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Does a Major Earthquake Change Job Preferences and Human Values?

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Abstract: Does a major natural disaster change human values and job preferences? The present studies examined whether the experience of a natural disaster experience shifts people's values and job preferences toward pro-social directions. In Study 1 (cross-temporal analysis), we analysed job application data in nine cities in Japan over 12 years and found that the popularity of pro-social occupations (e.g. firefighter) increased after the Great Hanshin–Awaji Earthquake in 1995, in particular the area hit hardest by the quake. In Study 2 (a large national survey), we found that Japanese respondents who had experienced a major earthquake are more likely to hold a pro-social job than those who never experienced a major earthquake. Together, the current findings suggest that the experience of a major natural disaster shifts human values from the egocentric to the allocentric direction, which in turn could result in a social structure that values pro-social occupations. Copyright © 2017 European Association of Personality Psychology

Key words: natural disaster; social ecology; human values; well-being; occupational preference

> 'Mr. Fujimoto became misty-eyed as he talked about the people who helped him recover after the storm. "It changed my perspective for life"' (Takashi Fujimoto, a survivor of Hurricane Sandy, December 1, 2013, New York Times).

Natural disasters such as earthquakes, hurricanes, tornadoes, floods, and volcanic eruptions are part of human life and history. Humans have had to deal with them ever since their earliest times on Earth. While modern technologies with advance warning systems and disaster preparation have reduced the number of victims dramatically, many people living in a modern society today are still faced with major natural disasters. What kinds of effects does the experience of a major natural disaster have on humans? Does it have any effect on human values? From a socioecological perspective (Gelfand et al., 2011; Jokela, Rentfrow, Bleidorn, Lamb, & Gosling, 2015; Oishi & Graham, 2010; Rozin, 2003), we examined these questions using cross-temporal analyses of job application data (Study 1) and a national survey (Study 2). It is true that much of the change in the labour market and occupational structure is typically determined by economic factors (e.g. a gradual shift from agricultural to manufacturing to service/technology industry in the United States from late 1800s to today). However, our paper suggests that a natural disaster could shift people's values (or 'desirable transsituational goals, varying in importance, that serve as guiding principles in the life of a person' Schwartz, 1994, p. 21) and occupational preferences, which in turn could result in a change in the occupational structure and social structure at large.

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ENVIRONMENTAL THREATS AND HUMAN PSYCHOLOGY

Recent studies have shown that ecological conditions appear to affect human psychology (see Murray, 2014; Oishi, 2014; Oishi & Graham, 2010; Van de Vliert, 2013 for reviews). For instance, nations historically high in pathogens such as India and Ethiopia are shown to be more collectivistic (Fincher, Thornhill, Murray, & Schaller, 2008), more conformative (Murray & Schaller, 2011), more religious (Fincher & Thornhill, 2012), and less extraverted/reward seeking (Schaller & Murray, 2008) than those low in pathogens (even controlling for GDP per capita). The main idea is that environmental threats evoke adaptive psychological defense; in threatening environments, there is a larger benefit to be collectivistic, conformist, religious, and less sociable than in non-threatening environments (Murray, 2014).

Like pathogens, a harsh climate poses environmental challenges. Van de Vliert (2013) found that nations with a harsh climate and low economic resources tend to show less freedom, oppression of press (media), and greater levels of ingroup favoritism and outgroup hate. Gelfand and colleagues (2011) also found that natural disaster vulnerability was associated with tighter cultural syndromes (i.e. strong norms and severe punishment of deviant behaviours). Most research in this area is

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correlational; the causal effect of an environmental threat on values remains speculative at this point. However, there are a plethora of experimental studies that manipulated perceived threat on similar outcome measures such as dogmatism (e.g. Vail, Arndt, Motyl, & Pyszczynski, 2012). It is also interesting to note that terrorist attacks such as 9–11 indeed induced a similar value change among Americans (e.g. outgroup hate) and moralization in general (Janoff-Bulman & Sheikh, 2006).

Given that natural disasters are a type of threat and that threat is associated with value changes, they are likely to affect human values as well. Because a natural disaster happens randomly, it is difficult for victims to understand why it happened (see Neria, Galea, & Norris, 2009; Norris et al., 2002 for reviews). Many victims of Hurricane Katrina turned to God to explain their experiences (Stephens, Fryberg, Markus, & Hamedani, 2012). Some victims of Hurricane Katrina also spontaneously mentioned caring for others, connection to others, community, and family (Stephens, Hamedani, Markus, Bergsieker, & Eloul, 2009). An analysis of 1084 US bloggers before and after the September 11 attacks revealed that the bloggers used more socially oriented words such as friend, talk, and share after the 9–11 attacks (Cohn, Mehl, & Pennebaker, 2004). These changes suggest that the 9–11 attacks made these bloggers more communal. Interestingly, however, these changes lasted only roughly 2 weeks.

Most relevant to the current research, Uchida, Takahashi, and Kawahara (2014) conducted a large internet survey among Japanese young adults a few weeks after the Great East Japan Earthquake of March 2011, when a Magnitude 9 earthquake hit the Tohoku area of Japan, followed by the massive tsunami, killing over 15 000 residents altogether. They found that the majority of participants reported that their attitude toward life changed a lot (13%) or somewhat (45%). The majority of these participants (61.7%) also reported having already donated or considering donating for the 3–11 earthquake and tsunami. Similarly, Tiefenbach and Kohlbacher (2015) found that respondents participating in disaster relief-related volunteering increased from 1 to 4% and those making disaster relief-related donations increased from 6 to 32% after the 3–11 earthquake. These changes could be due in part to the increased demand for volunteer activities and donations. However, these findings could also mean that the experience of a major natural disaster redirects human values away from self-indulgence toward pro-social values, at least for the short run.

Li, Li, Decety, and Lee (2013) conducted the first behavioural study to directly test whether the experience of a great natural disaster would change altruism among the victims of the great Sichuan earthquake (8.0 magnitude) of May 2008. They found that the experience of the great earthquake did not have any effect on 6-year-old children's altruistic behaviours. However, the experience of the great earthquake significantly increased 9-year-old children's altruistic behaviour (i.e. how many stickers children donated for another classmate) assessed around 1 month after the earthquake. In the second study, the pictures of the great earthquake made 9-year-olds more altruistic, whereas they did not make 6-year-olds more altruistic. Thus, the experience of a great earthquake appears to increase altruism, at least among 9 years old.

Although natural disasters pose existential threats, it is important to distinguish between natural disasters and other types of existential threats. One major difference is that people experience a natural disaster with many others, whereas mortality threat (at least the way it is manipulated in the lab) is often concerned with one's own, as opposed to another's, death (e.g. Jonas, Sullivan, & Greenberg, 2013). Similarly, a lot of post-traumatic growth research is concerned with victims of rape, child abuse, or other tragedies, which are often specific to the victims; that is, the victims did not experience the same traumatic event with others together (Janoff-Bulman, 1992). By nature, the experience of a natural disaster tends to be a collective, shared tragedy, whereas other types of threats (rape, child abuse) tend to be personal experiences. Many victims of crime might become cynical about human nature and less trusting of others (Janoff-Bulman, 1992), whereas the victims of a natural disaster (unless they became victims of violence aftermath of a natural disaster) are less likely to become cynical about humanity. It is noteworthy, however, that some victims of traumatic personal events find new meaning in life (Janoff-Bulman, 1992; Linley & Joseph, 2011; Park & George, 2013) and engage in more pro-social behaviours than those who did not have traumatic personal events (Frazier et al., 2013). Similarly, older people who were reminded of their own mortality showed greater concern for future generations (Maxfield et al., 2014). Likewise, although mortality salience sometimes makes people more materialistic, it made people less materialistic when the fairness was primed (Jonas et al., 2013). Considering that victims of a natural disaster are in a threatening situation with others together, like people in the mortality salient and the fairness condition, victims of a natural disaster are likely to become more pro-social (that is concerned about the well-being of others).

In sum, natural disasters are likely to present an existential threat to the victims. Like other threats, natural disasters might make people more defensive, conservative, and collectivistic (e.g. ingroup favoritism, prosociality toward ingroup members). However, considering the collective nature of the threat, we hypothesized that natural disasters would make people realize the importance of others, the significance of order and conformity, and more likely to pursue pro-social occupations (that we define as the job whose primary goal is to benefit others).

THE PRESENT RESEARCH

The present research investigated whether experiencing a major natural disaster changed people's occupational choices. Study 1 is a cross-temporal analysis of job application data in nine cities in Japan from 1989 to 2000. We tested whether the popularity of pro-social jobs increased after the Great Hanshin Awaji Earthquake in January 1995, especially in the Kansai area devastated by the 1995

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earthquake relative to the Kanto area not directly affected by this earthquake, using the regression discontinuity design model (West, Biesanz, & Pitts, 2000). West et al. called this design 'one of the strongest alternatives to the randomized experiment' (p. 58), as it can test whether the popularity of pro-social jobs increased suddenly using this model. In Study 2, using a large national survey, we examined whether people who had experienced any major earthquake (the earthquake officially designated by Japanese government as a disaster of extreme severity) were more likely to hold a pro-social job than those who never experienced any major earthquake. In Study 2, we also assessed participants' value-orientations.

Study 1: Occupational popularity over time

First, it is important to recognize that some natural disasters examined in the past such as the Great East Japan Earthquake of March 2011involved not only great natural disaster but also human-made disaster (e.g. the Fukushima nuclear meltdown, Federal Emergency Management Agency's mishandling of the Hurricane Katrina). In Study 1, we examined the natural disaster with the minimum level of human disaster involved, namely, the 1995 Great Hanshin Awaji Earthquake. Second, previous research on natural disaster was limited to self-reports. Most data were collected immediately after the great earthquake and tsunami. Thus, it is unclear how long the change observed by previous researchers would last (Burger & Palmer, 1992). If the experience of a great natural disaster indeed changes one's values so profoundly, then it should result in some concrete behaviours. One such behaviour might be an occupational choice. An occupational choice is one of the most important decisions in one's life that could represent one's core values (Rokeach, 1979; Sagiv, 2002).

Extending the previous research that focused on the immediate change in attitude or behaviour following a natural disaster (Li et al., 2013; Tiefenbach & Kohlbacher, 2015; Uchida et al., 2014), we examined whether a major natural disaster had a lasting effect. Specifically, we tested whether pro-social occupations (e.g. firefighter, kindergarten teacher) have become more popular since the Hanshin Awaji Great Earthquake that took place on 17 January 1995 (Magnitude 7.3), which devastated Kobe, Nishinomiya, Akashi, and other surrounding areas in Kansai region of Japan (over 6000 residents were killed; over 43 000 residents were injured). Because the demand for certain pro-social jobs (e.g. firefighters) was likely to have increased after the earthquake, we analysed the acceptance rate (i.e. # of job offers/# of applicants) as the main dependent variable. That is, we examined whether it has become more difficult to get a pro-social job after the earthquake.

To make the test stricter, we compared the popularity of pro-social occupations in the Kansai area of Japan with the popularity of pro-social occupation in the Kanto area from 1989 to 2000, roughly 5 years before and after the 1995 earthquake. In the Kansai area of Japan (e.g. Kobe, Osaka, Kyoto), many residents received direct damages, whereas in the Kanto area of Japan (e.g. Tokyo, Chiba, Kanagawa), residents did not receive any direct damages from the 1995 earthquake. These are two major metropolitan areas in Japan, separated by roughly 300 miles.

We chose 10 cities, five from each region: Kobe, Nishinomiya, Akashi, Takatsuki, and Kyoto from the Kansai region, and Machida, Chiba, Kawasaki, Fujisawa, and Kamakura from the Kanto region. These cities are matched roughly in terms of the population size and the median income. We were unable to obtain the data from Kamakura. Thus, the final data came from nine cities, five from the Kansai area (Kobe, Nishinomiya, Akashi, Takatsuki, Kyoto), and four from the Kanto area (Machida, Chiba, Kawasaki, and Fujisawa). We looked at all the job application data in these nine cities and identified kindergarten teachers, social workers, fire

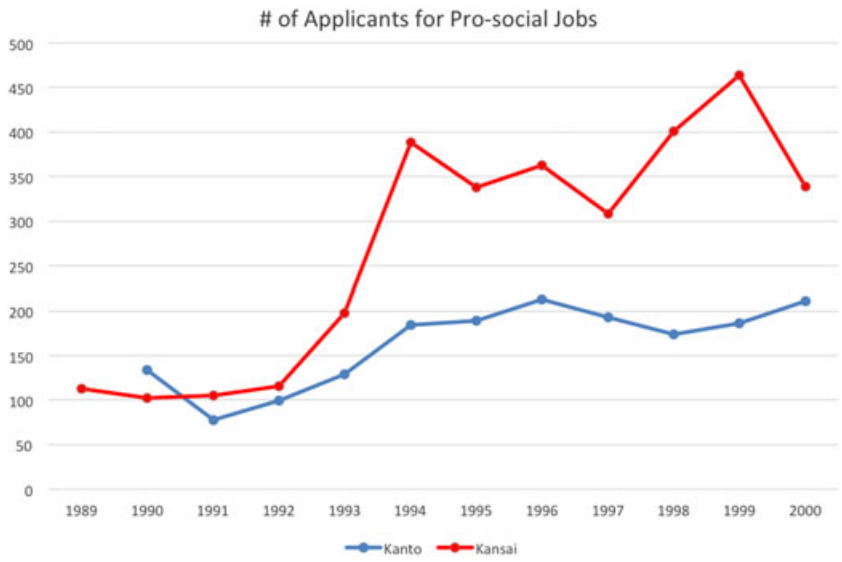

Figure 1. The number of applicants to the pro-social positions in city governments. Years are fiscal years (e.g. fiscal year 1994 is from April 1994 till March 1995). [Colour figure can be viewed at wileyonlinelibrary.com]

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fighters as pro-social jobs. Although there are many other pro-social jobs, other pro-social jobs are handled at the level of prefecture (e.g. elementary school teachers), or in private sectors (e.g. nurses) where job data are not publicly available.

There were 72 data points for the pro-social jobs in the Kansai area, whereas there were 113 data points for the pro-social jobs in the Kanto area. If the effect size f^2 is .11, the Kansai data have the statistical power of .80 (two-tailed, alpha = .05) using the G*Power 3.192 (multiple regression, fixed model with two predictors). For the same effect size, the Kanto data have the statistical power of .94.

When interpreting the results reported below, it is important to note that the fiscal year in Japan starts on April 1, Year X and ends on March 31, Year X + 1. For example, Fiscal Year 1994 starts on 1 April 1994 and ends on 31 March 1995. That is, the Great Hanshin–Awaji Earthquake took place in Fiscal Year 1994.

RESULTS AND DISCUSSION

Figures 1 and 2 depict the number of applicants and acceptance rate for the pro-social jobs (i.e. firefighter, kindergarten teacher, social worker) in the Kansai area and the Kanto area, separately, across the 10-year period. First, we tested whether the acceptance rate for the pro-social jobs in Kansai area increased after the earthquake (Fiscal Year 1994) using the regression discontinuity model analysis (Bernal, Cummins, & Gasparrini, 2016; West et al., 2000). Because the data were nested within each city, we used a multilevel random coefficient model using HLM 7.04. Specifically, our model was as follows:

Level 1 (within-city)

# of applicants = b_{00} + b_{10}*year + b_{20}*discontinuity + e

Level 2 (between-city)

$$B_{00} = \gamma_{00} + e$$

$$B_{10} = \gamma_{10}$$

$$B_{20} = \gamma_{20},$$

where year was centred around Fiscal Year 1994 (i.e. 1992 = −2, 1993 = −1, 1994 = 0, 1995 = 1, 1996 = 2 etc.). This variable captures a linear trend (whether the acceptance rate decreased during this period linearly). The discontinuity variable was a dummy code which had a value of 1 for Fiscal Year 1994 and afterward, and 0 until Fiscal Year 1993. γ_{20} for Level 2 indicates the average discontinuity effect (whether the acceptance rate suddenly decreased after Fiscal Year 1994) across the cities in the Kansai area.

First, the mean intercept, $\gamma_{10,}$ was 14.646 (SE = 2.160), t (3) = 6.782, $p < .001$. This means that in Fiscal Year 1994, the acceptance rate for prosocial jobs was on average 14.646%. This analysis further revealed that there was a marginally linear decrease in the acceptance rate for the pro-social jobs in the Kansai area, $\gamma_{10} = -.643$ (SE = .385), t (69) = −1.671, $p = .099$. This means that the acceptance rate went down on average by .643% per year between 1989 and 2000. Most importantly, there was a significant discontinuity effect, or a sudden decrease in the acceptance rate after the earthquake in the Kansai area above and beyond the general trend toward lower acceptance rate, $\gamma_{20} = -5.342$ (SE = 2.476), t (69) = −2.158, $p = .034$. The discontinuity effect was quite substantial; in Fiscal Year 1994, the acceptance rate dropped by 5.342%. That means, although the pro-social jobs became more and more popular and competitive over time, this trend accelerated after Fiscal Year 1994, or around the Great Hanshin–Awaji Earthquake.

We repeated the above HLM analysis, this time in the Kanto area of Japan, where there was no direct effect of the Great Hanshin–Awaji Earthquake. We ran this analysis to test whether the growing popularity of pro-social jobs was specific to the area most affected by the earthquake. Because of the magnitude of the earthquake, there was extended media coverage of the earthquake throughout Japan. Thus, it is reasonable to assume that this was a

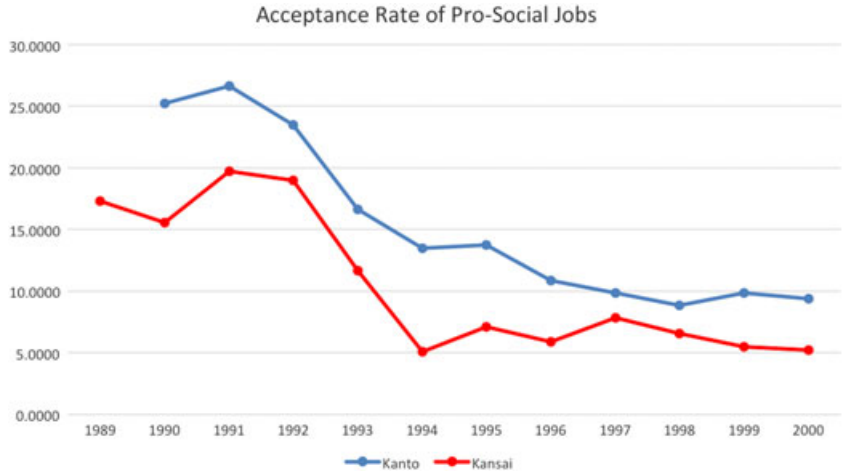

Figure 2. X-axis is fiscal year. Y-axis is the acceptance rate in % (% of applicants offered the position). Fiscal year X starts on April 1, year X to March 31, year X + 1 (e.g. year 1994 is from April 1, 1994 to March 31, 1995). [Colour figure can be viewed at wileyonlinelibrary.com]

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national tragedy that affected many Japanese beyond the Kansai area. However, it is still reasonable to assume that the effect was most robust in the Kansai area. The intercept, γ_{10}, was 19.841 (SE = 2.269), t (3) = 8.744, $p < 001$. That is, the average acceptance rate for the pro-social jobs in the Kanto area was 19.841%. The results further showed a marginal linear trend such that pro-social jobs became more popular and competitive over time in the Kanto area as well, $\gamma_{10} = -1.099$ (SE = .596), t (110) = −1.844, $p = .067$. That is, every year, the acceptance rate dropped by 1.099%. Unlike the Kansai area, the acceptance rate for the pro-social jobs did not drop significantly after the earthquake in the Kanto area, $\gamma_{20} = -5.576$ (SE = 3.913), t (110) = −1.425, $p = .157$.

In sum, pro-social jobs tended to become more popular and competitive between 1989 and 2000 in both the Kanto and the Kansai metropolitan areas. However, the regression discontinuity design model analyses showed that the popularity and competitiveness of the pro-social jobs had a sudden surge after the Hanshin–Awaji Great Earthquake in the Kansai area but not in the Kanto area.

Study 2: Occupational choice of major earthquake victims

Another way to test our main idea is to test whether people who experienced a major earthquake (living in the city/town where a major earthquake hit) are more likely to hold a pro-social job than those who have never experienced a major earthquake. To this end, we conducted a nationally representative survey in Japan. Because Study 1 did not assess human values directly, we also included Schwartz's (1994) 10 universal values.

METHOD

Participants were 1500 Japanese (750 men, 750 women) who lived in three areas: Tohoku (Iwate, Miyagi, and Fukushima prefectures), Kanto (Tokyo, Chiba, and Kanagawa prefectures), and Kansai (Kyoto, Osaka, and Hyogo prefectures) area. They were selected from members of a research panel of an online research company. We sampled Tohoku, Kansai, and Kanto areas because most residents in these areas, especially Tohoku and Kansai, have first-hand experience with a major earthquake. The mean age was 44.44 (SD = 13.63, Range = 20 to 69). We expected that the effect size would be quite small (e.g. d = .20). Assuming the true effect size of $d = .20$, our sample had the statistical power of .97.

In December 2012, the participants completed an online survey mainly on political attitudes and voting. We assessed respondents' values by asking them to rank-order Schwartz's (1994) 10 universal values (power, achievement, hedonism, stimulation, self-direction, universalism, benevolence, conformity, tradition, and security) from 1 = most important to 10 = least important (for the data analyses below, we reversed the ranks, so that the larger number indicates more importance, as in Oishi et al., 2007).

After answering all the political attitudes, voting, and value questions, participants read the list of a major earthquake to which the Severe Disasters Act was applied (i.e. Sanriku–Haruka–Oki, Hanshin–Awaji, Niigata Prefecture–Chuetsu, Noto–Hanto, Nigataken–Chuetsu–Oki, Iwate–Miyagi–Nairiku, and Higashi–Nihon), and indicated whether they lived in the area hit by each earthquake at the time of the earthquake (yes/no). Among our participants, 903 participants (60.2%) experienced at least one major earthquake, whereas 597 (39.8%) did not experience any major earthquake.

At the end of the survey, participants indicated their occupation, followed by 10 questions about their job on a 7-point scale (1 = not at all true; 7 = very true): (i) it requires higher education; (ii) it requires skills; (iii) it has large responsibilities; (iv) it is a well-paid job; (v) it is a job well-respected by people; (vi) it makes a large contribution to society; (vii) it is a job that has a large impact on society; (viii) it uses a great deal of creativity; (ix) it has a great deal of autonomy and (x) it has lots of power. These items were taken from the 11-item job characteristics scale used by the 1995 social class and social mobility survey in Japan (see http://www.sal.tohoku.ac.jp/~tsigeto/ssm/reports.html#5 for the original survey). One item 'It is cool' was not included in this survey because it was deemed irrelevant. Items 5, 6, and 7 capture pro-sociality ($\alpha = .85$), whereas the rest are concerned with power and status ($\alpha = .82$).

Two coders (the second author and an undergraduate RA) independently classified each participant's occupation into two categories: pro-social (1) or other (0). The data file that these two coders received for coding did not include any other information besides participants' ID and occupation. Thus, although the second author was aware of the hypothesis, her coding was in no way affected by her knowledge of the hypothesis. The undergraduate RA was not aware of the hypothesis. The pro-social occupations were social welfare (e.g. social worker), health care (e.g. doctor, nurse), education (e.g. teacher, instructor, coach), and public welfare (e.g. police officer). Two coders were able to code reliably, $\kappa = .935$, $p < .001$. There were 15 cases of disagreement out of 1500 cases. These disagreements were subsequently resolved by a discussion between the two coders. We used the consensus coding below (see the Supporting Information for the full coding). The results are virtually identical to either coder's original coding.

RESULTS AND DISCUSSION

According to the consensus classification, there were 129 respondents with a pro-social job out of 1500 participants (8.6%). When we looked at the individuals who have never experienced any major earthquake, 39 out of 597 (or 6.5%) had a pro-social job, whereas 90 of the 903 participants who experienced a major earthquake (or 10%) had a pro-social job, $\chi^2(1, 1500) = 5.39$, $p = .020$.

Because there might be gender, age, and marital status differences in the propensity to have a pro-social job, we next conducted a binary logistic regression, regressing the pro-

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social job (yes/no) on participants' age, gender, marital status (married = 1; others = 0), as well as the major earthquake experience. The result was virtually identical, as the experience of a major earthquake was the only significant predictor, $b = .230$ ($SE = .100$), $Wald = 5.30$, $p = .021$, *Odds Ratio* = 1.26 (95% C.*I* = 1.04; 1.53). Thus, replicating and extending Study 1, we found that individuals who have experienced a major earthquake are more likely to hold a pro-social job than those who have not experienced it.

Next, we analysed whether participants who experienced a major earthquake reported that their jobs are more pro-social than those who have not experienced. As expected, participants who experienced a major earthquake reported that their jobs were more pro-social ($M = 3.73$, $SD = 1.35$) than those who did not ($M = 3.55$, $SD = 1.43$), t (998) = 1.98, $p = .048$, $d = .13$. In contrast, the experiencers ($M = 4.02$, $SD = 1.13$) did not differ from non-experiencers ($M = 4.07$, $SD = 1.13$) in terms of the power dimension of their jobs, t (998) = −.72, $p = .469$, $d = -.05$. Because the power dimension and pro-sociality were positively correlated, r (998) = .69, $p < .001$, next we conducted a multiple regression analysis, predicting pro-sociality from power, as well as the experience of a major earthquake, gender, age, and marital status. This analysis showed that the effect of the experience of a major earthquake remained significant, $b = .108$, 95% C.*I* = .045; .172 ($SE = .03$), $\beta = .077$, t (994) = 3.35, $p = .001$.

Finally, we examined whether value orientation is different between those who experienced a major earthquake and those who did not. First, a series of t-tests showed that participants who had experienced a major earthquake valued self-direction ($M = 6.37$, $SD = 2.57$ vs. $M = 6.65$, $SD = 2.50$) and achievement ($M = 5.42$, $SD = 2.38$ vs. $M = 5.68$, $SD = 2.55$) less than those who had not experienced any major earthquake, $t_{self\text{-}direction}$ (1498) = −2.11, $p = .035$, $d = .11$, $t_{achievement}$ (1498) = −1.96, $p = .051$, $d = .10$. The experiencers valued conformity marginally more than non-experiencers, t (1498) = 1.67, $p = .095$, $d = .09$. The results were essentially the same when we statistically controlled for age, gender, and marital status in multiple regression analyses, $t_{self\text{-}direction}$ (1495) = −2.18, $p = .030$, $d = .11$, $t_{achievement}$ (1495) = −1.95, $p = .052$, $d = .10$, $t_{conformity}$ (1495) = 1.55, $p = .121$, $d = .08$. Overall, the Japanese who experienced a major earthquake were less individualistic and more collectivistic than those who did not. Therefore, these results conceptually replicated Study 1 findings.

GENERAL DISCUSSION

From a socioecological perspective (Gelfand et al., 2011; Jokela et al., 2015; Oishi, 2014; Rozin, 2003), the present research explored the relation between the experience of a natural disasters and life perspectives using multiple methods. Previous research has provided suggestive evidence that the experience of a major natural disaster changes human values. For instance, the experience of a major earthquake appears to increase altruism among 9 years old children (Li et al., 2013). Japanese have donated money and engaged in volunteer work more after the Great East Japan Earthquake (Tiefenbach & Kohlbacher, 2015; Uchida et al., 2014). However, it is not yet known whether the change in human values seen in the previous research is a short-term or a lasting change. Furthermore, it is unclear whether it translates into an important life outcome such as occupational choice. Finally, the increase in donation and volunteerism observed in the previous research could be due in large part to the increased demand for such activities. Building on recent research on natural disasters (Neria et al., 2009; Stephens et al., 2012), the current research has examined a simple yet important question: can the experience of a major natural disaster change human values, including one's occupational choice?

In order to explore whether the experience of a major natural disaster could change human values in the long run, we examined occupational preferences in Study 1. Specifically, we tested whether occupational popularity has changed before and after the 1995 Hanshin–Awaji Earthquake, using the job application data collected from nine cities from 1989 to 2000 in Japan. We found that pro-social occupations have become more popular after 1995, and this was particularly true in the Kansai area hit heavily by the 1995 earthquake. Because the job market is sensitive to various other factors, most notably the economic prospects and job demands in a particular year, the fluctuation in job application data could be influenced by idiosyncratic factors, the factors specific to a particular year or region. Thus, it was desirable to corroborate the job application data with people who experienced different natural disasters in different years.

In Study 2, we conducted a large national survey and examined whether individuals who experienced a major earthquake (out of several major earthquakes that took place in different years) were more likely to hold a pro-social job than those who never experienced a major earthquake. Study 2 replicated and extended Study 1 by showing that (i) Japanese respondents who had experienced a major earthquake were indeed more likely to hold a pro-social job than those who have never experienced a major earthquake; (ii) described their jobs to be more pro-social and (iii) endorsed individualistic values such as self-direction and achievement *less* and collectivistic values such as conformity (marginally) *more* strongly than the non-experiencers.

In sum, our studies show that the experience of a major earthquake appears to have changed people's job preferences toward the pro-social direction. We demonstrated this by using diverse methods, including actual job application data (Study 1), and a large national survey (Study 2). The effect sizes were small for value orientations (Study 2). In contrast, the effect sizes for Study 1 were substantial, as the number of applicants tripled before and after the earthquake (roughly 100 applicants in 1990, 1991, 1992; well over 300 applicants in 1997, 1998, and 1999), and the acceptance rate of the pro-social occupations went down significantly (from over 20% to less than 10%).

The current findings have several important implications for research on social ecology and human values. First, the previous research appears to show that one-dimensional self-selected events such as educational and occupational

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transitions did not change value orientations, whereas multi-dimensional self-selection events such as migration did (Bardi, Buchanan, Goodwin, Clabu, & Robinson, 2014). Natural disasters are not self-chosen events. They are different from self-chosen life events in several important ways. First, in the case of self-chosen events such as education and occupational transitions, individuals have concrete expectations and envision the new life in advance. That is, people imagine what it would be like to be in a university, for instance, and have very specific assumptions about what they would be doing, what would be expected of them, and so forth. In contrast, natural disasters often happen unexpectedly. Even though Japanese are familiar with earthquakes and in a vague sense expect them to occur once in a while, people do not live their lives anticipating an earthquake every day. Research on hedonic adaptation shows that expectation and explanation play a key part. That is, people adapt to an event when they can explain away why that event happened (Wilson & Gilbert, 2008). Unexpectedness along with the difficulty of explaining why a natural disaster happened might have contributed to the potency of such events to affect human values.

Second, just as a migration to a new country affects many aspects of one's life (Bardi et al., 2014), a major earthquake affects one's entire life, ranging from job, to family, to community. The many aspects of life that a major natural disaster affects might be a reason why it changes human values. It is also important to explore in the future the effect of self-selected and non-self-selected events on value and personality changes, and clarify the factors that contribute to changes in human values and personality. The present findings in the context of the existing findings (e.g. Bardi et al., 2014), then, suggest that unexpectedness, multi-dimensionality of an event, and non-self-selection might be key.

Third, it is well recognized that occupational choices reflect one's value orientations (Rokeach, 1973; Sagiv, 2002). However, so far research has not examined the possibility that the experience of a major natural disaster changes one's occupational preferences. Our studies showed that the experience of a major earthquake shifted the population's occupational preferences toward pro-social occupation. These findings are consistent with the earlier findings that victims of Hurricane Katrina spontaneously mention community (Stephens et al., 2009) and that bloggers used socially oriented words such as 'friends' and 'share' after the 9–11 attacks (Cohn et al., 2004). As occupation is one of the most important life outcomes (Roberts, Kuncel, Shiner, Caspi, & Goldberg, 2007), it is beneficial to use occupational choice as an indicator of human value orientations in the future.

Finally, it is important to note that a small shift in the popularity of pro-social occupations could have a large societal consequence. As pro-social occupations become more popular, it is likely that the prestige of such occupations will go up also. As the prestige and popularity grow, more schools are likely to offer training programs for such occupations (e.g. social workers, teachers). In the long run, this could affect occupational and social structure at large. Based on Park and Peterson's (2010) work on head (e.g. love of learning, creativity, curiosity) vs. heart (e.g. love, forgiveness, fairness) cities and Jokela and others' work on selective migration (Jokela, 2009; Jokela, Elovainio, Kivimäki, & Keltikangas-Järvinen, 2008; Motyl, Iyer, Oishi, Trawalter, & Nosek, 2014), it is easy to imagine that disaster-ridden cities might become more of the 'heart' cities and attract 'heart' persons over time. This in turn could make disaster-ridden cities have quite different vibes than disaster-free cities (cf. Oishi, 2015). In the future, it is important to explore how value changes at the level of the individual will result in changes in social structure in the long run.

Before concluding, it is important to recognize limitations of the current research and future directions. First, the present research does not reveal the exact mechanism through which the experience of a major earthquake translates into a change in job preferences. Was it the experience of needing someone's help that enhanced a pro-social value, which led the victims to pursue a pro-social occupation? Was it the heroism of firefighters, doctors, and nurses that changed their course? Second, Study 2 was a cross-sectional study. Thus, any unmeasured third variables could explain our findings. For instance, it is possible that structural changes caused by the earthquake (e.g. residential relocation to another region, different rates of job vacancies, disruption in education) could have caused the differential popularity of prosocial occupations between earthquake experiencers and non-experiencers. It is ideal to follow victims of a major earthquake over time to see if their values and occupational preferences change over time. Finally, it is important to explore other major life experiences that might transform job preferences in a similar way (e.g. terrorist attack, Bonanno, Galea, Buchiarelli, & Vlahov, 2006). Natural disasters such as earthquake and hurricane are a part of human life. If the goal of personality psychology is to understand individual differences in human mind, feelings, and behaviours, then it is critical to investigate psychological changes and individual differences associated with the experience of a major natural disaster.

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SUPPORTING INFORMATION

Additional Supporting Information may be found online in the supporting information tab for this article.

REFERENCES

Bardi, A., Buchanan, K. E., Goodwin, R., Clabu, L., & Robinson, M. (2014). Value stability and change during self-chosen life transitions: Self-selection versus socialization effects. *Journal of Personality and Social Psychology*, *106*, 131–147.

Bernal, J. L., Cummins, S., & Gasparrini, A. (2016). Interrupted time series regression for the evaluation of public health interventions: A tutorial. *International Journal of Epidemiology*, 1–8.

DOI: 10.1002/per

Bonanno, G. A., Galea, S., Buchiarelli, A., & Vlahov, D. (2006). Psychological resilience after a disaster: New York City in the aftermath of the September 11th terrorist attack. *Psychological Science*, *17*, 181–186.

Burger, J. M., & Palmer, M. L. (1992). Changes in and generalization of unrealistic optimism following experiences with stressful events: Reactions to the 1989 California earthquake. *Personality and Social Psychology Bulletin*, *18*, 39–43.

Cohn, M. A., Mehl, M. R., & Pennebaker, J. W. (2004). Linguistic markers of psychological change surrounding September 11, 2001. *Psychological Science*, *15*, 687–693.

Fincher, C. L., & Thornhill, R. (2012). Parasite-stress promotes in-group assortative sociality: The cases of strong family ties and heightened religiosity (target article). *Behavioral and Brain Sciences*, *35*, 61–79.

Fincher, C. L., Thornhill, R., Murray, D. R., & Schaller, M. (2008). Pathogen prevalence predicts human cross-cultural variability in individualism/collectivism. *Proceedings of the Royal Society B: Biological Sciences*, *275*, 1279–1285.

Frazier, P., Greer, C., Babrielsen, S., Tennen, H., Park, C., & Tomich, P. (2013). The relation between trauma exposure and prosocial behavior. *Psychological Trauma: Theory, Research, Practice and Policy*, *5*, 286–294.

Gelfand, M. J., Raver, J. L., Nishii, L., Leslie, L. M., Lun, J., Lim, B. C., … & Aycan, Z. (2011). Differences between tight and loose cultures: A 33-nation study. *Science*, *332*, 1100–1104.

Janoff-Bulman, R. (1992). *Shattered assumptions: Toward a new psychology of trauma*. New York: Free Press.

Janoff-Bulman, R., & Sheikh, S. (2006). From national trauma to moralizing nation. *Basic and Applied Social Psychology*, *28*, 325–332.

Jokela, M. (2009). Personality predicts migration within and between U.S. states. *Journal of Research in Personality*, *43*, 79–83. https://doi.org/10.1016/j.jrp.2008.09.005.

Jokela, M., Elovainio, M., Kivimäki, M., & Keltikangas-Järvinen, L. (2008). Temperament and migration patterns in Finland. *Psychological Science*, *19*, 831–837.

Jokela, M., Rentfrow, P. J., Bleidorn, W., Lamb, M. E., & Gosling, S. D. (2015). Geographically varying associations between personality and life satisfaction in the London metropolitan area. *Proceedings of the National Academy of Science*, *112*, 725–730.

Jonas, E., Sullivan, D., & Greenberg, J. (2013). Generosity, greed, norms, and death—Differential effects of mortality salience on charitable behavior. *Journal of Economic Psychology*, *35*, 47–57.

Li, Y., Li, H., Decety, J., & Lee, K. (2013). Experiencing a natural disaster alters children's altruistic giving. *Psychological Science*, *24*, 1686–1695.

Linley, P. A., & Joseph, S. (2011). Meaning in life and posttraumatic growth. *Journal of Loss and Trauma*, *16*, 150–159.

Maxfield, M., Greenberg, J., Pyszczynski, T., Weise, D. R., Kosloff, S., Soenke, M., Abeyta, A. A., et al. (2014). Increases in generative concern among older adults following reminders of mortality. *International Journal of Aging and Human Development*, *79*, 1–21.

Motyl, M., Iyer, R., Oishi, S., Trawalter, S., & Nosek, B. A. (2014). How ideological migration geographically segregates groups. *Journal of Experimental Social Psychology*, *51*, 1–14.

Murray, D. R. (2014). Ecological threat and psychological variation. *Psychologia*, *57*, 82–101.

Murray, D. R., & Schaller, M. (2011). On the origins of cross-cultural differences in conformity: Four tests of the pathogen prevalence hypothesis. *Personality and Social Psychology Bulletin*, *37*, 318–329.

Neria, Y., Galea, S., & Norris, F. H. (2009). *Mental health and disasters*. Cambridge, England: Cambridge University Press.

Norris, F. H., Friedman, M. J., Watson, P. J., Byrne, C. M., Diaz, E., & Kaniasty, K. (2002). 60,000 disaster victims speak: Part I. An empirical review of the empirical literature, 1981–2001. *Psychiatry*, *65*, 207–239.

Oishi, S. (2014). Socio-ecological psychology. *Annual Review of Psychology*, *65*, 581–609.

Oishi, S. (2015). Geography and personality: Why do different neighborhoods have different vibes? *The Proceedings of the National Academy of Science*, *112*, 645–646.

Oishi, S., & Graham, J. (2010). Social ecology: Lost and found in psychological science. *Perspectives on Psychological Science*, *5*, 356–377.

Oishi, S., Schimmack, U., Diener, E., Kim-Prieto, C., Scollon, C. N., & Choi, D. W. (2007). The value-congruence model of memory for emotional experiences: An explanation for cultural differences in emotional self-reports. *Journal of Personality and Social Psychology*, *93*, 897–905.

Park, C. L., & George, L. S. (2013). Assessing meaning and meaning making in the context of stressful life events: Measurement tools and approaches. *Journal of Positive Psychology*, *8*, 483–504.

Park, N., & Peterson, C. (2010). Does it matter where we live? The urban psychology of character strengths. *American Psychologist*, *65*, 535–547.

Roberts, B. W., Kuncel, N. R., Shiner, R., Caspi, A., & Goldberg, L. R. (2007). The power of personality: The comparative validity of personality traits, socioeconomic status, and cognitive ability for predicting important life outcomes. *Perspectives on Psychological Science*, *2*, 313–345.

Rokeach, M. (1973). *The nature of human values*. New York: Free Press.

Rokeach, M. (1979). *Understanding human values*. New York: Free Press.

Rozin, P. (2003). Five potential principles for understanding cultural differences in relation to individual differences. *Journal of Research in Personality*, *37*, 273–283.

Sagiv, L. (2002). Vocational interests and basic values. *Journal of Career Assessment*, *10*, 233–257.

Schaller, M., & Murray, D. R. (2008). Pathogens, personality, and culture: Disease prevalence predicts worldwide variability in sociosexuality, extraversion, and openness to experience. *Journal of Personality and Social Psychology*, *95*, 212–221.

Schwartz, S. H. (1994). Are there universal aspects in the content and structure of values? *Journal of Social Issues*, *50*, 19–45.

Stephens, N. M., Fryberg, S. A., Markus, H. R., & Hamedani, M. G. (2012). Who explains Hurricane Katrina and the Chilean earthquake as an act of god? The experience of extreme hardship predicts religious meaning-making. *Journal of Cross-Cultural Psychology*, *44*, 606–619.

Stephens, N. M., Hamedani, M. G., Markus, H. R., Bergsieker, H. B., & Eloul, L. (2009). Why did they "choose" to stay?: Perspectives of Hurricane Katrina observers and survivors. *Psychological Science*, *20*, 878–886.

Tiefenbach, T., & Kohlbacher, F. (2015). Disasters, donations, and tax law changes: Disentangling effects on subjective well-being by exploiting a natural experiment. *Journal of Economic Psychology*, *50*, 94–112.

Uchida, Y., Takahashi, Y., & Kawahara, K. (2014). Changes in hedonic and eudaimonic well-being after a severe national disaster: The case of the Great East Japan Earthquake. *Journal of Happiness Studies*, *15*, 207–221.

Vail, K. E., Arndt, J., Motyl, M., & Pyszczynski, T. (2012). The aftermath of destruction: Images of destroyed building increase support for war, dogmatism, and death though accessibility. *Journal of Experimental Social Psychology*, *48*, 1069–1081.

Van de Vliert, E. (2013). Climato-economic habitats support patterns of human needs, stresses, and freedoms. *Behavioral and Brain Sciences*, *36*, 465–480.

West, S. G., Biesanz, J. C., & Pitts, S. C. (2000). Causal inference and generalization in field settings: Experimental and quasi-experimental designs. In H. T. Reis, & C. M. Judd (Eds.), *Handbook of research methods in social and personality psychology* (pp. 40–84). New York: Cambridge University Press.

Wilson, T. D., & Gilbert, D. (2008). Explaining away: A model of affective adaptation. *Perspectives on Psychological Science*, *3*, 370–386.

DOI: 10.1002/per