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The role of culture on the link between worldviews on nature and psychological health during the COVID-19 pandemic

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ABSTRACT

Worldviews about human's relationship with the natural world play an important role in psychological health. However, very little is currently known regarding the way worldviews about nature are linked with psychological health during a severe natural disaster and how this link may differ according to cultural context. In this study, we measured individual differences in worldviews about nature and psychological health during the 2020 COVID-19 pandemic within two different cultural contexts (Japan and United States). We found that across Japanese and American cultural contexts, holding a harmony-with-nature worldview was positively associated with improved psychological health during the COVID-19 pandemic. We also found that culture moderated the link between mastery-over-nature worldviews and negative affect. Americans showed a stronger link between mastery-over-nature worldviews and negative affect than Japanese. These findings support the biophilia hypothesis and contribute to theories differentiating Japanese and American cultural contexts based on naïve dialecticism and susceptibility to cognitive dissonance.

True Budo is to accept the spirit of the universe, keep the peace of the world, correctly produce, protect and cultivate all beings in nature.

Morihei Ueshiba (Japanese philosopher)

All the laws of nature will bend and adapt themselves to the least motion of man.

Henry David Thoreau (American author and naturalist)

1. Introduction

The way people think about the natural world is linked to many psychological constructs that include well-being, life-satisfaction and vitality (Capaldi et al., 2014). Individual differences in worldviews about nature may be a particularly important individual difference metric linked to psychological health when coping during a severe natural disaster, such as a global pandemic. During the early part of 2020, people across the entire world experienced severe negative impacts to their health, family life and financial stability due to the COVID-19 (coronavirus) pandemic. This study was designed to investigate the way individual differences in worldviews about human's relationship with the natural world correspond to psychological health during the COVID-19 pandemic across two different cultural contexts (Japan and the United States).

Thinking and behaving in ways that are connected and harmonious with nature tends to confer many benefits to psychological health. For example, individual differences in nature connectedness are positively associated with psychological well-being (Nisbet et al., 2011), and happiness (Capaldi et al., 2014) and negatively associated with anxiety (Martyn & Brymer, 2016). Some findings also indicate that experiences with nature serve as preventative medicine (Lee et al., 2012) and that nature connectedness is associated with resilience (Ingulli & Lindbloom, 2013). Although many findings linking nature connectedness with psychological health are based on data collected within Western, individualistic cultural contexts, some evidence also shows that nature connectedness is linked to improved psychological health within other cultural contexts such as in Japan and Russia (Capaldi et al., 2017). These studies support the hypothesis that individual differences in harmony-with-nature worldviews would be positively associated with improved psychological health during the COVID-19 pandemic irrespective of cultural context (Japan and United States).

Another way people tend to think about the natural world is with a mastery-over-nature worldview. A mastery-over-nature worldview

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represents the belief that humans are distinct from nature and have the right and ability to control and exploit nature to their own ends (De Groot et al., 2011). The experience of a natural disaster, such as a global pandemic, likely stands in stark contrast with the worldview that humans are in control of, and ultimately the master of, the natural world. Cognitive dissonance theory posits that experiencing counter-attitudinal information elicits negative affect (Harmon-Jones, 2000; Martinie et al., 2013). Thus, when faced with a natural disaster, holding a mastery-over-nature worldview may yield conflict and thus lead to greater negative affect in comparison to not holding a mastery-over-nature worldview.

There exists some evidence however that cognitive dissonance is not a culturally universal phenomenon (Heine & Lehman, 1997; Hoshino-Browne et al., 2005; Wong, 2009). Several accounts on the link between culture and cognitive dissonance suggest that this may be rooted, in part, by cultural variation in naive dialecticism. Naive dialecticism is the acceptance and/or tolerance of contradiction (Peng & Nisbett, 1999). As compared to Western cultural contexts, many East Asian cultures, such as Japan, tend to be more tolerant of contradiction, as manifested in the domains of the self, emotional experience and attitudes (Spencer-Rodgers et al., 2010).

Cultural differences in naive dialecticism may play a role on the link between mastery-over-nature worldviews and psychological health during a global pandemic. In cultural contexts where naive dialecticism tends to be low, such as the United States, the conflict between the worldview that humans are masters of the natural world (i.e., mastery-over-nature) and evidence that humans are not the masters of the natural world (i.e., severe negative impact of the COVID-19 pandemic) may illicit negative affect. While in cultural contexts where naive dialecticism tends to be high, such as Japan (Spencer-Rodgers et al., 2010), people may be more accepting and tolerant of the apparent conflict between a mastery-over-nature worldview and awareness of the global pandemic, and may thus elicit relatively lower levels of negative affect.

1.1. Overview

This study was designed to elucidate the way worldviews about nature are linked to psychological health during the COVID-19 pandemic. During the height of the 2020 COVID-19 pandemic (May 2020), participants residing in Japan and the United States (US) completed self-report scales to measure 1) impact of the COVID-19 pandemic (personal, family and financial), 2) worldviews on nature (harmony, mastery, subjugation and incremental theory), and 3) psychological health (perceived stress, negative and positive affect). In addition, we also sourced data from a prior large-scale cross-cultural study in Japan and the US, Midlife Development in the Midlife in Japan (MIDJA) and the Midlife Development in the U.S. (MIDUS). We compared levels on each of the psychological health outcome measures collected during the COVID-19 pandemic to data collected prior to the COVID-19 pandemic. We tested three hypotheses: H1: Across cultural contexts, people would report greater psychological distress during the COVID-19 pandemic than prior to the pandemic (MIDJA and MIDUS data); H2: Across cultural contexts, individual differences in harmony-with-nature worldviews would be positively associated with improved psychological health; and H3: Individual differences in mastery-over-nature worldviews would be more strongly associated with negative affect in the United states than in Japan. Lastly, we also tested for links between incremental theory about the natural world and psychological health during the COVID-19 pandemic.

2. Method

2.1. Sample characteristics, power analysis, and data quality

A power analysis, using an alpha level set to 0.05 indicated that a sample size of 306 per group was necessary to detect a small effect size ($f^2 = 0.04$) with a high level of power (95%) (Faul et al., 2007). During May of 2020, 813 participants provided informed consent and agreed to take part in a study on "people's thoughts about the world, the current COVID-19 pandemic and how they are coping." Sample data were collected using online crowdsourcing websites (Japan: www.lancers.co.jp, US: www.mturk.com). Participants self-reported on demographic (age and sex), survey measures (pandemic impact, worldviews on nature, and psychological health), and a single attention check item. Based on responses to the attention check item, 23 (Japan = 9, US = 14) respondents were removed from the data set. The final data set consisted of 381 in Japan (200 females, mean age = 39.81, *SD* = 10.13) and 409 in the United States (174 females, mean age = 37.11, *SD* = 13.39).

As a proxy of psychological health prior to the COVID-19 pandemic, we sourced publicly available data from the MIDJA and MIDUS studies. The MIDJA project collected data within the Tokyo metropolitan area and the MIDUS project collected data across the United States. Both the MIDJA and MIDUS studies included measures on perceived stress, positive affect (PA) and negative affect (NA). We pooled data from the second wave of data collection (MIDJA II: 2004–5, MIDUS II: 2012) because perceived stress was not collected during the first wave of the MIDUS study (MIDJA II: n = 657, 348 females, mean age 59.25, SD = 13.54; MIDUS II [PSS]: n = 1255, 679 females, mean age = 55.74, SD = 12.33; MIDUS II [PA and NA]: n = 4963, 2647 females, mean age = 55.44, SD = 12.46).

2.2. Procedure and materials

Participants reported on 3 items related to how much (1 = not at all, 2 = slightly, 3 = somewhat, 4 = very, 5 = extremely) they were affected by the COVID-19 pandemic for each of the following domains: personal, family and job/financial situation, using a single item for each (How much have you been personally affected by the COVID-19 virus pandemic? How much has your friends and family been affected by the COVID-19 virus pandemic? How much has your job and financial situation been affected by the COVID-19 virus pandemic?).

Participants also responded to 12 items measuring individual differences in worldviews on nature (Supplementary materials). Nine items (people/nature) were selected from the Tertiary Student Values Scale (TSVS) (Kluckhohn & Strodtbeck, 1961; Marino & Stuart, 2005). TSVS People/nature consists of 3 subscales (3 items each: harmony-with-nature, mastery-over-nature, and subjugation-to-nature). Participants also competed 3 items on implicit theories about the natural world (Dweck et al., 1995). The implicit theories about the natural world items were included in order to explore the association between the belief that the natural world is changeable, in general, and psychological health during the COVID-19 pandemic. Prior psychometric research demonstrates each subscale to have adequate discriminant validly and reliability (Dweck et al., 1995; Marino & Stuart, 2005), with the exception of the subjugation-to-nature subscale, that was shown to have marginally acceptable internal consistency (Marino & Stuart, 2005).

The items used to measure the COVID-19 impact (3 items) and worldviews on nature (12 items) were translated to Japanese using back translation (Brislin, 1970). First, items were translated from English to Japanese by a bilingual translator. Next, a separate bilingual translator translated the Japanese items back to English and the two English versions were compared for discrepancies. Lastly, any discrepancies were discussed and subsequently resolved.

Participants also completed the Perceived Stress Scale (PSS) (10 items) (Cohen et al., 1994) and the Negative and Positive Affect Scales (12 items) (NAPAS) (Mroczek & Kolarz, 1998). The PSS and NAPAS scale have been shown to be reliable and valid across Japanese and US cultural contexts (Joshanloo, 2018; Sumi, 2006). Participants were prompted to report on their level of stress and affect throughout the last 60 days. The Japanese versions of the PSS and NAPAS items were obtained from the MIJDA study questionnaire.

Table 1
Multigroup confirmatory factor analysis comparing Japanese and American samples.

	χ^2	df	CFI	RMSEA [90% CI]	NNFI	ΔCFI	ΔRMSEA	ΔNNFI
World-views on nature (3 factors)								
Configural	148.535	48	0.957	0.052 [0.042, 0.061]	0.938			
Metric	194.708	57	0.941	0.055 [0.047, 0.064]	0.919	0.016	0.003	0.019
Metric partial[a]	152.546	52	0.957	0.050 [0.041, 0.059]	0.936	0.000	0.002	0.002
PSS								
Configural[b]	157.566	36	0.958	0.065 [0.055, 0.076]	0.946			
Metric	204.835	44	0.944	0.068 [0.059, 0.078]	0.930	0.014	0.003	0.016
Metric partial[c]	178.2	42	0.953	0.064 [0.055, 0.074]	0.939	0.005	0.001	0.007
NA								
Configural	129.739	18	0.960	0.089 [0.075, 0.103]	0.954			
Metric	157.677	24	0.952	0.084 [0.072, 0.097]	0.944	0.008	0.005	0.010
PA								
Configural	127.571	18	0.966	0.088 [0.074, 0.103]	0.960			
Metric	155.852	24	0.959	0.083 [0.071, 0.096]	0.952	0.007	0.005	0.008

Note. PSS perceived stress scale, NA negative affect, PA positive affect, χ^2 minimum fit function chi-square, df degrees of freedom, CFI comparative fit index, RMSEA root mean square error of approximation (90% confidence interval), NNFI non-normed fit index,

[a] The intercepts for items implicit theory 3, mastery-over-nature 3 and harmony-with-nature 2 were relaxed and unique variance between items implicit theory 1 and 2 were allowed to correlate.

[b] The unique variance between items 4 and 8, and between items 1 and 4 were allowed to correlate, and items 5 and 7 were removed.

[c] The intercepts for items PSS1 and PSS6 were relaxed and the unique variance between items 4 and 8, and between items 1 and 4 were allowed to correlate.

2.3. Internal consistency, measurement equivalence of scales and statistical analysis

Cronbach's alpha for each subscale of the worldviews on nature measure indicated adequate reliability (harmony-with-nature: Japan = 0.82, US = 0.85, mastery-over-nature: Japan = 0.65, US = 0.69, implicit theory on nature: Japan = 0.70, US = 0.84), with the exception of subjugation-to-nature (Japan = 0.29, US = 0.71). Because of low reliability of the subjugation-to-nature subscale, these items were excluded from all subsequent analyses. Cronbach's alpha for each of the outcome measures also indicated adequate reliability (PSS: Japan = 0.85, US = 0.87; NA: Japan = 0.89, US = 0.92; PA: Japan = 0.91, US = 0.93).

We performed a multigroup confirmatory factor analysis to test for configural and metric invariance across cultural contexts (Cheung & Rensvold, 2002). Across all measures, we obtained evidence for either full or partial configural (comparative fit index: CFI > 0.95, root mean square error of approximation: RMSEA < 0.10) and metric (ΔCFI < 0.01, ΔRMSEA < 0.015) invariance across cultures (Table 1). The multigroup confirmatory factor analysis for the PSS indicated substantially better fit when items 5 and 7 were removed and were thus excluded from subsequent analyses. Lastly, in accordance with prior cross-cultural research on personality and individual differences (De Raad et al., 2014; Paletz & Peng, 2008), the item level data for the worldviews on nature scale were standardized per person (ipsatization). This method involves recalculating each item score to control for each individual's mean score and standard deviation on that scale and can reduce spurious effects due to differences in response style such as acquiescence or extremity bias between cultural contexts (Church et al., 2008; Fischer, 2004; Rammstedt et al., 2013). Statistical analysis included independent sample *t*-tests to compare outcome measures collected during the COVID-19 pandemic to data collected within the MIDJA and MIDUS studies. We then carried out a series of regression analyses to test for associations between worldviews on nature and psychological health during the COVID-19 pandemic, with age and sex entered as covariates.

3. Results

Japanese and US participants self-reported how much they were affected by the COVID-19 pandemic within personal, family and job/financial. In order to gauge the existence of cultural differences in impact of the pandemic on people's life, we compared responses to each item between cultures. Across all domains, we did not observe any statistically significant differences in self-reported impact due to the COVID-19 pandemic between Japanese (mean: personal = 3.31, family = 3.39, financial/career = 3.15) and American (personal = 3.17, family = 3.31, financial/career = 3.14) cultural contexts (all *p*'s > .05). These findings, however should be considered with caution, as response styles may be different according to cultural context.

Descriptive statistics, reliability coefficients and bivariate correlations between all variables are shown in Supplementary Table 1. For H1, we compared each of the outcome measures collected during the COVID-19 pandemic to data collected within the MIDJA and MIDUS studies (Table 2). Within each culture, people tended to report greater psychological distress during the COVID-19 pandemic as compared to during the MIDJA and MIDUS studies. We also tested for associations between self-reported impact during the pandemic within each domain

Table 2
Impact of coronavirus pandemic on psychological health outcome measures.

	Japan						United States					
	MIDJA 2		COVID-19		*t*	*p*	MIDUS 2		COVID-19		*t*	*p*
	M	*SD*	*M*	*SD*			*M*	*SD*	*M*	*SD*		
PSS	2.57	0.82	3.04	0.70	9.32	< .001	2.66	0.56	2.80	0.82	4.06	< .001
NA	1.78	0.94	2.52	0.81	12.80	< .001	1.58	0.85	2.41	1.04	18.49	< .001
PA	3.29	0.81	2.76	0.74	10.44	< .001	3.45	0.77	3.22	0.91	5.64	< .001

Note. PSS perceived stress scale, NA negative affect, PA positive affect, MIDJA II data were collected throughout 2012, MIDUS II data were collected throughout 2004–2006. COVID-19 data were collected during May 2020.

Table 3
Associations between worldviews on nature and psychological health during the COVID-19 pandemic.

	HN				MN				ITN			
	B	95% CI	*t*	*p*	*B*	95% CI	*t*	*p*	*B*	95% CI	*t*	*p*
PSS												
Japan	−0.172	[−0.28, −0.06]	3.06	.002	0.065	[−0.04, 0.16]	1.27	.205	0.078	[−0.03, 0.18]	1.48	.139
USA	−0.229	[−0.33, −0.13]	4.63	.000	0.159	[0.06, 0.26]	3.16	.002	0.059	[−0.03, 0.15]	1.28	.201
Interaction	−0.081	[−0.23, 0.06]	1.07	.283	0.108	[−0.03, 0.25]	1.51	.131	−0.018	[−0.16, 0.12]	0.24	.807
NA												
Japan	−0.215	[−0.34, −0.09]	3.34	.000	0.065	[−0.05, 0.18]	1.12	.263	0.114	[0.00, 0.23]	1.90	.059
USA	−0.289	[−0.41, −0.17]	4.70	.000	0.232	[0.11, 0.36]	3.72	.000	0.049	[−0.06, 0.16]	0.85	.394
Interaction	−0.116	[−0.29, 0.06]	1.29	.198	0.192	[0.02, 0.36]	2.23	.026	−0.061	[−0.23, 0.11]	0.71	.481
PA												
Japan	0.288	[0.18, 0.40]	5.06	.000	−0.130	[−0.23, 0.03]	2.51	.013	−0.106	[−0.23, 0.00]	1.97	.050
USA	0.212	[0.10, 0.33]	3.65	.000	−0.027	[−0.14, 0.09]	0.45	.653	−0.155	[−0.26, −0.05]	2.90	.004
Interaction	−0.110	[−0.27, 0.05]	1.32	.186	0.134	[−0.02, 0.29]	1.67	.094	−0.040	[−0.19, 0.11]	0.51	.608

Note. Unstandardized parameter estimates (B) and 95% confidence intervals (CI) for linear effects. HN harmony with nature, MN master over nature, ITN implicit theories about nature, PSS perceived stress scale, NA negative affect, PA positive affect.

(personal, family and job/financial) and each of the psychological health outcome measures, with age and sex entered as covariates. Within each cultural context, self-reported impact was significantly associated with increased psychological distress (PSS and NA) (all p's $< .005$). However, we found that PA was not significantly associated with impact to one's family in Japan, and to one's financial/job situation in the US.

Next for H2, we tested for associations between worldviews on nature and psychological health. We conducting a series of regression analyses with individual differences in harmony-with-nature worldviews entered as the predictor variable and each of the psychological health measures entered as criterion variables, with age and sex entered as covariates. The results of this analysis demonstrated that both Japanese and American samples showed a positive association between harmony-with-nature worldviews and each of the psychological health measures (PSS, NA and PA) (Table 3).

We tested H3, that individual differences in mastery-over-nature worldviews would be more strongly associated with NA in the US than in Japan. We found that culture moderated the link between mastery-over-nature worldviews and NA (Table 3). The American sample showed a strong positive association between mastery-over-nature worldviews and NA ($r = 0.18$, $p < .001$), while the Japanese sample did not ($r = 0.06$, $p = .26$). The effect of culture on the strength of the association between mastery-over-nature worldviews and NA was statistically significant ($t = 2.26$, $p = .026$).

Lastly, we explored the link between implicit theories on the natural world and psychological health during the COVID-19 pandemic. The implicit theory items were coded such that lower values correspond to incremental theories and higher values correspond to entity theories. We found that incremental theories on nature tended to be associated with increased PA in both American ($p = .004$) and Japanese (trend: $p = .05$) cultural contexts (Table 3).

4. Discussion

In this study we found that individual differences in worldviews about nature are associated with psychological health during a severe natural disaster. Across both Japanese and American cultural contexts, holding a worldview that humans and nature are best thought of as being be harmonious with one another, corresponded to improved psychological health during the COVID-19 pandemic. This finding further supports the biophilia hypothesis, that humans possess an innate tendency to seek connections with nature and other forms of life (Wilson, 1984). We also found that cultural context moderated the link between mastery-over-nature worldviews and NA during a natural disaster. Americans showed a stronger link between mastery-over-nature worldviews and negative affect than Japanese. This finding supports theories differentiating Japanese and American cultural contexts based on naïve dialecticism (Spencer-Rodgers et al., 2010) and susceptibility to cognitive dissonance (Heine & Lehman, 1997; Hoshino-Browne et al., 2005; Wong, 2009).

This study contributes to a growing body of empirical research demonstrating positive outcomes associated with spending time in nature and thinking about nature in an interconnected and harmonious way. Exposure to natural environments reduces aggressive responses to being ostracized (Poon et al., 2016), self-control depletion (Wang et al., 2018), and improves cognition and affect in depression (Berman et al., 2012). Individual differences in nature connectedness are associated with reduced anxiety (Martyn & Brymer, 2016) and increased positive affect (Mayer et al., 2009). This body of work indicates that interacting and thinking about nature in a harmonious way may be a culturally universal construct linked to improved psychological health.

We found that culture moderated the link between mastery-over-nature worldviews and NA during the COVID-19 pandemic. This finding may in part, represent cross-cultural differences in the tolerance of contraction (naive dialecticism). Americans holding contradictory self-views tend to experience greater anxiety and depression, while this does not tend to occur for Japanese (Brown, 2013). Japanese also tend to report greater contradictory self-views than North Americans (i.e., Canadians) (Hamamura et al., 2008). Contradictory self-views are linked with improved physical health in Japan more so than the North America (Miyamoto & Ryff, 2011). There also exists prior evidence that Americans and Japanese differ in their susceptibility to cognitive dissonance and that is particularly apparent during the processing of self-referent information. Americans tend to experience dissonance across different types of social cues (both self and other), while Japanese tend to experience dissonance when thinking about others, but not when thinking about one's self (Hoshino-Browne et al., 2005; Kitayama et al., 2004). Participants in the current study during the COVID-19 pandemic were tasked to think about their own (i.e., self) worldviews and psychological health (stress and affect). Thus, the interpretation that dissonance occurred more in Americans than in Japanese is consistent with prior research on cultural differences in cognitive dissonance susceptibility.

An alternative interpretation about the reason why the link between mastery-over-nature worldviews and psychological distress differs between cultures may involve cultural differences in trust in authority, and more specifically the government. Americans tend to display lower levels of trust in their government than Japanese. The most recent Edelman's Annual Global Study on the Trust Barometer (2020) reported that 39% of Americans versus 43% of Japanese trusted their government to do what's right. During the COVID-19 pandemic, both

American and Japanese governments placed restrictions on many individual liberties in order to reduce rates of person-to-person infection. The tendency to hold a mastery-over-nature worldview may correspond with an increased aversion to being restricted; if humans are indeed masters over the natural world, there is little need to restrict behavior. Holding a mastery-over-nature worldview may correspond to increased negative affect more within a cultural context where one is restricted by a government that is less trusted (US as compared to Japan). Furthermore, it may also be the case that cultural differences in discomfort with maintaining "social distance" may impact the levels of NA.

This study is limited in several important ways (Supplementary materials). Although the COVID-19 pandemic has influenced the lives of people throughout the entire world, we only collected data across two different cultural contexts. We are thus limited in our ability to generalize the observed worldviews on nature and psychological health associations to other cultural contexts. We measured perceived impact to people's lives within personal, family and job/financial domains. However, many other factors, including infection rates, were different between Japan and the United States. It is thus possible that between-country differences in damage caused by the pandemic influenced participant responses during this study. This study is also limited in terms of the extent to which observed effects can be specifically attributed to responses to the COVID-19 pandemic. We did not collect data using the same sample of participants prior to the pandemic, and we are thus not able to rule out the possibility that many of the current results would be similar during a non-pandemic period of time. As a proxy of psychological impact, we compared the psychological health responses during the pandemic to two independent samples (MIDJA/MIDUS). The sampling and data collection methods were different between the MIDJA/MIDUS projects (in person or phone) and the present study (online) and the MIDJA II was conducted in 2004–5, whereas the MIDUS II was conducted in 2012. There exist many relevant social and economic factors that are different between 2005, 2012 and 2020. Combined we suggest that the current findings be considered with a reasonable amount of caution.

In spite of several limitations, this study advances the way the link between worldviews on nature and psychological health is understood. We found that viewing humans and nature as interconnected and harmonious is positively associated with psychological health during a natural disaster and that the link between viewing humans as masters over nature and experiencing of NA during a natural disaster differs according to cultural context.

Credit authorship contribution statement

BWH designed the study, analyzed data and wrought the paper. FH and KO collected data and contributed to the writing of the paper.

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Appendix A. Supplementary data

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