

Age-Related Variations in the Relationship between Personality Traits and Changes in Outing Behaviors during the COVID-19 Pandemic in Japan: A Cross-Sectional Web-Based Survey

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Abstract

The emergence of COVID-19 in late 2019 prompted governments worldwide to implement multiple public health interventions. These included limits on mobility and social assemblies, which successfully lowered transmission rates and related deaths. In Japan, voluntary recommendations to stay indoors proved effective at controlling infections, as they did elsewhere. Nevertheless, these policies affected daily routines in other ways, such as reducing physical activity, increasing frailty risks, and promoting excessive eating—issues separate from their role in curbing viral spread. Individual characteristics such as personality, age, and cultural influences shaped how people adjusted their behavior during outings, with variations observed across different types of trips. This study examined links between personality characteristics and shifts in outing behaviors amid the COVID-19 crisis, while also identifying age-related variations in these behaviors across specific categories of outings. Researchers carried out a cross-sectional online survey in January 2021, coinciding with Japan's second state of emergency announcement. A total of 1236 individuals participated, evenly distributed by gender and 10-year age brackets. The questionnaire assessed changes in the frequency of three outing categories—visits to medical facilities, dining out, and travel—alongside personality dimensions, including sociability and morality. Multinomial logistic regression models were used to explore associations between personality factors and changes in outing habits. Analyses were also stratified by age group. Among respondents, 790 individuals indicated no alteration in visits to medical institutions, while the frequency of dining out and travel notably declined during the pandemic. Age-group comparisons showed that a larger share of older participants maintained unchanged medical visits but reduced dining out and travel compared to younger participants. Age-stratified multinomial logistic regression indicated that, among younger adults, more sociable individuals had higher odds of decreased medical visits and increased dining out (odds ratio [OR] 1.92, 95% CI: 1.36-2.71, $P < .001$; OR: 2.57, 95% CI: 1.19-5.54, $P = .016$, respectively). Those with a stronger sense of responsibility were more prone to reduced travel frequency (OR: 1.76, 95% CI: 1.14-2.72, $P = .011$). In older adults, individuals with high responsibility were less inclined to dine out frequently (OR: 2.56, 95% CI: 1.12-5.82, $P = .026$). The research explored diverse behavioral adjustments during the pandemic across distinct outing types, their ties to personality traits, and variations by age. These insights may help develop more effective communication strategies and promote appropriate actions during future public health crises.

Keywords: Lockdown, Personality, Outing behaviors, Internet survey, Public health, Japan

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Introduction

Governments worldwide enacted numerous social distancing policies to slow COVID-19 transmission. These included physical distancing, handwashing, mask use, and curbs on local and international travel, with existing evidence supporting their effectiveness [1-3]. For instance, Lau *et al.* [4] observed that the infection

doubling time in Wuhan, China, increased from 2 to 4 days following the lockdown. In the United States, Fowler *et al.* [5] found that stay-at-home directives correlated with a 30%+ drop in weekly COVID-19 cases within 1 week and a roughly 60% decline in weekly deaths after 3 weeks in areas that implemented the orders. While mobility and gathering restrictions effectively contained the virus, they also produced unintended lifestyle consequences, particularly among adults, especially older adults, contributing to health declines [6-10]. Shinohara *et al.* [6] reported rising frailty levels in older populations in a prospective six-month cohort study launched right after Japan's initial mobility and gathering curbs. García-Esquinas *et al.* [7] noted reduced physical activity and greater sedentary time among community-dwelling seniors in Spain a few weeks into lockdown [7]. In Slovakia, Lorková and Gažarová [8] observed shifts in dietary patterns after restrictions, with over 30% of adult men and women overeating and more than half experiencing weight gain. Among French university students, Tavalacci *et al.* [9] reported lower participation in physical exercise and elevated depression risk for males. Additionally, job losses and income drops during lockdowns influenced the financial and mental health of young adults across six diverse countries [10]. Outing restrictions also hindered routine healthcare, as fewer people pursued medical check-ups throughout the pandemic [11-13]. A Massachusetts hospital-based investigation by Bakouny *et al.* [11] revealed declines in cancer screening and diagnostic procedures in the three months after pandemic onset, compared with the prior period. Spanish trend data similarly indicated fewer cancer diagnoses across age groups in primary care settings during and following lockdown [12]. Japanese research further linked reduced cancer screenings under restrictions to heightened COVID-19-related anxiety [13]. These patterns raise concerns, as postponed detection and care could elevate long-term mortality [14]. In Japan, restrictions on outings aimed to minimize interpersonal contact and prevent large clusters at crowded venues or events, thereby protecting the healthcare infrastructure from overload [15, 16]. These were non-mandatory emergency declarations encouraging behavioral adjustments to limit infections. Multiple rounds (each lasting 1–3 weeks) occurred nationwide between 2020 and 2021, successfully reducing cases [17]. Despite the lack of legal enforcement, the Japanese public largely complied, leaving streets notably empty.

Because these mobility restrictions carried broad consequences beyond infection control, their thoughtful application is essential. Effective rollout requires acknowledging influences on preventive actions, including health and information literacy, gender, age, and personality traits [18-30].

Personality features have shown associations with pandemic-related conduct [25-28, 30]. Earlier work connected traits such as morality, conscientiousness, and neuroticism to hygiene practices and social distancing [25-27]. Other investigations linked outing patterns to attributes like modesty, honesty, sociability, and extraversion [23, 28, 29]. Age has also been linked to preventive actions [20-22, 30], with older adults more readily adopting protective measures and demonstrating stronger health literacy [20, 21]. For seniors, unlike younger groups, risk perceptions more strongly predicted prevention efforts [22].

Cultural context further shapes these behaviors. Abuliezi *et al.* [31] found that Japanese medical students outperformed their American peers in adherence to preventive measures. Additional studies noted Japanese sensitivity to social expectations, avoidance of negative social judgments, and strong compliance with infection controls rooted in societal norms and cultural factors [31-34].

Dining out and recreational travel dropped, while local park visits rose [23, 24, 35, 36]. Dining out and recreational travel dropped, while local park visits rose [23, 24, 35, 36]. This suggests pandemic effects on mobility were not uniform but activity-dependent.

Although preventive measures, including outing limits, are shaped by personality, age, and culture—and vary by outing category—no prior research has integrated these elements. Thus, the current study aimed to investigate relationships between personality traits and alterations in 外出 frequency during COVID-19, along with age-specific patterns, for three outing types: medical facility visits, dining out, and travel. Results may inform tailored strategies that account for demographic differences when preparing for future infectious disease emergencies.

Materials and Methods

Study design, setting, and participants

This cross-sectional study utilized data from a web-based questionnaire administered January 27–29, 2021, during active COVID-19 transmission in Japan. At that time, the

national government had issued a state of emergency in 11 of 47 prefectures (Tochigi, Saitama, Chiba, Tokyo, Kanagawa, Gifu, Aichi, Kyoto, Osaka, Hyogo, and Fukuoka), based on infection levels, healthcare capacity, and surveillance readiness [15-17]. This marked the second such declaration, issued eight months after the initial one [15-17].

Macromill, Inc., a Japanese internet research firm with a panel of more than 30 million registered residents nationwide, managed participant recruitment and data collection. The study enrolled 1236 adults aged 20–79 years from various regions of Japan. Email invitations were sent to randomly selected panel members. Sampling ensured equal representation by gender and 10-year age groups, and enrollment stopped once targets were

reached. Respondents completed the survey online and received modest compensation set by the company.

Data collection

The web-based questionnaire collected cross-sectional data on demographic details, health status, pandemic-related changes in outdoor behavior, and personality characteristics (**Table 1**). Because economic conditions were known to affect mobility during the crisis [37], participant income was incorporated as a covariate. Questions evaluated changes in frequency for three types of outings: medical institution visits, eating out, and traveling. Responses used a five-point Likert scale (1 = Increased, 2 = Somewhat increased, 3 = No change, 4 = Somewhat decreased, 5 = Decreased).

Table 1. Items included in the questionnaire.

Questionnaire ^a domain	Survey item	Response options
Household composition	Number of individuals currently living in your household (including yourself)	1 = One person; 2 = Two people; 3 = Three people; 4 = Four people; 5 = Five people; 6 = Six or more people
Household members	Select all categories that describe the people living with you. (Multiple selections permitted.)	1 = Infant/toddler not enrolled in nursery or kindergarten; 2 = Infant/toddler attending nursery or kindergarten; 3 = Elementary or junior high school student; 4 = High school, college, or vocational student studying within the same prefecture; 5 = High school, college, or vocational student studying outside the prefecture; 6 = Adult; 7 = Older adult (65–74 years); 8 = Older adult (75 years or older); 9 = Other (please specify)
Chronic health conditions	Indicate the status of each chronic illness. Select the applicable option for every condition except “Other.”	1 = Receiving treatment with medication; 2 = Periodic follow-up with hospital visits; 3 = Follow-up without hospital visits; 4 = Not receiving treatment; 5 = Treatment completed; 6 = Not applicable
	Additional chronic disease categories	Same response scale as above
Current well-being	Indicate your present condition.	1 = Physically healthy; 2 = Mentally healthy; 3 = Financially stable
Personality characteristics	I consider myself to be hardworking.	1 = Strongly disagree; 2 = Disagree; 3 = Slightly disagree; 4 = Slightly agree; 5 = Agree; 6 = Strongly agree
	I am outgoing and sociable.	Same 6-point agreement scale
	I have a strong sense of responsibility.	Same scale
	I possess a strong moral character.	Same scale
	I work well with others.	Same scale
	I am truthful and sincere.	Same scale
Behavioral changes compared with the previous year	Frequency of visits to healthcare facilities	1 = Increased; 2 = Slightly increased; 3 = No change; 4 = Slightly decreased; 5 = Decreased
	Frequency of dining out	Same 5-point change scale
	Frequency of travel	Same 5-point change scale

^a Demographic information, including age, sex, marital status, employment status, annual household income, and prefecture of residence, was obtained from participant registration records maintained by the survey panel before questionnaire administration.

The questionnaire used the Japanese adaptation of the Personality Inventory, grounded in the Big Five framework, to evaluate key personality dimensions [38]. Additional culturally relevant traits—“sense of morality,” “diligence,” and “strong sense of responsibility”—were assessed because of their potential relevance to COVID-19 preventive actions [26, 39]. To reduce respondent fatigue, these traits were consolidated into six broader categories: “diligent,” “sociable,” “cooperative,” “honest,” “strong sense of responsibility,” and “strong sense of morality.” The original seven-point Likert scale was reduced to a six-point scale to facilitate data aggregation and statistical modeling [15, 40]. Participants rated their level of agreement with each trait statement on this scale (1 = Strongly disagree, 2 = Disagree, 3 = Somewhat disagree, 4 = Somewhat agree, 5 = Agree, 6 = Strongly agree).

Data analysis

Multinomial logistic regression models were utilized to investigate relationships between personality characteristics and modifications in outing frequency. Following checks for multicollinearity, all personality-related predictors were entered into the models simultaneously. Age-stratified analyses were also conducted. Participants were divided into younger and older adult categories. Given the distribution of sample sizes across age brackets, the older adult group comprised those aged 60 years and older.

For the outcome variables, responses regarding each outing type were collapsed into three categories: increase (combining 1 = Increased and 2 = Somewhat increased), no change (3 = No change), and decrease (combining 4 = Somewhat decreased and 5 = Decreased). The “no change” category served as the reference group in the multinomial logistic regression. Personality trait responses were dichotomized into “applicable” (4=Somewhat agree, 5=Agree, or 6=Strongly agree)

versus “not applicable” (1=Strongly disagree, 2=Disagree, or 3=Somewhat disagree) for use as independent variables. Covariates included gender, age, marital status, living alone, cohabitation with children under 15 years old, cohabitation with adults over 65 years old, low household income (under JPY 4 million / USD 36,500 per year), presence of self-reported chronic conditions, self-rated health status, employment status, and whether the participant’s prefecture was under the emergency declaration.

All statistical procedures were carried out using STATA 17/SE (StataCorp LLC), with statistical significance defined as $P < .05$.

Ethical considerations

The study protocol received approval from the Ethics Committee of the National Institute of Public Health, Japan (NIPH-IBRA#12302, approved November 17, 2020). It was conducted in line with the Declaration of Helsinki. Every participant gave informed consent for data collection and retention. We obtained written consent at the time of registration. A certified research firm administered the online survey in compliance with all applicable personal data protection laws. Only de-identified data were provided to the researchers after survey completion.

Results and Discussion

Table 2 summarizes the sample’s demographic profile and reported shifts in outing behaviors before and during the COVID-19 pandemic. The 1236 participants had a mean (SD) age of 49.4 (16.5) years, with 618 (46.6%) being male. With respect to personality attributes, a substantial majority displayed positive traits: “honest” ($n=1028$, 83.2%), “strong sense of responsibility” ($n=957$, 77.4%), and “strong sense of morality” ($n=965$, 78.1%).

Table 2. Demographic profile, personality attributes, and reported changes in outing activities among survey participants.

Variable	Overall (n = 1,326)	Older adults (> 60 Years, n = 412)	Younger adults (n = 824)
Participant characteristics			
Mean age, years (SD)	49.4 (16.5)	68.3 (5.2)	39.9 (11.1)
Male participants, n (%)	618 (46.6)	206 (50.0)	412 (50.0)
Household income below JPY 4 million (≈USD 36,500), n (%)	364 (29.5)	166 (40.3)	198 (24.0)

Income not reported, n (%)	275 (22.3)	58 (14.1)	217 (26.3)
Currently employed, n (%)	749 (60.6)	147 (35.7)	602 (73.1)
Married, n (%)	446 (36.1)	79 (19.2)	367 (44.5)
Living independently, n (%)	207 (16.8)	58 (14.1)	149 (18.1)
Living with children aged ≤ 15 years, n (%)	267 (21.6)	11 (2.7)	256 (31.1)
Living with adults aged ≥ 65 years, n (%)	392 (31.7)	244 (59.2)	148 (18.0)
Receiving treatment for multiple chronic illnesses, n (%)	542 (43.9)	274 (66.5)	268 (32.5)
Self-rated health as good, n (%)	928 (75.1)	322 (78.2)	606 (73.5)
Survey conducted during COVID-19 emergency declaration^a, n (%)	783 (63.4)	277 (67.2)	506 (61.4)
Self-reported personality traits			
Described themselves as diligent, n (%)	709 (57.4)	297 (72.1)	412 (50.0)
Described themselves as sociable, n (%)	554 (44.8)	197 (47.8)	357 (43.3)
Reported a strong sense of responsibility, n (%)	957 (77.4)	363 (88.1)	594 (72.1)
Reported a strong moral character, n (%)	965 (78.1)	369 (89.6)	596 (72.3)
Considered themselves cooperative, n (%)	887 (71.8)	340 (82.5)	547 (66.4)
Considered themselves honest, n (%)	1028 (83.2)	384 (93.2)	644 (78.2)
Changes in outing activities			
Healthcare visits, n (%)			
Increased	88 (7.1)	20 (4.9)	68 (8.3)
No change	790 (63.9)	294 (71.4)	496 (60.2)
Decreased	358 (29.0)	98 (23.8)	260 (31.6)
Dining out, n (%)			
Increased	52 (4.2)	7 (1.7)	45 (5.5)
No change	311 (25.2)	94 (22.8)	217 (26.3)
Decreased	873 (70.6)	311 (75.5)	562 (68.2)
Travel frequency, n (%)			
Increased	28 (2.3)	3 (0.7)	25 (3.0)
No change	273 (22.1)	72 (17.5)	201 (24.4)
Decreased	935 (75.7)	337 (81.8)	598 (72.6)

^a During the survey period, Japan was under a COVID-19 state of emergency in 11 prefectures: Tochigi, Saitama, Chiba, Tokyo, Kanagawa, Gifu, Aichi, Kyoto, Osaka, Hyogo, and Fukuoka. This condition applied to 783 (63.4%) participants overall, including 506 (61.4%) younger adults and 277 (67.2%) older adults.

Regarding shifts in mobility patterns, survey responses showed that the number of visits to medical facilities remained unchanged for most respondents ($n = 790$, 63.9%). In contrast, the large majority reported reduced dining out ($n = 873$, 70.6%) and travel ($n = 935$, 75.6%). When comparing age groups, a greater share of older adults reported stable medical facility visits. In contrast, a larger proportion of younger adults reported increases or decreases in such visits than the older group. For dining out and travel, fewer younger adults reported reductions in these activities, while a higher percentage reported increases than older participants.

Tables 3 and 4 present the odds ratios (ORs) and their 95% Confidence Intervals (CIs) derived from multinomial logistic regression models, including age-stratified results for younger and older adults. These models assessed connections between the six personality dimensions and variations in outing frequency—increased, no change, or decreased—across the three outing types, separately for each age group. We contrasted individuals with each personality trait with those without it.

Table 3. Multinomial logistic regression examining the relationship between personality characteristics and changes in outing behaviors among all participants (n = 1,326)

Outing activity	Personality characteristic	Behavioral change	Adjusted OR (95% CI) ^a	P-value
Healthcare facility visits	Diligent	Increased	0.71 (0.41–1.23)	.223
		Decreased	0.93 (0.69–0.69)	.623
	Sociable	Increased	0.86 (0.51–1.46)	.582
		Decreased	1.55 (1.17–2.06)	.002
	Responsible	Increased	1.56 (0.86–2.83)	.144
		Decreased	1.17 (0.77–1.77)	.473
	Morally minded	Increased	0.98 (0.54–1.78)	.960
		Decreased	1.39 (0.93–2.08)	.112
	Cooperative	Increased	1.34 (0.73–2.49)	.346
		Decreased	0.91 (0.65–1.26)	.561
	Honest	Increased	0.60 (0.33–1.10)	.098
		Decreased	1.08 (0.71–0.71)	.714
Dining out	Diligent	Increased	1.13 (0.51–2.52)	.763
		Decreased	1.05 (0.77–1.42)	.774
	Sociable	Increased	2.04 (1.02–4.08)	.045
		Decreased	1.09 (0.81–1.47)	.570
	Responsible	Increased	1.25 (0.50–3.11)	.630
		Decreased	1.33 (0.90–1.94)	.149
	Morally minded	Increased	0.71 (0.34–1.49)	.367
		Decreased	0.98 (0.66–1.45)	.922
	Cooperative	Increased	1.07 (0.52–2.21)	.857
		Decreased	1.09 (0.78–1.53)	.600
	Honest	Increased	0.94 (0.41–2.14)	.881
		Decreased	1.33 (0.91–1.97)	.144
Travel activities	Diligent	Increased	1.83 (0.65–5.15)	.249
		Decreased	1.01 (0.73–1.40)	.936
	Sociable	Increased	1.39 (0.50–3.84)	.523
		Decreased	1.31 (0.96–1.80)	.092
	Responsible	Increased	1.46 (0.54–3.97)	.456
		Decreased	1.81 (1.22–2.68)	.003
	Morally minded	Increased	0.59 (0.22–1.59)	.298
		Decreased	1.41 (0.95–2.08)	.086
	Cooperative	Increased	1.02 (0.39–2.65)	.974
		Decreased	1.08 (0.77–1.51)	.656
	Honest	Increased	0.62 (0.24–1.59)	.318
		Decreased	1.12 (0.74–1.69)	.587

^a The odds ratios for reduced outing frequency were derived from multinomial logistic regression models. These models adjusted for age, gender, household income, employment status, marital status, living alone, co-residing with children, co-residing with older adults, self-reported medical conditions under treatment, self-assessed health status, and emergency declaration status. Analyses covered the full sample and age-stratified subgroups, with “no change” as the reference outcome category. For each odds ratio, individuals lacking the specific personality trait served as the reference group. CI: Confidence Interval.

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

Variable	Younger adults (n = 824) Odds ratio (95% CI) ^a	P-value	Older adults (> 60 years; n = 412) Odds ratio (95% CI) ^a	P-value
Medical institution visits				
Diligent				
Increase	0.76 (0.40-1.44)	.395	0.53 (0.20-1.40)	.198
Decrease	0.98 (0.69-1.39)	.903	0.90 (0.50-1.61)	.714

Sociable				
Increase	1.08 (0.58-2.00)	.818	0.64 (0.23-1.83)	.409
Decrease	1.92 (1.36-2.71)	< .001	1.19 (0.72-1.96)	.509
Responsibility				
Increase	1.29 (0.68-2.47)	.436	4.82 (0.47-49.84)	.187
Decrease	1.07 (0.67-1.72)	.772	1.58 (0.58-4.32)	.371
Morality				
Increase	0.87 (0.44-1.72)	.691	0.98 (0.22-4.30)	.974
Decrease	1.19 (0.76-1.87)	.445	2.38 (0.73-7.78)	.152
Cooperative				
Increase	1.27 (0.63-2.57)	.510	1.61 (0.45-5.77)	.461
Decrease	0.91 (0.63-1.33)	.639	0.89 (0.42-1.88)	.760
Honest				
Increase	0.63 (0.33-1.18)	.148	0.52 (0.09-3.06)	.469
Decrease	1.17 (0.75-1.84)	.482	0.63 (0.20-2.01)	.432
Eating out				
Diligent				
Increase	1.53 (0.67-3.49)	.310	0.24 (0.02-2.73)	.250
Decrease	1.14 (0.79-1.64)	.486	0.81 (0.43-1.55)	.532
Sociable				
Increase	2.57 (1.19-5.54)	.016	1.61 (0.20-13.22)	.655
Decrease	1.13 (0.78-1.63)	.529	1.07 (0.63-1.81)	.811
Responsibility				
Increase	1.13 (0.43-2.96)	.801	— ^b	—
Decrease	1.11 (0.72-1.71)	.627	2.56 (0.12-5.82)	.026
Morality				
Increase	0.57 (0.25-1.30)	.183	—	—
Decrease	1.12 (0.72-1.74)	.619	0.60 (0.22-1.58)	.297
Cooperative				
Increase	0.98 (0.44-2.20)	.968	2.35 (0.16-34.42)	.534
Decrease	0.98 (0.66-1.45)	.931	1.53 (0.80-2.93)	.195
Honest				
Increase	1.16 (0.48-2.84)	.738	0.25 (0.01-4.50)	.346
Decrease	1.49 (0.97-2.29)	.066	0.56 (0.18-1.75)	.322
Traveling				
Diligent				
Increase	2.81 (0.94-8.35)	.063	—	—
Decrease	1.01 (0.69-1.48)	.956	—	—
Sociable				
Increase	1.47 (0.49-4.40)	.486	—	—
Decrease	1.38 (0.95-2.02)	.095	—	—
Responsibility				
Increase	1.14 (0.40-3.29)	.803	—	—
Decrease	1.76 (1.14-2.72)	.011	—	—
Morality				
Increase	0.43 (0.14-1.32)	.139	—	—
Decrease	1.48 (0.95-2.28)	.081	—	—
Cooperative				
Increase	1.11 (0.38-3.18)	.852	—	—
Decrease	1.03 (0.70-1.52)	.874	—	—
Honest				
Increase	0.84 (0.32-2.22)	.721	—	—

Decrease	1.10 (0.70-1.72)	.672	—	—
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^a The odds ratios for reduced outing frequency were derived via multinomial logistic regression. Models were adjusted for age, gender, household income, employment status, marital status, living alone, living with children, living with older adults, self-reported diseases under treatment, self-reported health, and emergency declaration status. Adjustments were applied to the full sample and each age-stratified subgroup, with “no change” serving as the reference outcome category (age adjustment was performed only for the overall sample). Individuals lacking the specified personality traits served as the reference group for all odds ratios. Associations between morality and eating out among older adults were not computed due to severe data imbalance and extremely small cell sizes in certain categories, which produced unreliable estimates. Similarly, models examining personality traits and travel among older adults failed to converge properly due to extremely low sample sizes across multiple categories, leading to data imbalance. CI: Confidence Interval.

^b Not available.

Analysis of personality traits and changes in outing patterns showed that sociable individuals had higher odds of reporting reduced medical institution visits than non-sociable individuals, both overall and among younger adults (OR: 1.55, 95% CI: 1.17-2.06, $P = .002$; OR: 1.92, 95% CI: 1.36-2.71, $P < .001$, respectively). For eating out, sociable participants were more likely to report an overall increase and an increase in the younger group (OR: 2.04, 95% CI: 1.02-4.08, $P = .045$; OR: 2.57, 95% CI: 1.19-5.54, $P = .016$, respectively). In contrast, older adults with a strong sense of responsibility showed elevated odds of decreased eating out (OR: 2.56, 95% CI: 1.12-5.82, $P = .026$). Regarding travel, greater responsibility was associated with a reduced frequency overall and among younger adults (OR: 1.81, 95% CI: 1.22-2.68, $P = .003$; OR: 1.76, 95% CI: 1.14-2.72, $P = .001$, respectively).

Main results

The study yielded two primary observations. First, COVID-19 affected different outing activities in distinct ways. While most respondents reported no change in medical visits, a large majority reported declines in eating out and traveling. Older adults were more likely than younger adults to maintain unchanged medical visits and to reduce both eating out and traveling. Second, personality characteristics were linked to shifts in outing behaviors during the pandemic. Sociable individuals tended to report fewer medical visits and more frequent eating out, whereas those with high responsibility were more prone to cut back on travel. These personality-related patterns varied by age: younger adults largely mirrored the overall sample, whereas among older adults, strong responsibility was associated with reduced eating-out frequency.

Prior research indicated that emergency care visits stayed stable while preventive screenings dropped during the pandemic [11, 12, 36, 41]. Our assessment of general medical institution visits (including outpatient care) similarly found stability for most participants. Although

Japan introduced telemedicine in 2018, its use stayed limited even amid the pandemic, so its influence on visit volumes was likely negligible. In earlier Japanese [24], Polish [38], and American [23] studies on eating out, reductions in frequency were documented during lockdowns, mirroring our observations. Travel likewise declined under pandemic restrictions and infection controls, as shown in multiple prior reports [42-45].

Age-group differences align with findings from González-Herrera *et al.* [21] in Spain, which linked older age to more frequent preventive actions, higher health literacy, and stronger COVID-19 concerns [22]. Among younger people, adherence was associated with being female, greater worry, and information-seeking; among older adults, it was mainly associated with concern levels [22]. Heightened COVID-19 concerns among older adults may thus explain their sharper reductions in non-essential outings, such as eating out and traveling.

By evaluating medical visits, eating out, and travel together, the study highlighted that essential activities remained largely stable while discretionary ones declined, with patterns differing by age. This underscores that pandemic effects on mobility depended heavily on perceived necessity.

Personality traits also shaped behavioral responses. Earlier work has connected traits to COVID-19-related actions [25, 26, 29, 30]. Qian and Yahara, for instance, linked preventive behaviors to extraversion, neuroticism, openness, conscientiousness, agreeableness, and morality [26]. Hygiene practices and distancing have been tied to extraversion, honesty, modesty, conscientiousness, and neuroticism [25, 30]. In Italy, Costantini *et al.* [30] found that modesty and creativity negatively predicted outing frequency, while liveliness and sociability positively predicted it. Our results on eating out among younger adults are consistent with their findings on sociability. However, we observed that sociable individuals were more likely to reduce medical visits—a divergence possibly because prior studies focused mainly on “non-essential” outings [30].

Cultural factors also played a role. Abuliezi *et al.* [31] noted that Japanese medical students demonstrated stronger preventive behaviors than their U.S. counterparts, despite lower perceived health competence. Japanese culture often emphasizes avoiding social pressure and negative judgment from others [33, 34]. These elements may help explain why younger, more sociable adults increased their eating out—potentially driven by peer influences or social norms.

Post-pandemic shifts in attitudes and behaviors have also been documented [46]. One year after the outbreak, younger people in Bangladesh showed improved knowledge and attitudes but inconsistent adherence to protocols [46]. Our survey, conducted roughly one year after Japan's first emergency declaration, may similarly reflect evolving perceptions. Older adults' concerns likely drove early behavioral changes during the pandemic. Future studies should explore how repeated states of emergency and accumulated experience altered long-term attitudes and actions.

Limitations

Despite providing clear insights into personality–outing links and age differences during COVID-19, the study has several constraints. First, participants relied on recall of pre-pandemic behavior, and objective outing counts were unavailable, raising the possibility of recall bias. Social desirability bias, common among Japanese respondents, may also have influenced answers [47]. Second, the sample was balanced by age and gender but did not reflect Japan's overall population demographics; therefore, the descriptive statistics on changes in outings cannot be generalized nationally. Finally, selection bias cannot be ruled out, as participants were internet panel registrants with web access. Panel surveys have become standard in recent research [48-50], and random selection from a large nationwide pool helps reduce bias, though small cash incentives may have affected participation.

Conclusion

This research explored pandemic-related shifts across multiple outing types and their connections to personality traits, highlighting age-group variations. The results offer valuable guidance for crafting effective public health communications and encouraging suitable behaviors during future emergencies.

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