

Impact of the COVID-19 pandemic on behavior changes among Japanese in different demographics: Examination using a free-response survey

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Abstract

Background: The spread of COVID-19 has changed people's everyday behaviors. The present research aimed to describe the dynamics of changes experienced by Japanese people with varying demographic backgrounds, aiming to reveal how those demographic features mediate the behavior changes caused by the pandemic. While most past studies investigating behavioral change caused by the pandemic used multiple-choice questions about pre-selected behaviors, the present research used a free-response style survey to cover a wide range of behaviors. **Methods:** 301 Japanese with varying demography took part in an online survey. They firstly wrote down at least five activities they frequently performed before the virus outbreak. After, they did the same about their current life. **Results:** A total of 1858 answers for the before-condition and 1668 answers were collected and grouped into 19 categories. The appearance rate for each category (the number of items divided by the number of participants) was calculated. Those appearance rates were compared across conditions (before and after the outbreak) and demographic features. **Conclusion:** Although the pandemic altered most people's daily behaviors, its impacts were not identical to everyone and were significantly mediated by individual's demography.

Introduction

The spread of COVID-19 has changed the lifestyles of people all over the world [1]. Restrictions of movements and inter-individual physical contact have been widely implemented [2], and a variety of prevention measures have been encouraged [3]. The current study focuses on such changes brought to Japanese people's daily behaviors by the pandemic. In recent years, many studies have been vigorously investigating behavioral changes brought by the pandemic, and most of them highlight their impacts on mental health. For example, participation in physical exercises has significantly reduced since the virus outbreak, which is strongly associated with mental health deterioration [4-6]. Time spent on sedentary behaviors and internet use, on the contrary, greatly increased, and they are also reported to enhance mental illness symptoms [5,7]. Another line of research on behavior changes focuses on prevention behaviors such as mask-wearing and hand washing. While engaging in the prevention behaviors is becoming a new social norm worldwide [8-10], the extent of engagement appears to be influenced by age [11], perceived risk of COVID-19 [12], and personality [13].

Instead of investigating the psychological impacts of behavior changes, the present research aimed to describe the dynamics of changes experienced by people of different ages and gender, varying in their family structures and socio-economic backgrounds. The study aims to reveal how those demographic features mediate the behavior changes caused by the pandemic. Investigating the influence of demography on behavior change is vital because our lifestyles are, at least to some extent, determined by it. For example, the pandemic has reduced people's opportunities to exercise [6], but their frequency is likely influenced by their age, gender,

and possibly family structures. Indeed, females engage in physical exercises generally less than males [14], and thus, the impact of the pandemic on males and females is not identical [4].

Targeting a wide variety of activities is also very important to grasp the actual lifestyle changes people have been experiencing. It is, however, difficult for researchers to investigate many behaviors at once in a study, and thus, most of them only target pre-selected behaviors. The most common way to assess behavior changes among the pandemic-related research is to present participants with multiple-choice questions about those selected behaviors. The questions are often about the frequency or duration of specific activities, and participants select answers describing their state before and during the pandemic [4-6,15,16]. However, with the multiple-choice method, only a limited number of behaviors can be measured, and it is insufficient for the current research purpose. Thus, the present research used a free-response method.

This study asked participants to report activities they often engage in. Precisely, participants wrote down up to ten activities that are practiced most often in their daily lives. Approximately 300 Japanese adults in various age groups participated in the survey conducted in February 2021. Firstly, they were asked to recall their life before the COVID-19 outbreak to produce responses. Once they have done so, they responded about their current behaviors. The appearance rate of each behavior before and after the outbreak was compared. This procedure does not limit the target behaviors to those in the mind of the researchers. Although this method does not precisely record the frequency of particular action being performed, the responses should reflect participants' subjective significance of the behaviors and their frequency in occurrence. Consequently, the results will provide a broader picture of behavioral changes experienced by people with varying demographics.

Participants

Three hundred and twenty-one Japanese adults took part in the survey. They were 160 males and 161 females with a mean age of 47.41 ($SD=19.17$). They were registered members of a survey company Macromill (<https://group.macromill.com/>), who recruited and reimbursed them. The participants' age ranged from 18 to 79, whom the company randomly chose.

Procedure

The survey was conducted online. Participants firstly reported their demographic information. The questions asked their gender, age, marital status, children, annual household income, annual individual income, living area (prefecture), and occupation. Next, the participants were asked to recall their life before the pandemic and write down at least five (up to ten) activities they frequently performed. Once this was done, they were asked to do the same about their current life. The true purpose of the survey (comparing behaviors before and after the outbreak) was concealed from the participants. This is because knowing the true purpose may limit their responses to pandemic-related behaviors. They were informed that the purpose of this study was to identify frequently performed behaviors in a society. The survey was produced in an online format, and the survey company distributed it to the participants.

Results

A total of 1858 answers for the before-condition and 1668 answers for the after-condition appropriately described some actions. Three researchers grouped each answer into 19 categories, shown in Table 1. Table S1 in the supplemental materials summarizes the details about behaviors included in each category. Simply comparing the number of items in each category across the conditions was inappropriate because the total number of items for the two conditions differed. Thus, the number of items in each category was divided by the number of participants to calculate appearance rates. Table 1 reports the appearance rates of the 19 situations in the two conditions and the differences between them. Since each participant could provide multiple answers for each category, some of the percentages reported in the table exceeded 100%. Among the categories in Table 1, those yielded more than 10% difference (nine items with asterisks on the table) were carefully examined by participants' demographics: age, gender, marital status, having children or not, and household income.

Table 1. Appearance rates for the 19 behavior categories in the before- and after-conditions

Category	Before	After	Change
Eat at home	8%	16%	8%
Eating out*	94%	30%	-64%
Food delivery, take away	0%	13%	13%
Going out*	19%	6%	-13%
Housework*	61%	78%	17%
Leisure activities*	56%	41%	-14%
Life necessities	24%	27%	3%
Pandemic prevention*	4%	73%	69%
PCs, smartphones, internet	9%	14%	5%
Physical exercises	30%	32%	2%
Reading, listening to music	6%	11%	5%
Shopping*	105%	74%	-31%
Spending time with family and friends*	37%	12%	-25%
Staying at home	0%	9%	9%
Studying	5%	1%	-4%
Travel*	36%	10%	-26%
Using public transports*	44%	17%	-27%
Watching videos	22%	30%	8%
Working, schooling	13%	20%	7%
Unable to code	5%	5%	0%

Note : The items with asterisks were further examined by demography

Overall, some of the most noticeable behavior changes were the decrease in eating out (-64%) and the increase in prevention behaviors (+69%). Shopping was the most frequently appeared item in the before-condition (105%) and still seemed to be performed quite frequently after the virus outbreak (74%), but a significant decrease was apparent (-31%). Occasions of spending time with family and friends, traveling, and using public transports are also perceived as greatly decreased by the participants. The changes in those activity categories were further examined by age groups (18-24, 25-65, and 66-79 years old), gender, marital status, children, and household income (below or above the annual income of 6 million yen, which roughly correspond to the average household income in Japan). Living area and occupations were not used because sample sizes in each sub-category of these demographics varied a lot. Target behaviors have been further reduced from the initial nine items by the following two criteria for the demographic-based examination. First, the behavior shows a bigger than 10% difference between the two conditions in at least one of the groups in each demographic

category. Second, the magnitude of the change noticeably differs among the groups in the demographic category. Table 2 summarizes the results of the behaviors meeting either of these two criteria.

Table 2. Appearance rates for the selected behaviors by the demographic categories

Age	18-24 (37)	18-24 (37)	25-65 (191)	25-65 (191)	66-79 (93)
	Before	After	Before	After	Before
Housework	24%	38%	59%	77%	80%
Leisure activities	76%	35%	49%	37%	61%
Pandemic prevention	0%	97%	5%	81%	4%
Shopping	73%	38%	114%	79%	97%
Spending time with family and friends	38%	22%	42%	10%	29%

Age	18-24 (37)	18-24 (37)	25-65 (191)	25-65 (191)	66-79 (93)
Travel	41%	5%	38%	12%	29%
Using public transports	57%	5%	49%	19%	29%
Gender	Male (160)	Male (160)	Female (161)	Female (161)	
	Before	After	Before	After	
Housework	39%	54%	83%	101%	
Leisure activities	56%	53%	55%	31%	
Pandemic prevention	4%	63%	4%	83%	
Spending time with family and friends	23%	7%	52%	17%	
Marital status	Single (128)	Single (128)	Married (193)	Married (193)	
	Before	After	Before	After	
Eating out	117%	42%	78%	22%	
Housework	49%	68%	69%	84%	
Leisure activities	70%	66%	46%	26%	
Pandemic prevention	5%	78%	4%	69%	
Shopping	136%	94%	84%	61%	
Spending time with family and friends	28%	9%	44%	15%	
Using public transports	54%	24%	37%	11%	
Children	Without (149)	Without (149)	With (172)	With (172)	
	Before	After	Before	After	
Housework	43%	72%	76%	82%	
Pandemic prevention	5%	74%	3%	71%	
Shopping	91%	60%	117%	86%	
Using public transports	51%	13%	38%	20%	
Household income	Below 6M (169)	Below 6M (169)	Above 6M (86)	Above 6M (86)	
	Before	After	Before	After	
Housework	69%	86%	40%	59%	
Pandemic prevention	2%	62%	0%	84%	
Spending time with family and friends	31%	12%	50%	9%	

The results by age group show that the amount of housework naturally increases with age, but the pandemic has forced people in all generations to commit more of it than before. It must be the consequence of people staying at home longer. The leisure activities decreased for all age groups, but the magnitude was noticeably large among people below 25. This may be because more mature people could substitute restricted leisure activities (e.g., partying, going to concerts, and joining public events) with unrestricted private activities (e.g., gardening and going for a drive). They can also substitute behaviors in crowded places with ones in non-crowded places (e.g., fishing and camping). Those substituted leisure activities often require some equipment or sufficient private space in the house, and those may be harder to obtain for young people who tend to live in small apartments and have less money. Shopping occasions significantly decreased for all age groups, but this seems to be performed generally less frequently by very young people. This may be because they are more likely to live with their parents, reducing the necessity for grocery shopping.

Regarding spending time with family and friends, the oldest group appears to have done so less often than the younger groups before the outbreak, consistent with the notion that social connections shrink among elderlies [17]. The magnitude of decrease for this activity was, however, equivalent for all age groups. The occasions of traveling are also less frequent for the oldest group at the before-condition, maybe due to physical mobility limitations. However, a noticeably more significant decrease was observed for the youngest group. The use of public transports decreased greatly for all generations, but the extent was more prominent for the younger groups because the use of a private car would increase by age.

The amount of housework, leisure activities, and spending time with family and friends look different between

males and females. The women reported much more housework than men for the before-condition, but the overall amount increased considerably for both genders. Interestingly, only female participants realized the decrease in leisure activities, which may relate to their extra housework, limiting their free time for leisure. The occasions of spending time with family and friends decreased greatly for both genders, but the responses from women indicated they performed these acts more often than men in general. Housewives with children, which are 25% of the current female sample, are likely to spend a significant amount of time with parents of their children's friends (whom they may call their friends) during the day, and this might be reflected in the larger proportion of this activity reported by women.

Looking at the data by participants' marital status, single people reported a greater number of behaviors relating to eating out, going shopping, and using public transports than married people. The extent of decrease in those activities was also greater for the singles. The amount of housework is generally greater for married people, while the increase during the pandemic was equivalent for both groups. These results reflect that single people have more free time and still commit to actions such as eating out and going shopping more often than married people under the pandemic. However, spending time with family and friends seems to less frequently happen for single people in general. This may reflect the activities of the housewives with other parents (see above) and an increased number of family members they need to spend time with due to marriage.

Having children impacted the behaviors of housework, shopping, and using public transports. Housework and shopping are committed more often by people with children than those without in general, as expected. The decrease in shopping did not differ across the two groups, but the increase in housework was more salient for the people without children. These results imply that people with children generally spend more time at home, having more housework and shopping needs than people without them, regardless of the pandemic. Therefore, the increase in those activities during the pandemic was less salient to them than to people without children. The pandemic forced children to stay home longer (e.g., an increased amount of homeschooling), which might be related to the increased housework for the parents. The use of public transports decreased for both groups, but the extent was much more significant for the people without kids, indicating that people with kids have a stronger tendency to use private transports when they go out.

Finally, household income is below or above the average influenced housework and spending time with family and friends. People with lower incomes spent more time on housework than people with higher incomes but spent less time with family and friends. The poorer people may spend more time at home, likely due to financial reasons. Limited finances may also make them refrain from outsourcing housework or childcare, resulting in less free time than affluent people.

In addition to the activities discussed above, the pandemic outbreak massively increased prevention measures in our daily lives. The present results show that wearing face masks and washing hands are most practiced. Interestingly, older participants did not mention prevention measures as often as younger participants, consistent with a past study showing that older people have implemented fewer prevention behaviors than younger people [11]. Household income also impacted the appearance rate of prevention measures, showing that people with higher income reported activities in this category 20% more than those with lower income.

Discussion

The present research asked Japanese individuals to report daily behaviors they often engage in before and after the COVID-19 outbreak to examine how behavioral changes differ by people's demography. Eating out, going shopping, doing housework, and engaging in leisure activities were the most frequently mentioned actions. The frequency of people performing them seems to be significantly changed by the pandemic. Those changes are, however, mediated by the people's demography. Examination by age showed that younger people generally go out more than older people while having to experience a greater reduction of those activities since the outbreak. This implies that the decrease (or restriction) of going out maybe more psychologically detrimental for younger people [18,19]. Independence and financial capability can open broader possibilities

of substitutional behaviors or solutions for the problems, but those options are also limited for the younger generations.

Housework is highlighted by all the demography-based examinations, indicating that housework is a major part of people's lives and its increase due to the pandemic has a significant impact. Unbalanced distribution of housework between men and women has been a significant social problem in Japan, reflecting the country's low level of gender equality [20]. The present results showed that women reported a greater number of housework-related activities than men. Although the extent of increase in this activity was equivalent for both genders, the psychological stress must be much more notable for women, which may contribute to the pandemic-induced mental problems among them [21-23].

Interestingly, activities related to internet use and sedentary behaviors (e.g., watching TV), which have been reported to be increased by the pandemic [7], were not mentioned very often in the present study. No significant change between the two conditions was also observed. Although the present results do not strictly reflect the actual frequency of activity performance, it can be said that the participants were not conscious of the changes in those activities. This suggests that the impact of the increased internet use on mental health might not be so significant compared to other causes, at least in Japan, despite an established direct relationship between the two factors.

The limitation of this study is that the appearance rates in the current results do not directly reflect how often those behaviors are performed. However, the appearance rate must reflect the subjective significance of those behaviors for the participants, and this must correlate with frequency in occurrence.

Conclusions

The present research investigated behavioral changes brought by the COVID-19 pandemic among Japanese people using a free-response survey, in which participants described their frequently performed behaviors. The results revealed that the pandemic altered various daily behaviors, but people's demography, which in part determines their lifestyles, moderated the impact. It also highlighted some behaviors that are not yet scrutinized by past research (e.g., housework and leisure activities) and suggested that changes in those activities could negatively influence people's mental health. The current results demonstrated that detailed examinations of the behavior change by different demographics effectively reveal how the pandemic impacts people's mental health in different backgrounds.

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Supplementary Materials: This manuscript contains one supplementary excel file containing Table S1 and a data set.

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