Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Personality and Individual Differences 183 (2021) 111127

Contents lists available at ScienceDirect

Personality and Individual Differences

journal homepage: www.elsevier.com/locate/paid

Individualism-collectivism during the COVID-19 pandemic: A field study testing the pathogen stress hypothesis of individualism-collectivism in Korea

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ARTICLE INFO

Keywords:
Individualism/collectivism
Pathogen stress hypothesis
COVID-19
Culture

ABSTRACT

The pathogen stress hypothesis posits that pathogen-related threats influence regional and individual differences in collectivism since behavioral practices associated with collectivism limit the spread of infectious diseases. In support of the hypothesis, previous research demonstrates the association between individualism/collectivism and pathogen stress based on historical records or experimental manipulation. However, it is still unclear whether individuals would indeed value collectivism during the outbreak of infectious diseases. Thus, we investigated the concurrent effects of pathogen-related stress on the endorsement of individualism/collectivism by examining 9322 Koreans for 14 weeks of the COVID-19 pandemic. The results revealed that the level of collectivism among respondents were higher after than before the COVID-19 outbreak. Moreover, the average level of collectivism on a given day showed a significant association with the number of confirmed COVID-19 cases on the same day during the outbreak. Interestingly, individualism did not significantly change for the same period.

1. Introduction

The individualism-collectivism is one of the most important dimensions explaining cultural variations in psychological processes (Heine, 2008). Numerous differences across cultures have been analyzed under the rubric of individualism/collectivism (e.g., Oyserman et al., 2002). Furthermore, other dimensions in cultural psychology are discussed in relation to individualism/collectivism (Gelfand et al., 2011; Varnum et al., 2010). In addition to demonstrating cultural differences, researchers examine why a certain culture becomes individualistic/collectivistic to begin with. For example, individualism/collectivism is connected to various factors such as modernization in socioeconomic structures (Greenfield, 2009; Inglehart & Baker, 2000) and subsistence styles (Talhelm et al., 2014). Of particular relevance to the present research, pathogen prevalence is proposed as an ecological foundation of collectivism (Fincher et al., 2008). Specifically, infectious diseases impose selection pressures on psychological tendencies associated with collectivism such as conformity or vigilance towards strangers since they serve defensive functions against the spread of infectious diseases. Consistent with the reasoning, numerous research shows the association between historical records of pathogen prevalence and collectivism (e.g., Morand & Walther, 2018; Murray & Schaller, 2010; van Leeuwen et al., 2012). More recently, experimental manipulation of pathogen threat has been shown to lead to increase in collectivistic behaviors (Mortensen et al., 2010; Wu & Chang, 2012). However, natural experiments showing a temporal change of collectivism after the outbreak of an infectious disease are largely lacking. The COVID-19 pandemic provides a rare opportunity to monitor temporal changes of collectivism before and after the outbreak of pathogens. Thus, we investigated whether individuals would endorse collectivistic values more strongly during the COVID-19 outbreak than before the outbreak.

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https://doi.org/10.1016/j.paid.2021.111127
Received 6 January 2021; Received in revised form 13 June 2021; Accepted 8 July 2021
Available online 20 July 2021

1.1. Pathogen prevalence and individualism/collectivism

Pathogens pose substantial threats to health and fitness across species (Daszak et al., 2000) and consequently, humans, like other animals, have come up with behavioral immune systems that potentially inhibit the transmission of infectious diseases (Schaller, 2011; Terrizzi et al., 2013). For example, avoiding outsiders can limit the spread of infection and infection-related threats indeed intensify xenophobic responses (Faulkner et al., 2004). Likewise, extraversion decreases in response to infectious diseases presumably because interpersonal contacts may facilitate the transmission of pathogens (Murray et al., 2011). An interesting development in the literature is a hypothesis that pathogen-related threats give rise to the multi-faceted value systems of collectivism (Fincher et al., 2008). The hypothesis posits that critical features of collectivism such as a sharp distinction between in-groups and out-groups are linked to behavioral practices serving anti-pathogen functions. Previous research garners initial support to the hypothesis. For example, Murray and Schaller (2010) created an index of historical prevalence of infectious diseases and discovered its association with collectivism across 230 geopolitical regions. Likewise, pathogen prevalence is associated with various practices characterizing collectivism like in-group biases (Cashdan & Steele, 2013) and conformity (Murray et al., 2011). Moreover, one's threat responses to infectious diseases is shown to be related to individualism/collectivism measured at both the individual (Germani et al., 2020; Kim et al., 2016) and the group levels (Kim et al., 2016). Most recently, researchers showed that the region-level individualism in the U.S. negatively affected social distancing policy compliance during the COVID-19 pandemic (Bian et al., 2020). These findings are consistent with the view of collectivism as social defense against infectious diseases.

However, past studies that showed the link between pathogen-threat and collectivism used historical records of pathogen prevalence or experimentally-induced pathogen threat. Accordingly, they do not allow for examining the concurrent impact of infectious diseases on one's endorsement of collectivistic values. The present research attempted to fill this gap and examined the immediate association between infectious diseases and individualism/collectivism by exploiting the opportunity generated by the COVID-19 pandemic.

1.2. Present research

At the time of writing this paper, more than 174 million people were infected worldwide with the death toll of approximately 3.7 M. Thus, researchers from various disciplines have been investigating its impact not only on health-related issues (Abbas, 2020, 2021) but also on other economic and cultural factors (Su et al., 2021). The present research attempted to add to this emerging literature by testing the relations between pathogen-related threat and individualism/collectivism. Unlike other recent outbreaks such as the MERS or Ebola whose impacts were largely local, the threats of COVID-19 are widespread enough for individuals to feel realistic pathogen-related stress. In fact, the World Health Organization officially declared a fifth pandemic for COVID-19. Therefore, the COVID-19 pandemic sets the stage for a field study to investigate whether and (if so) how pathogen-related threat would be associated with the endorsement of individualism/collectivism.

We investigated how strongly Korean valued individualism-collectivism for 14 weeks starting on January 1st, 2020 about three weeks before the first confirmed patient was reported in South Korea. Specifically, we examined whether Koreans' endorsement of individualism/collectivism would differ before and after the first confirmed case. In addition, we investigated how the daily average of individualism/collectivism would be associated with the daily number of confirmed COVID-19 cases.

2. Methods

2.1. Participants

A total of 9322 individuals completed the survey on individualism/collectivism during the study period (January 1st, 2020 to April 7th, 2020). The survey was performed by Kakao Corporation, one of the largest Internet companies in South Korea, using its online survey platforms. The company provides the survey through its main application, KakaoTalk, and one of its websites (http://together.kakao.com/hello), and the users can respond to the survey voluntarily at any time and across multiple times (Choi et al., 2020). Due to the privacy policy of the company the collection of participants' demographic information was limited to age, gender, and region of residence. Secondary data analysis of the Kakao survey was approved by the Institutional Review Board of Kangwon National University (#201910009002).

The respondents aged from 14 to 68 ($M_{age} = 28.09$, $SD_{age} = 9.05$),[1] of which the large majority were female (82.07%). The residential areas of the respondents reflected the regional distribution of the South Korean population. About 3.07% participants responded at multiple occasions, and the maximum number of responses per person was 7. More detailed information about demographic characteristics of the sample is provided in Table 1.

2.2. Measures

2.2.1. Individualism/collectivism

A total of 16 items were used to measure individualism and collectivism. These items were originally from the scale developed by Singelis et al. (1995) consisting of 32 items. Later, Triandis and Gelfand (1998) used a modified version of Singelis et al. (1995) scale consisting of 27 items. We used the 16 items that had the higher loadings in Triandis and Gelfand (1998), where individualism and collectivism were measured using eight items each. The sample items include "I'd rather depend on myself than others (Individualism)." and "I feel good when I cooperate with others (Collectivism)." Participants indicated their agreements on a 7-point Likert scale (1: do not agree at all; 7: strongly agree). The individualism and collectivism scores were calculated by averaging participants' responses on the 8 individualism items ($\alpha = .70$) and the 8 collectivism items ($\alpha = .77$), respectively.

2.2.2. Daily confirmed cases of COVID-19

COVID-19 related threats were measured by daily confirmed cases of

Table 1
Demographic characteristics of the sample ($N = 9322$).

Variable	Levels	Frequency	Percentage
Age	10s	2317	24.86
	20s	4014	43.06
	30s	2060	22.10
	40s	642	6.87
	50s	237	2.54
	60s or older	52	0.56
Gender	Female	7651	82.07
	Male	1671	17.92
Region	Daegu/Gyeongbuk	741	7.95
	Others	8581	92.05
Number of responses per person	1	9036	96.93
	2 or more	286	3.07

[1] The range, mean, and standard deviation of age were calculated from the 8286 participants whose birth year information was collected. The remaining 1036 respondents only indicated which age group they belong to (10s, 20s, 30s, 40s, 50s, and 60s or older).

COVID-19 in Korea. We used the data provided by the Korean Disease Control and Prevention Agency (http://www.kdca.go.kr/board/board.es?mid=a30402000000&bid=0030). Recently, Nelson et al. (2020) showed that log-transformed global and regional confirmed cases are positively associated with COVID-19 concern. Thus, we log-transformed the confirmed cases to use them as proxies for COVID-19 related threats.

2.3. Analytic strategies

If the pathogen stress hypothesis of collectivism is indeed correct, we should expect two patterns of responses. First, individuals, on average, should value collectivism more strongly after the COVID-19 infection started (Jan. 20–Apr. 7) than before it did (Jan. 1–19). We regarded January 20th, 2020 as the starting day of the COVID-19 spread, when South Korea announced its first confirmed case. Second, the levels of collectivism should be significantly associated with COVID-19 related threats (e.g., the number of daily confirmed cases) during the COVID-19 outbreak. For this analysis, we used a subset of data that were collected from 7586 participants during the outbreak period when daily confirmed cases were recorded.

Demographic characteristics were included as control variables in all analyses. For simplicity, age was categorized into three groups (young: 10–20s, middle: 30–40s, old: 50s or older), and region was dichotomized into Daegu/Gyeongbuk (the hardest hit region during the study period) and others.[2] All analyses were performed in the framework of multilevel models, more specifically random intercept models, considering that some participants responded multiple times. All model parameters were estimated via maximum likelihood estimation method using *lme4* package (Bates et al., 2015) in R. Significance tests for the estimated parameters were performed using *lmerTest* package (Kuznetsova et al., 2017) in R with Satterthwaite's degrees of freedom method. Considering the large sample size and potential issues with multiple comparisons, we adopted a more conservative approach using the testwise significance level of 0.001.

3. Results

3.1. Difference in individualism/collectivism before and after COVID-19

We first tested the difference in individualism and collectivism between the two time periods: before (Jan 1–19) and during the COVID-19 outbreak (Jan 20–Apr 7). If the pathogen stress hypothesis is correct, the endorsement of collectivistic values should be higher during the COVID-19 outbreak than before the outbreak. As shown in Table 2, the results showed such pattern. Specifically, no significant difference was found for the level of individualism ($b = -0.0105$, $SE = 0.0227$, $p = .6426$), whereas the level of collectivism was significantly higher during the COVID-19 outbreak as compared to the pre-COVID-19 period ($b = 0.0872$, $SE = 0.0253$, $p = .0006$).

3.2. Association between individualism/collectivism and COVID-19 related threats

The difference between before and during the outbreak was consistent with the pathogen stress hypothesis. However, the higher level of collectivism during the outbreak might be due to other factors than pathogen-related threats. Hence, more direct evidence is necessary such as an association between collectivism and the daily number of confirmed COVID-19 cases. Before testing the association, we decided to look at the trajectory of individualism/collectivism during the outbreak in order to see whether the trajectory would mimic the trajectory of the daily number of confirmed COVID-19 cases in Korea. Fig. 1 shows the trajectories of average daily individualism/collectivism levels and log-transformed daily confirmed cases of COVID-19 in Korea during the study period.[3] Fig. 1 does not present results from statistical analyses. However, they still provide rough information about patterns of change in individualism/collectivism and their association with COVID-19 related threats. Individualism did not show any clear pattern of change during the study period. On the other hand, collectivism showed an increasing pattern during the period when daily confirmed cases were rapidly increasing, which was followed by a plateau as daily confirmed cases flattened. These patterns of change may imply that COVID-19 related threats and collectivism are linked to some extent.

We then examined if individualism and collectivism levels were associated with daily confirmed cases. As shown in Table 3, individualism levels were not significantly associated with daily confirmed cases ($b = -0.0002$, $SE = 0.0043$, $p = .9621$). On the other hand, collectivism levels were significantly and positively associated with daily confirmed cases ($b = 0.0203$, $SE = 0.0048$, $p < .0001$). This result implies that increased pathogen-related threats may lead to an increased endorsement of collectivism as the pathogen prevalence hypothesis predicts. We obtained similar results when we considered daily global confirmed cases as a predictor variable. See the supplementary material for more detailed results (Table S1 and Fig. S1).[4]

4. Discussion

The present research is the first field study that confirmed the link between pathogens and collectivism in the context of COVID-19. Koreans, on average, valued collectivism more during than before the COVI-19 outbreak. Moreover, the daily average of collectivism was significantly associated with the daily number of confirmed COVID-19 cases. Taken together, the results are consistent with the main premise of the pathogen stress hypothesis that pathogen-related threats are an ecological foundation of collectivism. Our finding is particularly interesting in that the rise of collectivism occurred in an already highly collectivistic culture. Since Korea is among the most collectivistic cultures (Hofstede, 1980), one might expect that the hypothesized rise of collectivism would be unlikely. In spite of being a conservative test, the present finding speaks to the concurrent impact of infectious diseases on collectivism. Most past research has shown that *historical* pathogen prevalence is associated with collectivism (e.g., Murray & Schaller, 2010). Yet, our data demonstrates that *concurrent* pathogen-related threats may indeed give rise to collectivism in individuals who are living through the epidemic.

The current finding also has important implications for previous research where the pathogen stress hypothesis was pitted against other hypotheses regarding the origin of individualism/collectivism (e.g., Talhelm et al., 2014; Talhelm et al., 2018). These studies showed that historical pathogen prevalence showed weaker association with individualism/collectivism than other factors such as rice farming. However, unlike in the present research, participants in these studies did not go thorough major epidemics. Then, our findings suggest that pathogen prevalence may play a more critical role than previously believed in shaping individualism/collectivism when concurrent pathogen-related stress are considered.

It is also interesting that individualism did not change during the pandemic. Although individualism and collectivism are often conceptualized as the opposite poles of the same dimensions (Hofstede, 1980), empirical data show that they might be two independent dimensions

[2] Age and region of residence were originally measured using six age groups (10s, 20s, 30s, 40s, 50s, and 60s or older) and 17 administrative districts of Korea, respectively. Using the original levels in the analyses did not make any substantial change in the results.

[3] The method used for obtaining the smooth trajectories is described in the supplementary material.

[4] The log-transformed number of cases in Korea significantly correlated with the log-transformed number of global cases, $r = .39$, $p = .0003$.

Table 2
The results of examining the differences in individualism before and after the COVID-19 outbreak ($N = 9322$).

Dependent variable	Effects	Estimate	*SE*	*df*	*t*	*p*
Individualism	Intercept	4.9381	0.0294	9545.85	167.72	<.0001
	After[a]	−0.0105	0.0227	9646.40	−0.46	.6426
	Middle[b]	0.0727	0.0200	9391.35	3.63	.0003
	Old[c]	0.2090	0.0524	9487.05	3.99	<.0001
	Female[d]	−0.1729	0.0236	9408.61	−7.34	<.0001
	Region[e]	0.0470	0.0332	9388.55	1.42	.1571
Collectivism	Intercept	4.8393	0.0327	9502.59	147.82	<.0001
	After[a]	0.0872	0.0253	9622.08	3.45	.0006
	Middle[b]	−0.0113	0.0223	9349.79	−0.51	.6132
	Old[c]	0.4425	0.0583	9486.74	7.59	<.0001
	Female[d]	−0.1935	0.0262	9368.88	−7.39	<.0001
	Region[e]	−0.0089	0.0369	9346.90	−0.24	.8097

[a] After is a dummy variable that was coded 1 for the observations made after the COVID-19 outbreak and 0 otherwise.
[b] Middle is a dummy variable that was coded 1 for middle-aged group and 0 otherwise.
[c] Old is a dummy variable that was coded 1 for old-aged group and 0 otherwise.
[d] Female is a dummy variable that was coded 1 for females and 0 for males.
[e] Region is a dummy variable that was coded 1 for Daegu/Gyeongbuk region and 0 otherwise.

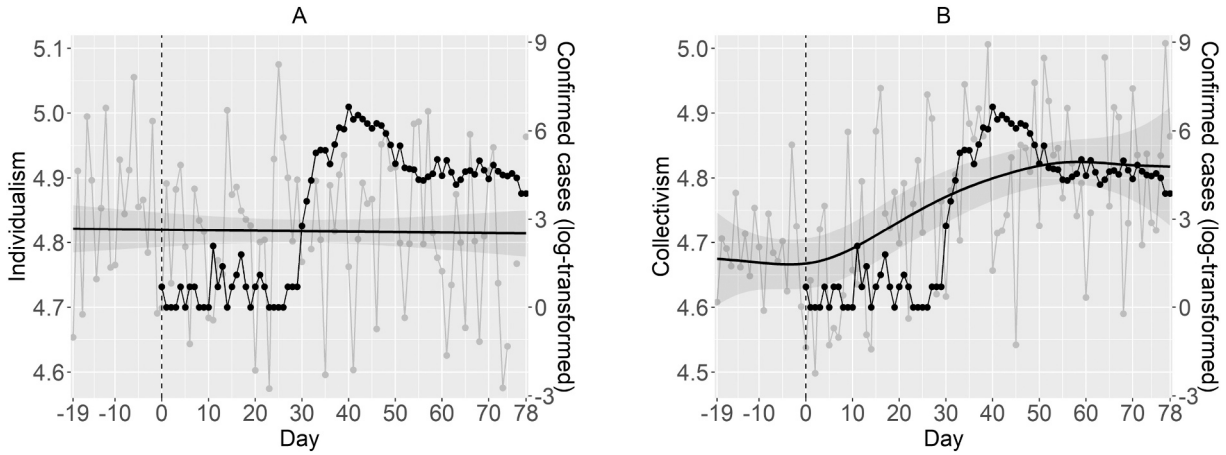

Fig. 1. Patterns of change in individualism and collectivism over the study period overlaid with trajectories of daily confirmed cases of COVID-19 in Korea. Thick solid lines indicate the smoothing curves fitted to the scores on individualism (panel A) and collectivism (panel B). Gray bands around the thick solid lines indicate the 95% confidence intervals for the curves. Gray dots connected with lines indicate daily average levels of individualism (panel A) and collectivism (panel B). In both panels, black dots connected with lines are log-transformed daily confirmed cases of COVID-19 in Korea, and dotted vertical lines indicate the starting day of COVID-19 spread in Korea.

Table 3
The association between individualism/collectivism and daily confirmed cases of COVID-19 in Korea ($N = 7586$).

Dependent Variable	Effect	Estimate	*SE*	*df*	*t*	*p*
Individualism	Intercept	4.9211	0.0306	7676.40	160.91	<.0001
	Cases in Korea[a]	−0.0002	0.0043	7779.93	−0.05	.9621
	Female[b]	−0.1665	0.0263	7619.41	−6.33	<.0001
	Middle[c]	0.0801	0.0224	7622.22	3.57	.0004
	Old[d]	0.2661	0.0571	7692.45	4.66	<.0001
	Region[e]	0.0191	0.0368	7633.62	0.52	.6026
Collectivism	Intercept	4.8614	0.0339	7647.24	143.41	<.0001
	Cases in Korea[a]	0.0203	0.0048	7766.07	4.27	<.0001
	Female[b]	−0.1979	0.0292	7586.18	−6.78	<.0001
	Middle[c]	−0.0335	0.0249	7590.03	−1.35	.1777
	Old[d]	0.4100	0.0633	7681.11	6.47	<.0001
	Region[e]	−0.0240	0.0407	7604.76	−0.59	.5552

[a] Cases in Korea is the natural log transformed number of daily confirmed cases of COVID-19 in Korea. To deal with 0 (no confirmed cases), the number of daily confirmed cases +1 was natural log transformed.
[b] Female is a dummy variable that was coded 1 for females and 0 for males.
[c] Middle is a dummy variable that was coded 1 for middle-aged group and 0 otherwise.
[d] Old is a dummy variable that was coded 1 for old-aged group and 0 otherwise.
[e] Region is a dummy variable that was coded 1 for Daegu/Gyeongbuk region and 0 otherwise.

(Brewer & Chen, 2007; Taras et al., 2014). Moreover, recent research demonstrate that individualism/collectivism is a multi-faceted concept whose sub-components are loosely connected to each other (Na et al., 2010; Na et al., 2019). Thus, it would be a worthy endeavor to explore exactly what aspects of individualism/collectivism would be closely related to pathogen-related stress.

Another area for future research is to investigate potential moderators of the association between pathogen-related stress and individualism/collectivism. A rise of collectivism is a behavioral defense mechanism in response to pathogen-related threats. Hence, the probability of a rise of collectivism may depend on the extent to which individuals have confidence in their in-group regarding the ability to fight against pathogens. Then, the fact that South Korea has been one of the few countries that have successfully flattened the curve of COVID-19 (Fisher & Choe, 2020) might play a critical role in obtaining the current finding. Thus, we speculate that the link between COVID-19 and collectivism might depend on how well each nation handled the pandemic. In a similar vein, given the multi-faceted nature of individualism/collectivism, collectivism may take different forms in other countries. Thus, future research needs to investigate whether the trend is replicated in other countries with different levels of medical competence and/or different forms of collectivism. In addition, gender may moderate psychological impacts of COVID-19 as gender plays a critical role in surviving tragedy (e.g., Yoosefi Lebni et al., 2020).

4.1. Limitation

Although the current finding is based on a multi-level analysis considering both between-person and within-person variations, most respondents (approximately, 97%) filled out the individualism-collectivism scale once. Thus, what we reported here may not be a temporal change in one's endorsement of individualism/collectivism. Rather, the present finding might indicate that collectivistic Koreans responded to the survey more after the COVID-19 outbreak than individualistic Koreans. Although there is no a priori reason to believe that such self-selection occurs (Choi et al., 2020), even if it is true, it may suggest that collectivistic individuals are more active during the COVID-19 pandemic, compared to individualistic individuals since the survey was open to everyone not only before but also after the outbreak. Then, it can still be said that collectivism becomes dominant in response to pathogen-related threats.

We also admit that the present research is based on an opportunity sample of online volunteers using the Kakao service. Thus, our participants are predominantly younger adults, in particularly younger women. This raises the issue of generalization and yet, we note that there are enough men (n = 1672) and 40 or older adults (n = 931) although they only account for a small fraction of the current sample. Therefore, we performed additional analyses to examine if the results changed across different demographic groups, and found no significant interactions (see the supplementary materials for the detailed results). Moreover, we note that the Kakao data has been shown to replicate well-established psychological tendencies (e.g., the day-of-week effect in subjective well-being) in spite of similar issues (Suk et al., 2020).

Additionally, given that the individualism-collectivism can be expressed in many different ways such as obedience or in-group favoritism, our measure of individual-collectivism may not fully cover the diverse aspects of the constructs. In particular, we measured respondents' explicit agreement with individualism/collectivism. Thus, future research should address this limitation by incorporating implicit/behavioral measures across different domains. Likewise, it would be also informative to do an in-depth analysis on a specific target group (e.g., Su et al., 2020).

4.2. Conclusion

In conclusion, the present research shows that COVID-19 is making one's cultural contexts more collectivistic. By providing a critical support to the pathogen stress hypothesis of individualism/collectivism, the current finding can add to an emerging literature investigating socio-ecological factors that are linked to individual differences in individualism/collectivism (Talhelm et al., 2014; Uchida et al., 2019; Uskul et al., 2008). Finally, it is also meaningful that the present research recruited non-WEIRD samples, namely Koreans, given that psychological mechanisms are mostly examined with Western and Educated participants from Industrialized, Rich, and Democratic countries (Henrich et al., 2010).

Author note

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CRediT authorship contribution statement

Jinkyung Na: Conceptualization, Methodology, Writing – original draft. **Namhee Kim:** Conceptualization, Investigation, Data curation, Formal analysis, Writing – review & editing. **Hye Won Suk:** Formal analysis, Methodology, Writing – original draft. **Eunsoo Choi:** Investigation, Writing – review & editing. **Jong An Choi:** Project administration, Investigation, Writing – review & editing. **Joo Hyun Kim:** Data curation, Formal analysis, Writing – review & editing. **Soolim Kim:** Data curation, Writing – review & editing. **Incheol Choi:** Conceptualization, Methodology, Project administration, Supervision, Funding acquisition, Writing – review & editing.

Declaration of competing interest

None.

Acknowledgements

We conducted secondary data analysis on the data from Kakao Corporation. Due to the privacy policy of the company, the data cannot be shared in a public/open access repository. However, the data are available from the corresponding author upon request. In addition, this work was supported by Kakao Corporation (#0404-20200007, The Study of Koreans' Daily Happiness).

Appendix A. Supplementary materials

Supplementary materials to this article can be found online at https://doi.org/10.1016/j.paid.2021.111127.

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