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The association between personality traits and hoarding behavior during the COVID-19 pandemic in Japan

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ABSTRACT

The purpose of this study was to investigate the relationship between personality traits and hoarding behavior during the coronavirus disease (COVID-19) pandemic. An online survey was conducted among 530 Japanese adults (274 women; $M_{age} = 44.26$, $SD_{age} = 8.43$) who were living in Tokyo when a state of emergency was declared. Personality traits were assessed using measures of the Big Five personality traits and dispositional greed. They also responded to measures of tendencies to hoard essential and countermeasure products during the COVID-19 pandemic. Correlation analysis revealed that Extraversion, Neuroticism, Openness, and dispositional greed were positively associated with hoarding behavior. Multiple regression analysis revealed that individuals with high Agreeableness, Neuroticism, Openness, and dispositional greed tended to hoard products. The present findings suggest that personality traits account for behavioral responses to the COVID-19 pandemic in Japan. The emergent relationship between hoarding behavior and each personality trait is discussed in relation to the existing literature.

1. Introduction

Personality traits, especially Big Five traits, are closely related to human behaviors and outcomes (Ozer & Benet-Martínez, 2006; Roberts et al., 2007; Soto, 2019). The Big Five personality traits describe the fundamental and comprehensive framework that classifies various psychological traits into five dimensions, including Extraversion, Agreeableness, Conscientiousness, Neuroticism, and Openness. The studies which dealt with the Big Five personality traits were seen in the 1980s and have increased since the late 1990s compared to other personality models (John et al., 2008). Past studies have found that the Big Five personality traits are associated with specific behaviors and attitudes toward the COVID-19 pandemic (Aschwanden et al., 2021; Carvalho, Pianowski, & Gonçalves, 2020; Qian & Yahara, 2020). For example, individuals with high Conscientiousness tend to believe that it is important to practice social distancing and handwashing (Carvalho, Pianowski, & Gonçalves, 2020). Indeed, they have been found to adopt infection prevention strategies (Aschwanden et al., 2021; Qian & Yahara, 2020).

Various behavioral responses to the COVID-19 pandemic have been

reported (e.g., buying and hoarding masks, alcohol for disinfection, and instant foods). Individuals engage in hoarding behavior to deal with situations in which they may not be able to buy products that are in short supply and to decrease their risk of infection by buying large quantities of essential products and staying home. Therefore, individuals who foresee such situations and act accordingly or are worried about COVID-19 transmission are likely to hoard such products. Garbe et al. (2020) found that Conscientiousness and Neuroticism positively influenced toilet paper hoarding behaviors among their participants. In addition, Garbe et al. (2020) found that the effect of Neuroticism on toilet paper hoarding behavior was mediated by the perceived threat of COVID-19. Columbus (2021) found that individuals with low Honesty-Humility were more likely to hoard products and report intentions to hoard them in the future. Moreover, dark personality traits also closely link to hoarding behavior. Dark personality traits are characterized by self-interest, coldness, and manipulated behavioral tendency, which is represented as the dark triad traits (i.e., Machiavellianism, narcissism, and psychopathy). Nowak et al. (2020) found that a strong dark core (i.e., the common factor underlying the dark triad traits) predicted engagement in the hoarding of food and countermeasure products (e.g., face

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masks). This relationship appears to be attributable to one aspect of the dark triad traits, namely, noncooperation or low Agreeableness. Past studies have reported that hoarding behavior during the COVID-19 pandemic was positively related to the personality traits of being planful, anxious, and noncooperative.

However, few studies have examined the relationship between hoarding behavior and personality traits in non-Western societies (United Kingdom: Columbus, 2021; Europe, United States, and Canada: Garbe et al., 2020; Poland: Nowak et al., 2020). It is important to examine whether the relationships observed in studies conducted in Western societies are valid in other ethnic and cultural contexts (Henrich, Heine, & Norenzayan, 2010). Long and Khoi (2020) proposed the model of intention to hoard food in Vietnam, however it didn't include personality traits. In Japan, there was a shortage of various products during the COVID-19 pandemic (The Japan Times, 2020), while collectivism who Japanese culture relatively belongs to tends to obey rules and behave in conformity with others (Markus & Kitayama, 1991) and many Japanese individuals emphasized social norms even during the COVID-19 pandemic (Nakayachi et al., 2020). Being collectivism doesn't mean inhibiting hoarding products because hoarding behavior is likely to be explained by the other cultural dimensions, not only collectivism (Hofstede, 2011), for example such behaviors may be seen in a culture of indulgence even collectivism (e.g., Brazil). Moreover, past studies have found that individuals in Japan do hoard essential products when natural disasters such as earthquakes and typhoons strike (Ohtomo & Hirose, 2014). This suggests that such behaviors are attributable to individual differences (e.g., normative consciousness). Therefore, personality traits may predict hoarding behavior during the COVID-19 pandemic among individuals in Japan.

This study examined the relationship between hoarding behavior and the Big Five personality traits by conducting an online survey among Japanese individuals. It is important to examine the predictive effects of the Big Five personality traits in non-Western cultures because the structure of the Big Five personality model is similar across countries and groups that speak different languages (McCrae et al., 2005). Garbe et al. (2020) and Mikolajczak-Degrauwe et al. (2012) found that there is a relationship between personality traits and compulsive buying behaviors. Thus, individuals with high levels of Neuroticism were expected to hoard products. Because noncooperative tendencies have been found to be related to hoarding behavior (Columbus, 2021; Nowak et al., 2020), Agreeableness was expected to be negatively related to hoarding behavior. A past study found that there is a positive relationship between Conscientiousness and hoarding behavior (Garbe et al., 2020). However, it is possible that highly conscientious individuals do not buy more products than they need because they control their impulsive inclinations and adhere to norms and rules. The relationship that Extraversion and Openness share with hoarding behavior has not been adequately explored.

This study also examined the role of dispositional greed (in addition to the Big Five personality traits). Dispositional greed is characterized by a desire to acquire more resources and chronic dissatisfaction (the feeling of never having enough; Seuntjens et al., 2015). Dispositional greed has been found to predict selfish behavior in experimental economic games (Seuntjens et al., 2015), impulsive buying behavior (Masui, Shimotsukasa, Sawada, & Oshio, 2018; Seuntjens et al., 2015), and other behaviors theoretically related to greed (Mussel & Hewig, 2016). Dispositional greed is modestly and negatively related to Agreeableness and positively related to Neuroticism ($r = 0.13-0.27$; Masui, Shimotsukasa, Sawada, & Oshio, 2018; Seuntjens et al., 2015). Thus, there is some level of conceptual overlap between dispositional greed and each Big Five personality trait. Variance in hoarding behavior can be comprehensively estimated by examining the role of dispositional greed and the Big Five personality traits because dispositional greed includes dimensions that are not subsumed under the Big Five model (Mussel & Hewig, 2016).

2. Materials and methods

2.1. Participants and procedure

We created an online questionnaire using the survey platform operated by iBridge Inc. (Japanese company; <https://freeeasy24.research-plus.net/>). Participants were recruited from a survey panel of approximately 4.5 million individuals. This survey was conducted among individuals who were living in Tokyo in May 2020, when a state of emergency had been declared (Prime Minister's Office of Japan, 2020). During this period, countermeasure and essential products, such as masks and toilet paper, were sold out in Tokyo, and the Tokyo Metropolitan Government (2020) had requested residents to stay home as much as possible. These factors reinforced intentions to hoard among residents.

A past study found that the index of stocked toilet paper was significantly correlated with Honesty-Humility, Conscientiousness, and Openness (Garbe et al., 2020). The correlation coefficients that emerged for Honesty-Humility, Conscientiousness, and openness were 0.11, 0.10, and -0.10 , respectively. We conducted power analysis using the R package "pwr" (Champely, 2018) and the following specifications: statistical power = 80%, significant level = 5%, and correlation coefficient = 0.11. The required sample size was 646 participants. Accordingly, 600 Japanese adults (300 women, $M_{age} = 44.39$, $SD_{age} = 8.48$) were recruited. There was an equal representation of men and women and individuals in their 30s, 40s, and 50s. We excluded 70 adults who had chosen the same response option for all the scale items, including the reverse-scored items (i.e., the BFS-S and the PVD). The final sample consisted of 530 Japanese adults (274 women, $M_{age} = 44.26$, $SD_{age} = 8.43$). We conducted power analysis using the following specifications: statistical power = 80%, 5% significance level, and 530 participants. The analysis yielded an r -value of 0.12.

2.2. Measures

2.2.1. Hoarding behavior

We measured hoarding behavior using eight items, which pertained to products that were in demand during the COVID-19 pandemic (i.e., face mask, toilet paper, tissue paper, rubbing alcohol, hand soap, wet tissue, rice, and instant food). The following question was presented: "When compared to last year, how many units of this product did you purchase between February and April 2020?" Items were rated on a 7-point scale that ranged from 1 (did not purchase) to 7 (purchased a lot).

Exploratory factor analysis with maximum likelihood procedure extracted a one-factor solution consisting of all the 8 items. Factor loadings, intercorrelations, and descriptive statistics for the 8 items are shown in Table 1. The correlation coefficients ranged from 0.24 to 0.68, and all factor loadings were greater than 0.47. The eight items yielded an acceptable internal consistency coefficient (Cronbach's alpha = 0.85). Therefore, the mean score was used as a measure of hoarding behavior.

2.2.2. Big Five Scale

We measured the Big Five personality traits using a short form of the Big Five Scale (BFS-S; Namikawa et al., 2012). This scale consists of 29 personality adjectives (in Japanese): Extraversion = 5 items (e.g., sociable, talkative), Agreeableness = 6 items (e.g., kind, quarrelsome; reverse), Conscientiousness = 7 items (e.g., planful, careless; reverse), Neuroticism = 5 items (e.g., worry-prone, anxious), and Openness = 6 items (e.g., intelligent, a wide range of interests). Items are rated on a 7-point Likert scale that ranges from 1 (strongly disagree) to 7 (strongly agree). We used the mean scores that emerged for each of the Big Five personality traits. The Cronbach's alpha coefficients that emerged for Extraversion, Agreeableness, Conscientiousness, Neuroticism, and Openness were 0.87, 0.78, 0.86, 0.92, and 0.87, respectively.

Table 1
Factor loadings, intercorrelations among hoarding behavior item scores, and descriptive statistics.

Item	FL	1	2	3	4	5	6	7	Mean	SD
1 Face mask	0.62								3.72	1.98
2 Toilet paper	0.74	0.37							4.33	1.47
3 Tissue paper	0.73	0.43	0.68						4.17	1.51
4 Alcohol for disinfection	0.66	0.52	0.40	0.38					3.27	1.91
5 Hand soap	0.74	0.45	0.51	0.52	0.53				3.83	1.67
6 Wet tissue	0.73	0.53	0.46	0.50	0.61	0.58			3.47	1.82
7 Rice	0.56	0.29	0.53	0.42	0.31	0.39	0.32		4.07	1.58
8 Instant food	0.47	0.24	0.42	0.35	0.25	0.33	0.27	0.39	4.51	1.38
Proportion of variance	0.44									

Note. Correlation coefficients are significant at $p < .001$. FL = factor loading.

2.2.3. Dispositional greed

Dispositional greed was assessed using Japanese version of the Dispositional Greed Scale (J-DGS; Masui, Shimotsukasa, Sawada, & Oshio, 2018), which is a translation of the 7-item DGS (Seuntjens et al., 2015). We used the mean of the seven individual item scores. The Cronbach's alpha of the scale was 0.83.

2.2.4. Other variables

A past study found that individuals with high perceived vulnerability to disease tend to experience anxiety associated with COVID-19 and engage in preventive behaviors (Makhanova & Shepherd, 2020). Perceived vulnerability to disease is also related to Neuroticism (Duncan et al., 2009; Fukukawa, Oda, Usami, & Kawahito, 2014). We controlled for perceived vulnerability to disease because this study focused on one's overall personality rather than his or her tendency to respond to specific stimuli. Perceived vulnerability to disease was assessed using the Japanese version scale (PVD-J; Fukukawa, Oda, Usami, & Kawahito, 2014), which was originally developed by Duncan et al. (2009). The PVD-J consists of 15 items and 2 factors: perceived infectability and germ aversion. We used the mean score that emerged for each factor. The Cronbach's alpha coefficients yielded by the perceived infectability and germ aversion dimensions were 0.76 and 0.72, respectively.

We also included age, sex (0 = women, 1 = men), living arrangement (1 = single-person household), and ease of access as control variables. We determined whether a participant was living arrangement using the item that assessed the number of household members. Ease of access to products was assessed using the following item: "When compared to the time period between February and April 2019, how easy was it to buy the following products between February and April 2020?" The participants rated each of eight items (face mask, toilet paper, tissue paper, rubbing alcohol, hand soap, wet tissue, rice, and instant food) on a 7-point scale that ranged from 1 (very difficult to buy) to 7 (very easy to buy). We used the mean of the 8 individual item scores (Cronbach's alpha = 0.88).

2.3. Statistical analysis

First, we conducted correlation analysis to examine the relationship between personality traits and hoarding behavior. Second, we conducted multiple regression analysis to identify the personality predictors of hoarding behavior after controlling for the aforementioned covariates. Personality traits (i.e., the BFS-S and the J-DGS), perceived infectability, germ aversion, age, sex, living arrangement, and ease of access served as the independent variables in the analysis. We used R (R Core Team, 2019) to conduct all statistical analyses.

2.4. Ethical considerations

This study was conducted after ethical approval was obtained from the research ethics review board of Teikyo Junior College (application number 17). The survey items did not require participants to provide personally identifiable information. The participants were informed

about the survey purpose and method and assured that personally identifiable information will not be collected. They took part in this survey after consenting them.

3. Results

Table 2 presents means, standard deviations, and correlation coefficients for the relationships between personality traits, hoarding behavior, and the other study variables. Hoarding behavior was positively related to Extraversion, Neuroticism, Openness, and dispositional greed. Hoarding behavior was also negatively associated with (single-person household) living arrangement and positively associated with ease of access to essential and countermeasure products. Correlations between tendencies to hoard each product and personality traits are presented in Table S1 on supplementary material.

We conducted multiple regression analysis to examine the relationship between hoarding behavior and personality traits after controlling for the effects of each covariate (Fig. 1). The BFS-S and the J-DGS scores were entered as independent variables after controlling for other variables. Agreeableness, Neuroticism, Openness, and dispositional greed had significant positive effects on hoarding behavior. Moreover, individuals from single-person households were more likely to have engaged in hoarding behavior. Ease of access to products was also associated with hoarding behavior. Supplementary Material presents the results of the multiple regression analysis including unstandardized and standardized partial regression coefficients with a table (Table S2).

4. Discussion

This study investigated the relationship between personality traits and hoarding behavior during the COVID-19 pandemic. Hoarding behavior was positively related to Neuroticism, Openness, and dispositional greed, even after perceived vulnerability to disease and demographic variables were controlled for. There was a significant positive correlation between hoarding behavior and Extraversion. The results of regression but not correlation analysis revealed that Agreeableness was significantly related to hoarding behavior.

The emergent relationship between high Neuroticism and hoarding behavior corresponds to the findings of a past study (Garbe et al., 2020). Both dimensions of the PVD-J (i.e., perceived infectability and germ aversion) were unrelated to hoarding behavior, but there was a correlation between Neuroticism and scores on the PVD-J (Duncan et al., 2009; Fukukawa, Oda, Usami, & Kawahito, 2014). This suggests that hoarding behavior is elicited by fear of product shortage rather than the threat of COVID-19 transmission.

Agreeableness was positively related to hoarding behavior, when dispositional greed and the other Big Five personality traits were controlled for, but there was no significant bivariate correlation between Agreeableness and hoarding behavior. This finding, which emerged when dispositional greed and other personality traits were controlled for, indicates that hoarding behavior is influenced by the dimension of sympathy for others (compassion) rather than respect for others (trust).

Table 2
Means, standard deviations, and zero-order correlations among the study variables.

Variable	1	2	3	4	5	6	7	8	9	10	11	12	Mean	SD
1 Hoarding behavior													3.92	1.18
2 Extraversion	0.16***												3.84	1.15
3 Agreeableness	0.06	0.37***											4.11	0.90
4 Conscientiousness	-0.05	0.25***	0.47***										4.24	1.00
5 Neuroticism	0.14***	-0.29***	-0.33***	-0.31***									4.27	1.26
6 Openness	0.21***	0.57***	0.29***	0.27***	-0.19***								3.75	1.04
7 Dispositional greed	0.23***	-0.01	-0.23***	-0.26***	0.29***	0.15***							3.80	1.00
8 Perceived infectability	0.00	-0.13**	-0.11**	-0.10**	0.21***	-0.09*	0.08						3.71	0.90
9 Germ aversion	0.06	-0.08	0.01	0.13**	0.13**	-0.06*	0.11*	0.08					4.53	0.90
10 Age	-0.01	0.03	0.06	0.10*	-0.12**	0.10	-0.05	0.00	0.07				44.26	8.43
11 Sex	-0.04	-0.08	0.05	-0.09*	-0.04	0.08	0.04	0.04	-0.17***	0.01			0.48	0.50
12 Living arrangement	-0.28***	-0.13**	0.05	0.00	-0.02	-0.04	-0.03	0.02	-0.01	-0.07	0.10*		0.29	0.45
13 Ease of access to products	0.14**	0.01	0.04	-0.05	-0.03	0.16***	0.07	0.00	-0.18***	-0.05	0.19***	0.03	2.83	0.88

Note. Sex (0 = women, 1 = men) and living arrangement (1 = single-person household) served as dummy variables.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

Because highly compassionate individuals tend to be considerate of others, they may not purchase and hoard products. However, highly compassionate individuals tend to be perceptive and act in accordance with contextual demands (Roccas, Sagiv, Schwartz, & Knafo, 2002). Nakayachi et al. (2020) found that many Japanese individuals were motivated to wear masks, not as a protective measure against COVID-19 transmission but because it was the norm to do so (i.e., everyone was wearing a mask). Thus, highly agreeable individuals may have bought products in accordance with current trends and the behaviors of those around them.

There was no significant relationship between Conscientiousness and hoarding behavior. Garbe et al. (2020) reported small coefficients for Conscientiousness. Garbe et al. (2020) also underscored the anticipatory process through which highly conscientious individuals purchase more products because they foresee and prepare for the future. However, they also noted that self-control may reduce hoarding behavior. Thus, distinct patterns may be valid for the different facets of Conscientiousness. Conscientiousness includes several dimensions (Roberts et al., 2014), and each dimension is related to different outcomes (Bogg & Roberts, 2004). Therefore, it is necessary to examine the relationship between hoarding behavior and each dimension of Conscientiousness.

Correlation analysis revealed that Extraversion was related to hoarding behavior, but this relationship was not significant when the other study variables were controlled for. Table 2 shows that there was a significant negative correlation between Extraversion and living arrangement (single-person household). Many Japanese individuals live alone, but highly extraverted individuals may live with others because they enjoy interpersonal interactions. Multiple regression analysis revealed that those who were living with others tended to hoard products. It is possible that living with others motivates one to buy more products (e.g., masks and food) for their cohabitants. The present findings underscore the mechanisms that underlie hoarding behavior. On the other hand, there may have been negative relationships between Extraversion and hoarding behavior from the perspective of other personality concept. Optimists, who are generally extrovert (Sharpe, Martin, & Roth, 2011), are not likely to be concerned situations in which they are difficult to buy products because they have positive expectations about future. However, the present findings would suggest the COVID-19 pandemic and the short supply were too severe for even extroverts to keep positive affectivity which is common to optimism (Sharpe, Martin, & Roth, 2011).

Openness was positively related to hoarding behavior. Openness includes the dimension of imaginativeness (John et al., 2008) and predicts various kinds of creativity such as divergent thinking (Silvia, Nusbaum, Berg, Martin, & O'Connor, 2009). Open people could come up with some ideas of prevention strategies. Being open helps individuals tackle novel situations effectively by visualizing precautions. Consequently, they may adopt hoarding behaviors as a preventive strategy.

Individuals with high levels of greed were more likely to have hoarded products. Moreover, there were significant correlations between dispositional greed and tendencies to hoard each product (Supplementary Material Table S1). These tendencies are consistent with the definition of greed (Seuntjens et al., 2015). Past studies have found that dispositional greed predicts greedy behavior in general (Mussel & Hewig, 2016). However, there is little evidence of the relationship between dispositional greed and specific behaviors in daily life. The present findings offer empirical support to the predictive validity of dispositional greed.

In this study, there were relationships between personality traits and hoarding behavior. However, the effect sizes were not large (e.g., significant correlation coefficients = 0.14–0.23). In a past study on individual differences, the fiftieth percentile corresponded to a correlation coefficient of 0.19 (Gignac & Szodorai, 2016). Thus, the emergent effect sizes were relatively medium. Furthermore, when investigating significant social outcomes, it is important to examine the relationships between the outcome variable and personality traits even if the effect size

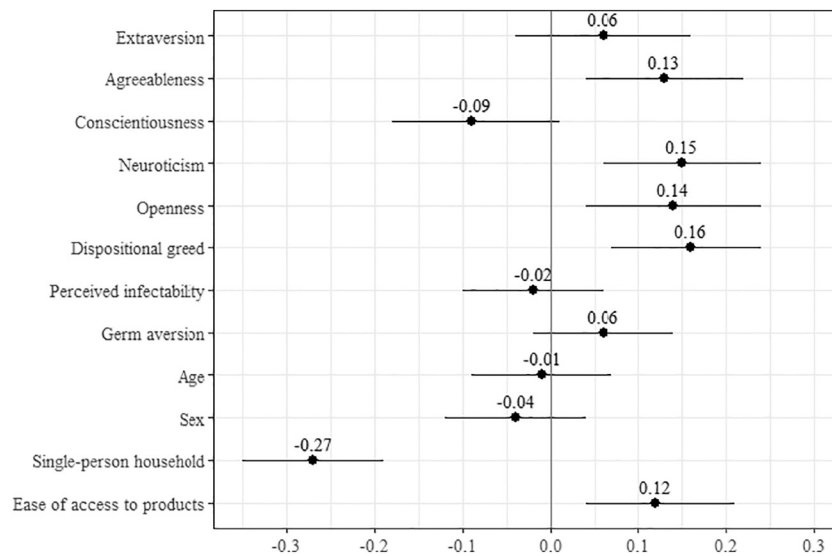


Fig. 1. Standardized partial regression coefficients on multiple regression analysis predicting hoarding behavior.

Note. Interval bars show the range of 95% confidence interval. Sex (0 = women, 1 = men) and single-person household (= 1) served as dummy variables.

is small (Roberts et al., 2007). Hoarding behaviors are not beneficial to society because the number of individuals who lack access to countermeasure products and resell these products at high prices increase (Wit & Wilke, 1992). Therefore, it is important to identify the characteristics of individuals who hoard such products to prevent excessive hoarding. The present findings on the relationship between the Big Five personality traits, dispositional greed, and hoarding behavior render a characteristic profile of individuals who engage in hoarding behavior.

5. Limitations and conclusions

This study has three limitations. First, this study did not examine the processes that underlie the relationship between personality traits and hoarding behavior. Each trait appears to be involved in these processes, but these speculations have not been empirically tested. The effect of personality traits on hoarding behavior should be tested empirically. Second, the generalizability of the emergent relationships to other cultures and countries is questionable. Countries differ in not only individualism and collectivism but also the extent of COVID-19 transmission and the countermeasures adopted against COVID-19 transmission. Therefore, the validity of the present findings should be tested using samples of individuals from different social backgrounds and countries. Third, future studies should examine whether the present findings can be replicated during other public emergencies. Indeed, because many natural disasters (e.g., earthquake, typhoon) have struck Japan, hoarding behavior may emerge as a social problem.

We examined the relationship between personality traits and hoarding behavior during the COVID-19 pandemic in Japan. Although this study didn't reveal the causal direction between them, the results suggested the likelihood that personality traits predict specific behavior even in case of emergency such as COVID-19. Additionally, hoarding behavior is an important social problem because many people can't take essential and countermeasure products, as a result, increase the risk of infection. It needs to indicate the cause of hoarding behavior from some perspectives, including individual differences, to prevent the secondary damage of COVID-19.

CRedit authorship contribution statement

Shinya Yoshino: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Validation, Visualization, Writing – original draft. **Tadahiro Shimotsukasa:**

Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Writing – review & editing. **Yasuhiro Hashimoto:** Conceptualization, Writing – review & editing. **Atsushi Oshio:** Conceptualization, Funding acquisition, Methodology, Supervision, Writing – review & editing.

Declaration of competing interest

None.

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Data availability statement

We didn't obtain informed consent about sharing dataset in public. You can contact us if you have any questions about the dataset and the survey. Analysis script on R is shared in Open Science Framework: <https://osf.io/9j58t/>.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.paid.2021.110927>.

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