using the internet, concerning COVID-19 spread, that physical activity levels decreased in April but rebounded in June.¹¹ Our survey duration covered this period and was possibly influenced by this change.

Acknowledgements

The authors thank the local authorities in the Itabashi Ward for their support and all the study participants.

Disclosure statement

The authors declare no conflict of interest.

References

- The Center for Systems Science and Engineering, J. H. U. (2020). COVID-19 dashboard. <https://www.arcgis.com/apps/opsdashboard/index.html#/bda7594740fd40299423467b48e9ecf6>
- Prime Minister's Office of Japan; Ministry of Health, L. a. W. Avoid the "three Cs"! <https://www.mhlw.go.jp/content/10900000/000619576.pdf>
- Prime Minister's Office of Japan; Ministry of Health, L. a. W. Preventing COVID-19 and stopping its spread. <https://www.c19.mhlw.go.jp/covid-19-en.html>
- Lim WS, Liang CK, Assantachai P *et al.* COVID-19 and older people in Asia: Asian working Group for Sarcopenia calls to actions. *Geriatr Gerontol Int* 2020; **20**: 547–558.
- Ekelund U, Steene-Johannessen J, Brown WJ *et al.* Does physical activity attenuate, or even eliminate, the detrimental association of sitting time with mortality? A harmonised meta-analysis of data from more than 1 million men and women. *Lancet* 2016; **388**: 1302–1310.
- Steffl M, Bohannon RW, Sontakova L, Tufano JJ, Shiells K, Holmerova I. Relationship between sarcopenia and physical activity in older people: a systematic review and meta-analysis. *Clin Interv Aging* 2017; **12**: 835–845.
- Moayyeri A. The association between physical activity and osteoporotic fractures: a review of the evidence and implications for future research. *Ann Epidemiol* 2008; **18**: 827–835.
- Yuki A, Otsuka R, Tange C *et al.* Daily physical activity predicts frailty development among community-dwelling older Japanese adults. *J Am Med Dir Assoc* 2019; **20**: 1032–1036.
- Aubertin-Leheudre M, Rolland Y. The importance of physical activity to care for frail older adults during the COVID-19 pandemic. *J Am Med Dir Assoc* 2020; **21**: 973–976.10.
- Yamada M, Kimura Y, Ishiyama D *et al.* Effect of the COVID-19 epidemic on physical activity in community-dwelling older adults in Japan: a cross-sectional online survey. *J Nutr Health Aging* 2020; **24**(9): 948–950.
- Yamada M, Kimura Y, Ishiyama D *et al.* Recovery of physical activity among older Japanese adults since the first wave of the COVID-19 pandemic. *J Nutr Health Aging* 2020b; **24**(9): 1036–1037.
- Ibrahim SME, Mahmoud MAM. Relationship between knowledge, preventive practices and fear from COVID-19 among middle aged and older adults: during the novel coronavirus outbreak. *Am J Nurs Sci* 2020; **9**: 338.
- Chen Y, Zhou R, Chen B *et al.* Knowledge, perceived beliefs, and preventive behaviors related to COVID-19 among Chinese older adults: cross-sectional web-based survey. *J Med Internet Res* 2020; **22**: e23729.
- Wells TS, Rush SR, Nickels LD, Wu L, Bhattarai GR, Yeh CS. Limited health literacy and hearing loss among older adults. *Health Lit Res Pract* 2020; **4**: e129–e137.
- Berg-Weger M, Morley JE. Loneliness in old age: an unaddressed health problem. *J Nutr Health Aging* 2020; **24**: 243–245.
- Clegg A, Young J, Iliffe S, Rikkert MO, Rockwood K. Frailty in elderly people. *Lancet* 2013; **381**: 752–762.
- Kera T, Kawai H, Takahashi J *et al.* Association between ground reaction force in sit-to-stand motion and falls in community-dwelling older Japanese individuals. *Arch Gerontol Geriatr* 2020; **91**: 104221.
- Sewo Sampaio PY, Sampaio RAC, Yamada M, Ogita M, Arai H. Comparison of frailty among Japanese, Brazilian Japanese descendants and Brazilian community-dwelling older women. *Geriatr Gerontol Int* 2014; **15** (6):762–769.
- Satake S, Senda K, Hong YJ *et al.* Validity of the Kihon checklist for assessing frailty status. *Geriatr Gerontol Int* 2016; **16**: 709–715.
- Iwasa H, Inagaki H, Yoshida Y *et al.* Normative data for the Japanese version of the World Health Organization-five well-being index (WHO-5-J) among Japanese community-dwelling older adults. *Jpn J Gerontol* 2014; **36**: 330–339.
- Kurimoto A, Awata S, Ohkubo T *et al.* Reliability and validity of the Japanese version of the abbreviated Lubben social network scale. *Nihon Ronen Igakkai Zasshi* 2011; **48** (2): 149–157.
- Koyano W, Shibata H, Nakazato K, Haga H, Suyama Y. Measurement of competence: reliability and validity of the TMIG index of competence. *Arch Gerontol Geriatr* 1991; **13**: 103–116.
- Sugishita M, Hemmi I, JADNI. Validity and reliability of the mini mental state examination-Japanese (MMSE-J): a preliminary report. *Jpn J Cogn Neurosci* 2010; **12**: 186–190.
- Sepulveda-Loyola W, Rodríguez-Sánchez I, Perez-Rodríguez P *et al.* Impact of social isolation due to COVID-19 on health in older people: mental and physical effects and recommendations. *J Nutr Health Aging* 2020; **24** (9): 938–947.
- Sone T, Nakaya N, Sugawara Y, Tomata Y, Watanabe T, Tsuji I. Longitudinal association between time-varying social isolation and psychological distress after the great East Japan earthquake. *Soc Sci Med* 2016; **152**: 96–101.
- Azlan AA, Hamzah MR, Sern TJ, Ayub SH, Mohamad E. Public knowledge, attitudes and practices towards COVID-19: a cross-sectional study in Malaysia. *PLoS One* 2020; **15**: e0233668.
- Shiina A, Niitsu T, Kobori O *et al.* Relationship between perception and anxiety about COVID-19 infection and risk behaviors for spreading infection: a national survey in Japan. *Brain Behav Immun Health* 2020; **6**: 100101.
- Hisaka A, Yoshioka H, Hatakeyama H, Sato H, Onouchi Y, Anzai N. Global comparison of changes in the number of test-positive cases and deaths by coronavirus infection (COVID-19) in the world. *J Clin Med* 2020; **9**: 1904.
- Jacobs JM, Cohen A, Hammerman-Rozenberg R, Azoulay D, Maaravi Y, Stessman J. Going outdoors daily predicts long-term functional and health benefits among ambulatory older people. *J Aging Health* 2008; **20** (3): 259–272.
- Shimada H, Ishizaki T, Kato M *et al.* How often and how far do frail elderly people need to go outdoors to maintain functional capacity? *Arch Gerontol Geriatr* 2010; **50**: 140–146.

Supporting Information

Additional supporting information may be found in the online version of this article at the publisher's website:

Table S1. Comparison between non-responders and responders (the 2019 survey)

Table S2. Participant characteristics (the 2019 survey)

How to cite this article: Kera T, Kawai H, Ejiri M, et al. Change in subjective health status among frail older Japanese people owing to the coronavirus disease pandemic and characteristics of their responses. *Geriatr. Gerontol. Int.* 2021;21:1053–1059. <https://doi.org/10.1111/ggi.14276>