

## BRIEF REPORT

# Conversation time and mental health during the COVID-19 pandemic: A web-based cross-sectional survey of Japanese employees

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## Abstract

**Objective:** During the Coronavirus disease 2019 (COVID-19) pandemic, social isolation and impaired social interaction could be the factors that cause mental health problems. This study investigated the association between conversation time in daily life and mental health among Japanese employees.

**Methods:** In August 2021, a web-based cross-sectional survey was conducted with 1000 Japanese employees. Weekly conversation time was assessed in four domains (family members, friends, someone in the workplace, and others), and mental health was assessed using the Japanese version of the Kessler Psychological Distress Scale (K6 scale). Weekly total conversation time was calculated, and participants were assigned to one of the four conversation time categories based on quantile values to investigate the associations with poor mental health ( $K6 \geq 13$ ).

**Results:** The logistic regression analyses revealed that participants with short conversation times ( $<3.5$  h per week) had poorer mental health compared to those with long conversation times ( $> 21.0$  h per week), even after adjusting for confounders ( $OR = 2.48$  [95% CI 1.31–4.71]). For the exploratory analyses of conversation time for each domain, the associations of short conversation time in the workplace with poor mental health was most robust ( $OR = 2.02$  [95% CI 1.13–3.63]).

**Conclusions:** Japanese employees with conversation time of  $<3.5$  h per week (i.e., 30 min per day) had poor mental health. During the COVID-19 pandemic, people have largely limited opportunities to have conversations with others, but a certain level of conversation time might be required to maintain mental health.

## KEYWORDS

conversation, COVID-19, employees, mental health, social interaction

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## 1 | INTRODUCTION

Due to the repeated outbreak of coronavirus disease 2019 (COVID-19), fear of infection, lifestyle changes such as social distancing, and economic breakdown could increase the risk of mental health problems in a variety of populations.<sup>1</sup> In a recent meta-analytic review for community-based studies, the pooled prevalence of depression was 25% in the people during the pandemic, which was seven times higher compared to a global estimated prevalence of depression of 3.4%.<sup>2</sup>

Social isolation and impaired social interaction, associated with lockdown and social distancing for the COVID-19 pandemic, could be factors that cause mental health problems. Traditionally, daily social interactions, as studied in the research on social networks, social support, and social capital, were reportedly important for well-being and mental health.<sup>3</sup> During the pandemic, to avoid COVID-19 infection, people were likely to reduce social interactions: 30%–40% of people reported a reduction in social interactions.<sup>4,5</sup>

In this study, we investigated the association between social interaction and mental health during the COVID-19 pandemic among Japanese employees. In Japan, lockdowns for COVID-19 were not imposed, in contrast with other countries, but repeated outbreaks of COVID-19 have deeply altered working environments by establishing social distancing policies and remote working and creating job insecurity, which could largely affect the mental health of employees.<sup>6</sup> Some previous studies have investigated the association between the amount of social interaction and mental health status in employees during the pandemic.<sup>4,7</sup> However, to our knowledge, no studies have investigated social interactions assessed in a quantitative manner and their associations with mental health. This could provide a guide for future intervention studies and preventive activities. Therefore, we focused on conversation time in daily life as a quantitative index of social interaction, and investigated its association with mental health.

## 2 | MATERIAL AND METHODS

### 2.1 | Participants

A web-based cross-sectional survey was conducted in August 2021, in which more than 20 000 cases of COVID-19 were reported daily (the fifth wave of the pandemic in Japan), and the Japanese government declared a state of emergency due to COVID-19 and required residents to avoid going out. This study was conducted as a preliminary study for “Web-based longitudinal study of

work environment and daily life style”, in which a large representative sample of Japanese employees were investigated to explore the associations between work environment, daily lifestyle, and mental health. In accordance with the sampling methodology of longitudinal studies, Japanese employees who were registered with monitors of an Internet-based survey company were sampled according to the distribution ratios of all Japanese employees for business categories, age groups (20–29, 30–39, 40–49, and 50–59 years), and gender. We further set the exclusion criteria for the sample as follows: (a) agriculture, forestry, fishery, mining, and quarry workers; (b) those who were self-employed or company executives; (c) those who had more than one job; (d) those who worked <20 h per week; and (e) those who had changed their job in the previous year. Invitations to participate were sent to 31 682 registrants via e-mail; 1000 registrants who met the above criteria participated in the survey. Of the 1000 participants, 173 who were considered to have not answered the survey seriously (described below in detail), one who did not indicate gender, and two who had been infected with COVID-19 in the previous year were excluded from the statistical analyses. Therefore, we analyzed data from 824 participants. Informed consent was obtained from all participants, and the study was approved by the Research Ethics Committee of the National Institute of Occupational Safety and Health, Japan (2021N-1-4).

### 2.2 | Measurements

#### 2.2.1 | Conversation time

Time (hours, minutes) of conversation per week was asked for four domains (family members, friends, someone in the workplace, and others) by a single question: “How many hours or minutes do you have voice conversation per week with the following people?” In this question, conversation was defined as voice conversation, in which not only face-to-face conversations, but also telephone or online conversations were included.

#### 2.2.2 | Mental health

Mental health was assessed using the Japanese version of the Kessler Psychological Distress Scale (K6 scale).<sup>8</sup> It has six items that ask about frequently experienced symptoms of psychological distress (e.g., feeling so sad that nothing can cheer you up) during the past 30 days. The response options range from 0 (none of the time) to 4 (all of the time). In this study, Cronbach's alpha coefficient for the scale was 0.94. Poor mental health was considered present

when participants had K6 scores of 13 or more, indicating severe mental illness.

### 2.2.3 | Perceived stress at the workplace

Perceived stress in the workplace was assessed by a single question: “Have you experienced something that caused you anxiety, worry, or distressed in your current work or occupational life?” This question was derived from the Special Survey on Industrial Safety and Health.<sup>9</sup> In this study, the response options included 1 (no), 2 (somewhat no), 3 (somewhat yes), and 4 (yes).

### 2.2.4 | Instructional manipulation check item

In this question, five decision branches (from “agree” to “disagree”) were presented, but in the instruction of the question participants were asked not to select any branches, to detect participants who did not answer to the survey seriously. Previously, excluding the respondents by this criterion improved the response quality (e.g. fewer “don't know” options, fewer straight line responses) of the web survey, and the proportion of excluded participants in this item of the study (17.3%) was almost the same as the proportion reported in the previous study (18.0%).<sup>10</sup>

### 2.2.5 | The other demographic and psychosocial factors

Participants' demographic and psychosocial details including age, gender, academic history, marital status, living arrangement, annual household income, business category, occupation, frequency of remote working from home, and weekly working hours were asked.

## 2.3 | Statistical analysis

To investigate the association between conversation time and mental health status, weekly total conversation time was calculated by summing up conversation time with family members, friends, someone in the workplace, and others, and participants were assigned to one of the four total conversation time categories based on quantile values (<3.5 h, 3.5–10.0 h, 10.0–21.0 h, and >21.0 h), because conversation time was not normally distributed. Chi-squared tests, one-way analysis of variance, and Kruskal-Wallis tests were conducted to compare demographic and psychosocial status, as well as mental health status

among the four groups. In these analyses, education was dichotomized into senior high school or less (i.e., 12 years or less) and college or higher (i.e., more than 12 years). Annual household income was grouped as <4 million, 4–8 million, and ≥8 million yen. The Business category was dichotomized into secondary and tertiary industries, occupation was dichotomized into managerial and non-managerial workers, and remote working was dichotomized into ≥5 days per week (full-remote) and “4 days per week. Overtime work was defined as weekly working hour ≥60 h.

Multivariate logistic regression analyses were also performed to estimate the odds ratios (ORs) of the conversation time (<3.5 h, 3.5–10.0 h, 10.0–21.0 h, and >21.0 h) for poor mental health (K6 ≥ 13), in which poor mental health and no poor mental health were coded as “1” and “0,” respectively. The first three quantile groups were compared with the fourth quantile group (longest conversation time group). We estimated crude ORs, as well as ORs adjusted for basic demographic factors (gender, age, education, marital status, and living arrangement; Model 2) and psychosocial factors (annual household income, perceived stress at workplace, business category, occupation, remote working from home, overtime work; Model 3).

For exploratory analyses, we conducted a series of multivariate logistic regression analyses to estimate the odds ratios of conversation time in the family and workplace for poor mental health. For conversation time for friends or the other domains, it was difficult to categorize into four groups because most participants reported a 0-minute conversation with friends (56.4%) and the other (65.4%) domains. Therefore, participants were assigned to one of the two conversation time categories (0.0 h and >0.0 h), and odds ratios of the conversation time categories were calculated. All statistical analyses were performed using SPSS version 27 (IBM, Chicago, IL, USA), and  $p < .05$  was considered statistically significant.

## 3 | RESULTS

Participants' characteristics are presented in Table 1. In the first quartile group (<3.5 h total conversation time), participants who were unmarried ( $\chi^2(3) = 37.3, p < 0.001$ ) or lived alone ( $\chi^2(3) = 35.0, p < 0.001$ ) were more prevalent than in the other groups. Participants in the first quartile group also had lower income ( $\chi^2(6) = 32.0, p < 0.001$ ) and exhibited higher K6 scores ( $F(3/823) = 34.4, p < 0.001$ ;  $\chi^2(3) = 15.4, p = 0.001$ ).

In multivariate logistic regression analyses (Table 2), participants with short conversation time (<3.5 h) had poor mental health compared to those with a long conversation time (>21.0 h) in the crude model (OR = 2.44

TABLE 1 Participant characteristics

	Total	Weekly conversation-time categories				<i>p</i> <sup>a</sup>
		<3.5 h	3.5–10.0 h	10.0–21.0 h	>21.0 h	
<i>N</i>	824	201	208	210	205	
Age, mean (SD)	41.7 (10.4)	41.0 (10.3)	41.8 (10.9)	42.2 (10.1)	41.7 (10.2)	0.713
Gender (female), <i>n</i> (%)	382 (46.4)	92 (45.8)	93 (44.7)	94 (44.8)	103 (50.2)	0.634
Education (>12 years), <i>n</i> (%)	629 (76.3)	142 (70.6)	157 (75.5)	167 (79.5)	163 (79.5)	0.111
Marital status (married), <i>n</i> (%)	354 (43.0)	50 (24.9)	94 (45.2)	108 (51.4)	102 (49.8)	<0.001
Living arrangement (living alone), <i>n</i> (%)	241 (29.2)	89 (44.3)	63 (30.3)	49 (23.3)	40 (19.5)	<0.001
Conversation time (h/week), median (IQR)						
Total	10.0 (3.5–21.0)	1.9 (1.0–2.5)	6.0 (4.5–8.0)	15.0 (12.0–17.5)	39.0 (27.8–51.8)	<0.001
Family members	3.0 (0.7–10.0)	0.5 (0.0–1.0)	2.0 (1.0–3.0)	6.5 (3.0–10.0)	20.0 (8.0–23.3)	<0.001
Friends	0.0 (0.0–1.0)	0.0 (0.0–0.1)	0.0 (0.0–1.0)	0.4 (0.0–1.1)	0.2 (0.0–3.0)	<0.001
Someone in the workplace	4.0 (1.0–10.0)	1.0 (0.3–1.0)	2.3 (1.0–5.0)	6.0 (4.4–10.0)	20.0 (10.0–30.0)	<0.001
Others	0.0 (0.0–1.0)	0.0 (0.0–0.0)	0.0 (0.0–0.5)	0.0 (0.0–1.0)	0.0 (0.0–1.0)	<0.001
Annual household income						
<4 million yen	229 (27.8)	79 (39.3)	49 (23.6)	44 (21.0)	57 (27.8)	<0.001
4–8 million yen	368 (44.7)	88 (43.8)	104 (50.0)	99 (47.1)	77 (37.6)	
≥8 million yen	227 (27.5)	34 (16.9)	55 (26.4)	67 (31.9)	71 (34.6)	
K6 score, mean (SD)	5.3 (5.9)	6.7 (7.0)	5.1 (5.9)	4.9 (5.3)	4.4 (5.1)	<0.001
K6 (≥13), <i>n</i> (%)	107 (13.0)	42 (20.9)	25 (12.0)	20 (9.5)	20 (9.8)	0.001
Perceived stress at the workplace, mean (SD)	2.94 (0.91)	2.96 (0.86)	3.00 (0.94)	2.92 (0.92)	2.90 (0.91)	0.670
Business category (secondary industry), <i>n</i> (%)	204 (24.8)	57 (28.4)	54 (26.0)	50 (23.8)	43 (21.0)	0.357
Occupation (managerial workers), <i>n</i> (%)	90 (10.9)	14 (7.0)	19 (9.1)	29 (13.8)	28 (13.7)	0.063
Remote working from home (≥5 day per week), <i>n</i> (%)	53 (6.4)	18 (9.0)	9 (4.3)	13 (6.2)	13 (6.3)	0.298
Overtime work (working hour ≥60 h per week), <i>n</i> (%)	27 (3.3)	4 (2.0)	9 (4.3)	10 (4.8)	4 (2.0)	0.224

Note: Abbreviations: IQR, interquartile range; SD, standard deviation.

<sup>a</sup>The  $\chi^2$  test, one-way ANOVAs, or Kruskal-Wallis test were conducted to compare the frequency or scores for the four groups.

[95% CI, 1.38–4.33]) as well as confounder-adjusted models (model 2, OR = 2.36 [95% CI, 1.30–4.29]; model 3, OR = 2.48 [95% CI, 1.31–4.71]). Zero-order correlations between the demographic and psychosocial variables are also shown in Appendix Table 1.

In multivariate logistic regression analyses for conversation time with family members (Appendix Table S2), participants with short conversation time (<0.7 h) had poorer mental health compared to those with long conversation time (≥10.0 h) in the crude model (OR = 2.20 [95% CI, 1.25–3.89]) but the associations were attenuated when adjusted for demographic and psychosocial factors (model 2, OR = 2.02 [95% CI, 0.99–4.11]; model 3, OR = 1.86 [95% CI, 0.87–4.00]). In the analyses for conversation time in the workplace (Appendix Table S3), participants with short conversation time (<1.0 h) had

poor mental health compared to those with a long conversation time (≥10.0 h) in the crude model (OR = 1.84 [95% CI, 1.08–3.12]) as well as confounder-adjusted models (model 2, OR = 1.90 [95% CI, 1.10–3.27]; model 3, OR = 2.02 [95% CI, 1.13–3.63]). In the analyses of conversation time for friends and other domains, the associations with poor mental health were not significant (Appendix Tables S4 and S5).

## 4 | DISCUSSION

This study investigated the association between conversation time in daily life as a quantitative index of social interaction and mental health among Japanese employees during the COVID-19 pandemic. In the logistic regression

**TABLE 2** Risk of poor mental health (K6  $\geq$  13) and weekly conversation time<sup>a</sup>

	Model 1 <sup>b</sup>	Model 2 <sup>c</sup>	Model 3 <sup>d</sup>
Total time of conversation			
<3.5 h	<b>2.44 (1.38–4.33)</b>	<b>2.36 (1.30–4.29)</b>	<b>2.48 (1.31–4.71)</b>
3.5–10.0 h	1.26 (0.68–2.35)	1.28 (0.67–2.42)	1.21 (0.62–2.39)
10.0–21.0 h	0.97 (0.51–1.87)	1.02 (0.52–1.97)	0.98 (0.49–1.97)
>21.0 h	(Ref)	(Ref)	(Ref)
Gender (female vs. male)		<b>1.54 (1.01–2.36)</b>	1.44 (0.89–2.32)
Age		<b>0.96 (0.94–0.98)</b>	<b>0.96 (0.94–0.98)</b>
Education (>12 vs. $\leq$ 12 years)		1.22 (0.73–2.04)	1.50 (0.86–2.62)
Marital status (married vs. unmarried)		0.59 (0.34–1.04)	0.61 (0.34–1.11)
Living arrangement (living alone vs. living with others)		0.88 (0.54–1.44)	0.78 (0.45–1.35)
Annual household income			
<4 million yen			1.95 (0.95–4.01)
4–8 million yen			1.41 (0.73–2.71)
$\geq$ 8 million yen			(Ref)
Perceived stress at the workplace			<b>3.73 (2.62–5.32)</b>
Business category (secondary vs. tertiary industry)			1.14 (0.66–1.99)
Occupation (managerial workers vs. others)			1.23 (0.46–3.29)
Remote working from home ( $\geq$ 5 day vs. $\approx$ 4 days per week)			0.71 (0.26–1.99)
Overtime work (working hour $\geq$ 60 h vs. <60 h per week)			1.25 (0.34–4.60)

<sup>a</sup>Logistic regression analyses were conducted to estimate the crude and adjusted odds ratios (ORs) and 95% confidence intervals (CIs) of poor mental health. 95% confidence intervals (CIs) are given in parentheses. Significant ORs ( $p < .05$ ) are indicated in bold.

<sup>b</sup>Crude model.

<sup>c</sup>Demographic factor-adjusted model.

<sup>d</sup>Demographic factor- and psychosocial factor-adjusted models.

analyses, we demonstrated that employees with short conversation times had poor mental health even after adjusting for demographic and psychosocial factors. To our knowledge, this is the first study demonstrating that <3.5 h per week (i.e., 30 min per day) of conversation time was associated with poor mental health during the pandemic. This result was consistent with previous findings on the association between perceived social isolation and impaired social interaction during the pandemic, evaluated in a subjective manner, with well-being and mental distress among employees.<sup>4,7</sup> In addition, a previous study conducted during the pre-pandemic period reported that more time talking to others was related to higher

well-being.<sup>11</sup> Furthermore, contact with family or friends could be one of the self-management strategies for anxiety and stress.<sup>12</sup> Taken together, a certain level of conversation time in any situation might be required to maintain mental health during the pandemic.

Some possible mechanisms could explain the relationship between conversation time and mental health. Social interaction, including daily conversation, could be beneficial to the reduction of stress through refreshing or distracting negative moods; traditionally, talking to others about one's stressful situation or negative mood could be one of the coping strategies for stress.<sup>13</sup> From a biological perspective, conversation has the power to change the

brain by boosting the production of hormones and neurotransmitters. For example, oxytocin, a nonapeptide that serves as a neuromodulator in the human central nervous system, is closely associated with various human social behaviors such as social bonding, trusting, and cooperation.<sup>14</sup> Oxytocin also has stress-buffering effects and could be a mediator linking social isolation and poor mental health during the pandemic.<sup>15</sup>

For the exploratory analyses for each domain, the association between short conversation time in families and mental health was attenuated after adjusting for demographic factors. Conversation time in the family could be largely altered by marital status and living arrangements, which could be a reason for the lack of robust results. The association between short conversation time in the workplace and mental health was robust after adjusting for demographic and psychosocial factors. Considering that most participants reported no conversation time with friends or other people, the workplace could be a major resource for social interactions during the pandemic. Therefore, careful attention should be paid to the mental health of workers with short conversation times in the workplace (e.g., office workers working remotely from home), especially for those living alone. These analyses were conducted for exploratory reasons, and further studies are needed to establish the associations between conversation time for each domain and mental health.

This study has certain limitations that may have affected the interpretation of the findings. First, we employed a cross-sectional design, and we could not determine the causal relationship between short conversation times and poor mental health. We could not exclude the possibility that depressed individuals were less eager to talk. Second, participants were recruited from the registrants of the research company. Although the participants were selected according to the distribution ratios of all Japanese employees for business categories, age groups, and gender, there may have been selection bias. Third, conversation time was reported by participants but not explored using objective methods, as in a previous study using electronically activated recorders.<sup>11</sup> Further studies are required to employ objective methods for the assessment of conversation time. Furthermore, we investigated conversation time, but not social interactions, using text messages in the social networking service because we considered that quantification of text message use could be difficult for participants to estimate. Fourth, we did not assess the conversation quality. For example, we could not distinguish between the conversation times of receiving complaints from customers on job duties and chatting with intimate coworkers. This study focused on conversation time as a quantitative index of social interaction.

Future studies are needed to investigate the quality of conversation and mental health.

## 5 | CONCLUSIONS

We demonstrated that Japanese employees with a voice conversation time of less than 3.5 h per week (i.e., 30 min per day) had poor mental health during the COVID-19 pandemic. During the pandemic, people have limited opportunities to have conversations with others (e.g., remote working from home), but a certain level of conversation time may be required to maintain mental health.

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## DISCLOSURE

Approval for the research protocol: This study was approved by the Research Ethics Committee of the National Institute of Occupational Safety and Health, Japan (2021N-1-4). Informed consent: Web-based informed consent was obtained from all participants. Registry and Registration No. of study/trial: N/A. Animal studies: N/A. Conflict of interest: All authors report no financial or other relationships that represent actual or potential conflicts of interest relevant to the content of this paper.

## AUTHOR CONTRIBUTIONS

All the authors contributed to the study design. SI analyzed the data and prepared the first version of the manuscript. All authors critically revised the manuscript and approved the final version of the manuscript.

## DATA AVAILABILITY STATEMENT

The data are available upon reasonable request from the corresponding author.

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## SUPPORTING INFORMATION

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

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