

Age-Specific Differences in Association Between Personality and Changes in Outing Behaviors During the COVID-19 Pandemic in Japan: Cross-Sectional Web-Based Questionnaire Survey

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Age-Specific Differences in Association Between Personality and Changes in Outing Behaviors During the COVID-19 Pandemic in Japan: Cross-Sectional Web-Based Questionnaire Survey

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Abstract

Background: Restrictions on outings in response to the COVID-19 pandemic had various effects on health-related issues, such as delays in disease detection and declines in health conditions for older adults. Therefore, it is important to engage in appropriate outing behavior during pandemics. Associations between COVID-19 prevention behavior and personality traits are reported. However, an association between types of outing behavior and individuals' personality traits remains unclear.

Objective: This study aimed to clarify the association between personality traits and changes in different types of outing behaviors during the COVID-19 pandemic.

Methods: This cross-sectional survey was conducted in January 2021 during the COVID-19 pandemic using a web-based questionnaire in Japan. A total of 1,236 participants were recruited, with an equal number of participants for each gender and 10-year age group. The questionnaire asked about changes in the frequency of three types of outings— medical institution visits, eating out, and traveling—and participants' personality traits such as sociability and morality. Logistic regression analysis was performed to analyze the association between personality traits and changes in different outing behaviors.

Results: Seven hundred and ninety participants reported an unchanged frequency of medical institution visits and decreased frequencies of eating out and traveling during the pandemic. Logistic regression analysis showed that sociable people were more likely to reduce the frequency of medical institution visits compared to non-sociable people (OR 1.57, 95%CI 1.19-2.08, $P < .001$), and strongly responsible people and moral people were more likely to reduce the frequency of traveling compared to those without each personality trait (OR 1.73, 95%CI 1.18-2.54, $P = .005$, and OR 1.48, 95%CI 1.01-2.17, $P = .044$, respectively).

Conclusions: This study highlights different tendencies in behavioral changes among types of outings and their associations with personality traits during the COVID-19 pandemic. The findings may be beneficial to promote appropriate behaviors among people in emergency communication within public health settings.

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Original Manuscript

Age-Specific Differences in Association Between Personality and Changes in Outing Behaviors During the COVID-19 Pandemic in Japan: Cross-Sectional Web-Based Questionnaire Survey

Abstract

Background: The outbreak of COVID-19 in 2019 led governments worldwide to introduce various public health measures, which included restrictions on travel and public gatherings, effectively reducing the spread of the virus and associated mortality rates. In Japan, non-legally binding restrictions on outings effectively curbed infections as in other countries. However, the restrictions impacted lifestyles, including with regard to reduced physical activity, increased frailty, and overeating issues, beyond the effect of preventing the spread of infection. Outing behavior during the pandemic was influenced by various factors such as personality, age, and cultural norms and differed by activity type.

Objective: To elucidate the association between personality traits and changes in outing behaviors during the COVID-19 pandemic, as well as to clarify age-specific differences in outing behaviors, focusing on different types of outings.

Methods: A cross-sectional survey was conducted using a web-based questionnaire in January 2021, when Japan announced its second emergency declaration during the pandemic. Overall, 1,236 participants were recruited, with an equal number of participants for each gender and 10-year age group. The survey included questions regarding changes in the frequency of three types of outings—medical institution visits, eating out, and traveling—in addition to participants' personality traits such as sociability and morality. Multinomial logistic regression analysis was performed to analyze the association between personality traits and changes in different outing behaviors. Stratified analysis by age group was also performed.

Results: The findings revealed that 790 participants reported no change in medical institution visits, although the frequency of eating out and traveling decreased during the pandemic. Regarding an age-wise comparison, a higher percentage of older people reported no change in medical institution visits but a decrease in eating out and traveling than did younger people. Multinomial logistic regression analysis stratified by age showed that sociable people were more likely to report a decrease in the frequency of medical institution visits and an increase in the frequency of eating out (odds ratio [OR]: 1.92; 95% confidence interval [CI]: 1.36–2.71, $P < .001$, OR: 2.57; 95% CI: 1.19–5.54, $P = .016$, respectively), and participants with a strong sense of responsibility were more likely to report a decrease in the frequency of traveling (OR: 1.76; 95% CI: 1.14–2.72, $P = .011$) among younger adults. Among older adults, strongly responsible individuals were less likely to eat out frequently (OR: 2.56; 95% CI: 1.12–5.82, $P = .026$).

Conclusions: We examined various behavioral changes observed during the pandemic for different types of outings and their associations with personality traits, as well as differences between age groups. The findings could help promote an understanding of how to effectively communicate and engage in appropriate behaviors in public health emergency settings.

Keywords: lockdown; personality; outing behaviors; internet survey; public health; Japan

Introduction

Various social measures were implemented to curb the global spread of COVID-19, including maintaining physical distance, hand hygiene, wearing of masks, and restrictions on domestic and international travel, and evidence of their effectiveness has been documented [1–3]. For example, Lau et al. reported that the doubling time of infections increased from two to four days after a lockdown was imposed in Wuhan, China [4]. Fowler et al. reported that in the United States, a stay-at-home order was associated with a more than 30% reduction in weekly COVID-19 cases after one week, and an approximately 60% reduction in weekly fatalities after three weeks in localities that implemented the measure [5].

Although travel and public gathering restrictions effectively controlled the spread of infection, they led to some unintended effects on the lifestyles of adults, especially older adults, leading to health impairments [6–10]. For instance, Shinohara conducted a prospective six-month cohort study immediately after the first travel and public gathering restrictions in Japan, reporting an increase in frailty among older people [6]. Esquinas reported a decrease in physical activity and an increase in sedentary lifestyle for community-dwelling older people several weeks after a lockdown was implemented in Spain [7]. In a survey conducted after the implementation of restrictions accompanying the pandemic in Slovakia, Lorkova et al. reported changes in eating habits, demonstrating that more than 30% of Slovak adults, both men and women, indulged in overeating, and more than half reported weight gain [8]. Tavoracci et al. reported that the proportion of students engaging in physical activities decreased, and the risk of depression increased for men among students of a French university [9]. Moreover, unemployment and reduced income during the lockdown affected the economic and psychological well-being of young adults in six countries across different regions [10].

Restrictions on outings also impacted disease prevention efforts, with the number of people receiving medical screenings decreasing during the pandemic [11–13]. Bakouny et al. conducted a hospital survey in Massachusetts during the pandemic and found that the number of patients receiving cancer screening and diagnosis had decreased in the previous three months compared with the three months before the pandemic [11]. A trend analysis in Spain also revealed a decline in the number of cancer diagnoses during and after the lockdown among youth, adults, and older adults at primary care clinics [12]. Furthermore, a study in Japan found a decrease in the number of patients receiving cancer screening under the restrictions and its association with anxiety triggered by COVID-19 [13]. Such trends are concerning because delays in disease detection and treatment could lead to increased mortality rates in the long term [14].

Restrictions on outings in Japan were aimed at preventing the spread of infection by reducing person-to-person contact and, consequently, large-scale cluster infections at specific locations or events with large groups of people which would have further disrupted the medical system [15,16]. The restrictions were not legally binding but rather represented a declaration of emergency urging citizens to change their outing behaviors to prevent the spread of infections. This was implemented multiple times (one-time duration was from one to three weeks) between 2020 and 2021 in all prefectures across the country, which effectively helped curtail infections [17]. Although the declaration was not legally binding, Japanese people strictly adhered to the restrictions on going out, and the streets were largely deserted.

Given the wide impact of behavioral restrictions beyond preventing the spread of infection,

their appropriate implementation is important. For implementation to be adequate, it must be recognized that people's preventive behavior is influenced by factors such as their health and information literacy, gender, age, and personality traits [18-30].

Personality traits have been reported to be associated with various types of behaviors related to the pandemic [25-28,30]. Previous studies have highlighted the association between personality traits, such as morality, conscientiousness, and neuroticism, and COVID-19 prevention behavior, such as maintaining hygiene and social distance [25-27]. There have also been reports on the association of outing behaviors with personality traits such as modesty, honesty, sociability, and extraversion [23,28,29]. Additionally, studies have highlighted the relationship between preventive behavior and age [20-22,30]. Older adults positively adopted preventive measures and had higher health-related literacy [20,21]. Furthermore, among older people, unlike younger people, perceptions of the seriousness of the situation were associated with preventive behavior [22].

Preventive behavior is also influenced by culture; as Abuliezi et al. reported, Japanese medical students performed significantly better during prevention measures than their American counterparts [31]. Previous studies have reported that the Japanese are sensitive to social pressure, have a strong tendency to avoid negative evaluations from others, and adhere to infection-prevention protocols, driven by social norms and cultural background [32-35].

Furthermore, regarding outing behaviors during the pandemic, different behavioral changes were reported depending on the type of outing. For instance, eating out and leisure activities decreased, whereas visits to neighborhood parks increased [23,24,36,37]. These findings indicate that the impact of the pandemic on outings may have varied depending on the type of activity.

Preventive behavior, including restrictions on outings, is influenced by various factors such as personality, age, and culture, with behavior also differing depending on the type of outing; however, no findings considering them collectively have been reported. Therefore, we aimed to clarify the association between personality traits and changes in outing behaviors during the COVID-19 pandemic, as well as determine age-specific differences, focusing on three types of outings: medical institution visits, eating out, and traveling. The findings could serve as useful tools when considering effective implementation that takes into account population characteristics for preparedness for emergencies such as infectious disease epidemics.

Methods

Study Design, Setting, and Participants

A cross-sectional analysis was conducted using a web-based questionnaire survey on January 27–29, 2021, when the COVID-19 pandemic was ongoing in Japan. The central government had declared a state of emergency during the survey period in 11 of the 47 prefectures (Tochigi, Saitama, Chiba, Tokyo, Kanagawa, Gifu, Aichi, Kyoto, Osaka, Hyogo, and Fukuoka) according to the number of infections, situation of the medical system, and the level of development of monitoring systems [15-17]. It was the second declaration, eight months after the first emergency declaration in Japan [15-17].

An online research company, Macromill, Inc. Japan, was engaged to recruit participants and

collect responses; the company's registered monitors include over 30 million individuals living in Japan. The survey included 1,236 participants aged between 20 and 79 years from across Japan. The company was responsible for recruiting participants and collecting responses. The participants were randomly selected and an email was sent inviting them to take the survey. An equal number of participants from both genders and 10-year age groups were recruited, with registrations closing once the targeted sample size was achieved. The participants completed the questionnaires through email and received a small reward, as determined by the company.

Data Collection

Cross-sectional data from the web-based questionnaire included information on participants' backgrounds, health-related items, changes in outing behaviors due to the pandemic, and personality traits (Table 1). **Economic status has been reported to influence outing behavior during the pandemic [38], and the analysis included participants' income as an adjustment variable.** Changes in the frequency of three types of outings were included: medical institution visits, eating out, and traveling. Scoring was performed on a five-point Likert scale (1=Increased, 2=Somewhat increased, 3=No change, 4=Somewhat decreased, 5=Decreased).

The survey referred to the Japanese version of the Personality Inventory, which is based on the "Big Five" model, to assess personality traits [39]. Japanese personality traits "sense of morality," "diligence," and "strong sense of responsibility" were also included because these could influence preventive behaviors toward COVID-19 [26,40]. To minimize the burden on participants, the items were grouped into six categories: "diligent," "sociable," "cooperative," "honest," "strong sense of responsibility," and "strong sense of morality." Regarding the response, the original seven-point Likert scale was modified to a six-point scale for aggregation and analysis purposes [15,41]. The participants were asked to indicate their agreement levels for each personality trait using the scale (1=Strongly disagree, 2=Disagree, 3=Somewhat disagree, 4=Somewhat agree, 5=Agree, 6=Strongly agree).

Table 1. Items included in the questionnaire

Question	Response
What is the number of people, including yourself, living in your house?	
	1: 1 2: 2 3: 3 4: 4 5: 5 6: 6 or more
Please indicate the family members living with you. (Multiple answers allowed.)	
	1: Infant(s)/toddler(s) (not attending nursery/kindergarten) 2: Infant(s)/toddler(s) (attending nursery/kindergarten) 3: Student(s) (elementary school–junior high school)

	4: Student(s) (senior high school–college, including vocational school) (attending school in the same prefecture) 5: Student(s) (senior high school–college, including vocational school) (attending school in another prefecture) 6: Adult(s) 7: Older adult(s) (youngest-old: aged 65–74) 8: Older adult (s) (middle-old: above 75) 9: Other (please specify)
Please tell us about your chronic disease(s). (Choose from options 1–6 above for all except “Other”.)	
☐ Hypertension	1: Undergoing treatment (oral medication)
☐ Diabetes mellitus	2: Follow-up (regular hospital visits only)
☐ Heart disease	3: Follow-up (without hospital visits)
☐ Cerebrovascular disease	4: Untreated
☐ Malignant tumor (cancer, leukemia, etc.)	5: Treated
☐ Respiratory disease (asthma, emphysema, etc.)	6: Not applicable
☐ Dyslipidemia (hyperlipidemia)	
☐ Liver disease	
☐ Dementia	
☐ Mental illness (depression, etc.)	
☐ Other (please specify)	
Please tell us about your current condition.	
	1: I am physically healthy 2: I am mentally healthy 3: I am financially stable
Please tell us about yourself.	
I am diligent	1: Strongly disagree
I am sociable	2: Disagree
I have a strong sense of responsibility	3: Somewhat disagree
I have a strong sense of morality	4: Somewhat agree
I am cooperative	5: Agree
I am honest	6: Strongly agree

Please tell us about the changes you experienced in the following compared with last year.	
☐ Medical institution visit frequency	1: Increased 2: Somewhat increased 3: No change 4: Somewhat decreased 5: Decreased
☐ Eating out frequency	
☐ Traveling frequency	
Age, gender, marital status, employment status, yearly household income, and prefectures were pre-recorded during the members' registration to the survey panel.	

Data Analysis

A multinomial logistic regression was performed to analyze the association between personality traits and changes in outing behaviors. After verifying multicollinearity, all independent variables representing personality traits were simultaneously inputted. Additionally, a stratified analysis was performed by age group. We classified participants into two groups, younger and older adults. Considering the number of participants in each age group, the older group included individuals aged 60 and above.

Regarding the variables, the scoring for each outing was classified into three groups—increase (1=Increased and 2=Somewhat increased), no change (3=No change), and decrease (4=Somewhat decreased and 5=Decreased)—which were used as dependent variables, and “no change” was used as the baseline category for multinomial logistic regression. The responses for personality traits were categorized into two groups—applicable (4=Somewhat agree, 5=Agree, and 6=Strongly agree) or not applicable (1=Strongly disagree, 2=Disagree, and 3=Somewhat disagree)—which were considered as independent variables. The following variables were included as covariates: gender, age, marital status, living alone, living with children (aged below 15), living with older adults (aged over 65), low household income (less than JPY 4 million annually), self-reported disease, self-reported health, employment status, and emergency declaration status.

For all statistical analyses, we employed STATA 17/SE (StataCorp., College Station, TX, USA) with a statistical significance of $P < .05$.

Ethical Considerations

This study was approved by the Ethics Committee of the National Institute of Public Health, Japan (NIPH-IBRA#12302, approval date: November 17, 2020), in accordance with the Declaration of Helsinki. All participants provided informed consent for data collection and storage. Written informed consent for study participation was obtained upon registration. The web-based questionnaire survey was conducted by an authorized survey company in adherence with personal information protection regulations. Anonymized data were obtained from the company after survey completion.

Results

Table 2 presents the participants' background characteristics and changes in outing behavior before and during COVID-19. The mean age of the 1,236 participants was 49.4 ± 16.5 years; 618 were men. In terms of personality traits, over 75% of the participants exhibited attributes such as being "honest" ($n=1,028$, 83.2%), having a "strong sense of responsibility" ($n=957$, 77.4%), and having a "strong sense of morality" ($n=965$, 78.1%).

Regarding changes in outing behavior, participants' responses indicated that the frequency of medical institution visits remained unchanged ($n=790$, 63.9%). However, the majority of the participants reported a decrease in the frequency of eating out ($n=873$, 70.6%) and traveling ($n=935$, 75.6%).

Comparing younger and older age groups, a higher proportion of older individuals reported no change in medical institution visits and a higher proportion of younger individuals reported increased or decreased medical institution visits than older adult group. Regarding eating out and traveling, a lower proportion of younger individuals reported a decrease in eating out and traveling, and a higher percentage reported an increase in eating out and traveling, compared with the older group.

Table 2. Characteristics of participants and changes in outing behaviors

Characteristics	Participants n=1,326	Younger adults n=824	Older adults (over 60) n=412
Sociodemographic factors			
Age (years), mean (standard deviation)	49.4 (16.5)	39.9 (11.1)	68.3 (5.2)
Gender (men), n (%)	618 (46.6)	412 (50.0)	206 (50.0)
Annual household income (<JPY 4 million), n (%)	364 (29.5)	198 (24.0)	166 (40.3)
(unknown), n(%)	275 (22.3)	217 (26.3)	58 (14.1)
Employment (current), n (%)	749 (60.6)	602 (73.1)	147 (35.7)
Marital status (married), n (%)	446 (36.1)	367 (44.5)	79 (19.2)
Living alone, n (%)	207 (16.8)	149 (18.1)	58 (14.1)
Living with children aged 15 and below, n (%)	267 (21.6)	256 (31.1)	11 (2.7)
Living with older adults aged 65 and over, n (%)	392 (31.7)	148 (18.0)	244 (59.2)
Self-reported disease (more than one disease in treatment), n (%)	542 (43.9)	268 (32.5)	274 (66.5)
Self-reported health (good), n (%)	928 (75.1)	606 (73.5)	322 (78.2)
Emergency declaration* when conducting the survey (in progress), n (%)	783 (63.4)	506 (61.4)	277 (67.2)

Personality traits				
	Diligent (applicable), n (%)	709 (57.4)	412 (50.0)	297 (72.1)
	Sociable (applicable), n (%)	554 (44.8)	357 (43.3)	197 (47.8)
	Having a strong sense of responsibility (applicable), n (%)	957 (77.4)	594 (72.1)	363 (88.1)
	Having a strong sense of morality (applicable), n (%)	965 (78.1)	596 (72.3)	369 (89.6)
	Cooperative (applicable), n (%)	887 (71.8)	547 (66.4)	340 (82.5)
	Honest (applicable), n (%)	1,028 (83.2)	644 (78.2)	384 (93.2)
Frequency of outing behaviors				
Medical institution visits, n (%)				
	Increased	88 (7.1)	68 (8.3)	20 (4.9)
	Remained unchanged	790 (63.9)	496 (60.2)	294 (71.4)
	Decreased	358 (29.0)	260 (31.6)	98 (23.8)
Eating out, n (%)				
	Increased	52 (4.2)	45 (5.5)	7 (1.7)
	Remained unchanged	311 (25.2)	217 (26.3)	94 (22.8)
	Decreased	873 (70.6)	562 (68.2)	311 (75.5)
Traveling, n (%)				
	Increased	28 (2.3)	25 (3.0)	3 (0.7)
	Remained unchanged	273 (22.1)	201 (24.4)	72 (17.5)
	Decreased	935 (75.7)	598 (72.6)	337 (81.8)

Following the outbreak of COVID-19, a state of emergency was declared in Japan during the survey period in 11 of the 46 prefectures: Tochigi, Saitama, Chiba, Tokyo, Kanagawa, Gifu, Aichi, Kyoto, Osaka, Hyogo, and Fukuoka.

Tables 3 and 4 present the odds ratios (OR) and 95% confidence intervals (CI) determined through multinomial logistic regression analysis and the stratified analysis for younger and older adults. The analysis examined the association between six personality traits and changes in the frequency of outing behaviors such as increase, no change, and decrease in three different types of outings, and those for younger and older age groups. Participants with each of these traits were compared with those without these personality traits.

In terms of the association between personality traits and outing behaviors, sociable individuals were more likely to report a decrease in the frequency of medical institution visits compared with individuals who were not sociable, for all participants and younger adults (OR: 1.55; 95% CI: 1.17–2.06, $P=.002$, and OR: 1.92; 95% CI: 1.36–2.71, $P<.001$, respectively). Regarding eating out, sociable individuals were more likely to report an increase among all participants and younger adults (OR: 2.04; 95% CI: 1.02–4.08, $P=.045$, and OR: 2.57; 95% CI: 1.19–5.54, $P=.016$, respectively), whereas participants with strong responsibility were more likely to report a decrease among the older adults group (OR: 2.56; 95% CI: 1.12–5.82, $P=.026$). Regarding traveling, participants with strong responsibility were more likely to report a decrease among all participants and younger adults (OR: 1.81; 95% CI: 1.22–2.68, $P=.003$, and

OR: 1.76; 95% CI: 1.14–2.72, $P=0.001$, respectively).

Values regarding the association between morality and eating out for older adults were not calculated, as the imbalance of the data with an extremely low sample size in a particular category resulted in inappropriate coefficients. The result of the association between personality traits and traveling for the older adult group was not calculated because some categories had extremely low sample sizes, which led to data imbalance, and the model did not converge appropriately.

Table 3. Association between personality traits and changes in outing behaviors (among all participants)

		Participant (n=1,326)				
		OR	95% CI		p-value	
Medical institution visits						
Diligent						
	increase	0.71	0.41	1.23	0.223	
	decrease	0.93	0.69	1.25	0.623	
Sociable						
	increase	0.86	0.51	1.46	0.582	
	decrease	1.55	1.17	2.06	0.002	**
Responsibility						
	increase	1.56	0.86	2.83	0.144	
	decrease	1.17	0.77	1.77	0.473	
Morality						
	increase	0.98	0.54	1.78	0.960	
	decrease	1.39	0.93	2.08	0.112	
Cooperative						
	increase	1.34	0.73	2.49	0.346	
	decrease	0.91	0.65	1.26	0.561	
Honest						
	increase	0.60	0.33	1.10	0.098	
	decrease	1.08	0.71	1.64	0.714	
Eating out						
Diligent						
	increase	1.13	0.51	2.52	0.763	
	decrease	1.05	0.77	1.42	0.774	
Sociable						
	increase	2.04	1.02	4.08	0.045	*
	decrease	1.09	0.81	1.47	0.570	

Responsibility						
	increase	1.25	0.50	3.11	0.630	
	decrease	1.33	0.90	1.94	0.149	
Morality						
	increase	0.71	0.34	1.49	0.367	
	decrease	0.98	0.66	1.45	0.922	
Cooperative						
	increase	1.07	0.52	2.21	0.857	
	decrease	1.09	0.78	1.53	0.600	
Honest						
	increase	0.94	0.41	2.14	0.881	
	decrease	1.33	0.91	1.97	0.144	
Traveling						
Diligent						
	increase	1.83	0.65	5.15	0.249	
	decrease	1.01	0.73	1.40	0.936	
Sociable						
	increase	1.39	0.50	3.84	0.523	
	decrease	1.31	0.96	1.80	0.092	
Responsibility						
	increase	1.46	0.54	3.97	0.456	
	decrease	1.81	1.22	2.68	0.003	**
Morality						
	increase	0.59	0.22	1.59	0.298	
	decrease	1.41	0.95	2.08	0.086	
Cooperative						
	increase	1.02	0.39	2.65	0.974	
	decrease	1.08	0.77	1.51	0.656	
Honest						
	increase	0.62	0.24	1.59	0.318	
	decrease	1.12	0.74	1.69	0.587	

Abbreviations: OR, odds ratio. CI, confidence interval.

Note. * $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$. The odds ratio of decrease in outing frequency was estimated by multinomial logistic regression adjusted for age, gender, household income, employment, marital status, living alone, living with children, living with older adults, self-reported diseases in treatment, self-reported health, and emergency declaration status for all participants and

each stratified group at “no change” as baseline outcome. Participants without personality traits were set as the reference for each odds ratio.

Table 4. Association between personality traits and changes in outing behaviors (stratified by age)

		Younger adults (n=824)					Older adults (over 60) (n=412)				
		OR	95% CI		p-value		OR	95% CI		p-value	
Medical institution visits											
Diligent											
	increase	0.76	0.40	1.44	0.395		0.53	0.20	1.40	0.198	
	decrease	0.98	0.69	1.39	0.903		0.90	0.50	1.61	0.714	
Sociable											
	increase	1.08	0.58	2.00	0.818		0.64	0.23	1.83	0.409	
	decrease	1.92	1.36	2.71	<0.001	** *	1.19	0.72	1.96	0.509	
Responsibility											
	increase	1.29	0.68	2.47	0.436		4.82	0.47	49.84	0.187	
	decrease	1.07	0.67	1.72	0.772		1.58	0.58	4.32	0.371	
Morality											
	increase	0.87	0.44	1.72	0.691		0.98	0.22	4.30	0.974	
	decrease	1.19	0.76	1.87	0.445		2.38	0.73	7.78	0.152	
Cooperative											
	increase	1.27	0.63	2.57	0.510		1.61	0.45	5.77	0.461	
	decrease	0.91	0.63	1.33	0.639		0.89	0.42	1.88	0.760	
Honest											
	increase	0.63	0.33	1.18	0.148		0.52	0.09	3.06	0.469	
	decrease	1.17	0.75	1.84	0.482		0.63	0.20	2.01	0.432	
Eating out											
Diligent											
	increase	1.53	0.67	3.49	0.310		0.24	0.02	2.73	0.250	
	decrease	1.14	0.79	1.64	0.486		0.81	0.43	1.55	0.532	
Sociable											
	increase	2.57	1.19	5.54	0.016	*	1.61	0.20	13.22	0.655	
	decrease	1.13	0.78	1.63	0.529		1.07	0.63	1.81	0.811	
Responsibility											
	increase	1.13	0.43	2.96	0.801		—	—	—	—	

	decrease	1.11	0.72	1.71	0.627		2.56	1.12	5.82	0.026	*
Morality											
	increase	0.57	0.25	1.30	0.183		—	—	—	—	
	decrease	1.12	0.72	1.74	0.619		0.60	0.22	1.58	0.297	
Cooperative											
	increase	0.98	0.44	2.20	0.968		2.35	0.16	34.4 2	0.534	
	decrease	0.98	0.66	1.45	0.931		1.53	0.80	2.93	0.195	
Honest											
	increase	1.16	0.48	2.84	0.738		0.25	0.01	4.50	0.346	
	decrease	1.49	0.97	2.29	0.066		0.56	0.18	1.75	0.322	
Traveling											
Diligent											
	increase	2.81	0.94	8.35	0.063		—	—	—	—	
	decrease	1.01	0.69	1.48	0.956		—	—	—	—	
Sociable											
	increase	1.47	0.49	4.40	0.486		—	—	—	—	
	decrease	1.38	0.95	2.02	0.095		—	—	—	—	
Responsibility											
	increase	1.14	0.40	3.29	0.803		—	—	—	—	
	decrease	1.76	1.14	2.72	0.011	*	—	—	—	—	
Morality											
	increase	0.43	0.14	1.32	0.139		—	—	—	—	
	decrease	1.48	0.95	2.28	0.081		—	—	—	—	
Cooperative											
	increase	1.11	0.38	3.18	0.852		—	—	—	—	
	decrease	1.03	0.70	1.52	0.874		—	—	—	—	
Honest											
	increase	0.84	0.32	2.22	0.721		—	—	—	—	
	decrease	1.10	0.70	1.72	0.672		—	—	—	—	

Abbreviations: OR, odds ratio. CI, confidence interval.

Note. * $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$. The odds ratio of decrease in outing frequency was estimated by multinomial logistic regression adjusted for age, gender, household income, employment, marital status, living alone, living with children, living with older adults, self-reported diseases in treatment, self-reported health, and emergency declaration status for all participants and each stratified group at “no change” as baseline outcome (age was adjusted only for all participants). Participants without personality traits were set as the reference for each odds ratio.

Values regarding the association between morality and eating out for older adults

were not calculated, as the imbalance of the data with an extremely low sample size in a particular category resulted in inappropriate coefficients. The result of the association between personality traits and traveling for the older adult group was not calculated because some categories had extremely low sample sizes, which led to data imbalance, and the model did not converge appropriately.

Discussion

The analysis revealed two main findings. First, the impact of COVID-19 on outing behavior varied depending on the type of activity. Although most participants reported no change in the frequency of medical institution visits, the majority reported a decrease in the frequency of eating out and traveling. To compare between age groups, a higher percentage of older people reported no change in medical institution visits and a decrease in eating out and traveling compared with younger people. Second, the impact of COVID-19 on outing behavior was associated with particular personalities. Participants with a sociable personality were more likely to report a decrease in the frequency of medical institution visits and an increase in the frequency of eating out, while participants with a strong sense of responsibility were more likely to report a decrease in the frequency of traveling. The association between changes in outing behavior and personality differed by age group. Younger adults showed similar trends across all participants; meanwhile, older adults with a strong sense of responsibility were more likely to report a decrease in the frequency of eating out.

For visits to medical institutions, previous studies have revealed that seeking emergency treatments remained unchanged and screening examinations decreased during the pandemic [11,12,37,42]. Examining visits to medical institutions, which may include outpatient treatment, we found that this aspect remained unchanged for most participants during the pandemic. **Incidentally, although telemedicine was introduced in Japan in 2018, its application remained limited even during the pandemic; thus, its effect on medical visits is considered minimal, if any.** Regarding eating out, studies in Japan [24], Poland [39], and the United States [23] found a reduction in frequency during lockdowns, consistent with our findings. Similarly for travel, previous studies reported that the COVID-19 pandemic and infection control measures led to a decrease in long-distance travel [43-46], consistent with our findings. Regarding the variation in results by age group, Harrera et al. conducted a survey during the pandemic in Spain and clarified the association between older age and higher frequency of preventive practices, higher health literacy, and greater concern about COVID-19 [22]. They also reported that increased adherence to preventive practices was associated with being female, having greater concern about COVID-19, and seeking more information among the younger generation; meanwhile, for the older generation, it was associated with greater concern about COVID-19 [22]. Concerns about COVID-19 might also have influenced our result that a higher proportion of older individuals reduced the frequency of eating out and traveling.

Importantly, three types of outing behaviors were simultaneously investigated, revealing that medical institution visits remained unchanged, whereas eating out and traveling decreased, with the trend differing among age groups. This suggests that the impact of the pandemic on outing behavior varied depending on necessity.

The findings also indicated that outing behaviors in response to COVID-19 were associated with particular personality traits. Personality traits have been reported to be associated with

various behaviors related to the COVID-19 pandemic [25,26,29,30]. For example, Qian and Yahara determined an association between preventive behaviors and personality traits such as extraversion, neuroticism, openness, conscientiousness, and agreeableness, as well as a sense of morality [26]. Hygiene and social distancing behaviors have also been associated with personality traits such as extroversion, honesty, modesty, conscientiousness, and neuroticism [25,30]. In a study conducted in Italy, Costantini et al. identified personality traits that predicted compliance with COVID-19 prevention measures, including outing behavior [30]. Their findings revealed that the frequency of outing behavior during the pandemic was negatively associated with modesty and creativity and positively associated with liveliness and sociability. The findings on eating out among younger adults align with those of this study. Although the previous study found a positive association between frequency of outings and sociable personalities, we revealed that sociable people were more likely to report a decrease in the frequency of one type of outing: medical institution visits. This inconsistency may be attributed to the evaluations in previous studies focusing on “unnecessary outings” [30].

Cultural aspects were reported to influence behavior during the pandemic. Abuliezi et al. reported the characteristics of preventive behavior among Japanese students compared with those in the United States [31]. They determined that Japanese medical students performed significantly better in preventive behavior although perceived health competence was lower, which means people do not have the confidence to manage their health through health-related habits [31]. Furthermore, Japanese people tend to avoid social pressure and negative evaluations from others [34,35]. To sum up these cultural aspects, the finding regarding the association between sociable personality and increase in the frequency of eating out among younger people may be attributed to peer pressure to eat out or such a trend among peers.

Furthermore, changes in people's perceptions and behaviors after the pandemic have been reported [47]. Although a better attitude and higher knowledge levels were observed, adherence to protocols remained inconsistent one year after the outbreak of the pandemic among younger adults aged 16–30 in Bangladesh [47]. This survey was also conducted a year after the first emergency declaration; therefore, the results might be influenced by changes in people's perceptions and attitudes toward the pandemic over time. Considering the results and the survey periods of this study, concerns regarding COVID-19 among older adults might have changed their outing behavior even during the early stages of the pandemic. For a deeper understanding, further analysis would be required to clarify how the experience of the pandemic and repeated emergency declarations affected attitudes and behaviors.

Limitations

Although this study effectively elucidates the association between personality traits and different types of outings during COVID-19 and differences by age group, there are certain limitations that are worth mentioning. First, the participants responded to the questions based on their memories of the situation prior to the pandemic, and the actual number of outings before and during the pandemic was not observed; thus, response bias is possible. Furthermore, response bias resulting from the high social desirability of Japanese people could have affected the results [48]. Second, given the equal recruitment across age groups and genders, the participants did not represent the general population structure of Japan. Accordingly, it should be noted that descriptive statistics regarding changes in the frequency of outing behavior do not represent the situation in Japan. Lastly, we cannot eliminate the possibility of selection bias as we only included participants registered with an internet panel

company, who had access to the internet and could respond online. Nevertheless, panel-based surveys have been widely used in recent years [49-51]. In addition, the participants received a small cash reward for completing the survey, which could have affected the randomness of the sample. However, because the participants were randomly selected from a large number of people registered with the engaged company across Japan, bias is expected to be minimized.

Conclusions

We examined various behavioral changes observed during the pandemic for different types of outings and their associations with personality traits, and differences between age groups. The findings can help in understanding how to effectively communicate and promote appropriate behaviors in public health emergency settings.

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Conflicts of interest

None declared.

Availability of data and materials

The datasets generated and analyzed during this study are available from the corresponding author upon reasonable request.

Abbreviations

CI: confidence interval

OR: odds ratio

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