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Psychological adaptation to the Great Hanshin-Awaji Earthquake of 1995: 16 years later victims still report lower levels of subjective well-being

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ABSTRACT

We investigated psychological adaptation to the Great Hanshin-Awaji Earthquake of 1995, using surveys conducted in 2001, 2003, 2005, and 2011. Respondents whose houses were damaged reported lower life satisfaction, more negative affect, and more health problems than those who did not suffer any damage in all surveys, including in 2011, or 16 years after the earthquake. Likewise, residents with at least one immediate family member who died in the earthquake reported lower life satisfaction, more negative affect, and more health problems than those who did not have any immediate family members killed in all surveys, including in 2011. Surprisingly, the effect of housing damage on subjective well-being remained significant, above and beyond human loss. Equally important, the 2011 survey data showed that pre-existing differences in socioeconomic status between the victims of housing damage and human loss did not change our main findings.

1. Introduction

Humankind has had to deal with all kinds of natural disasters since its earliest days on earth. From the time of ancient Greek epic poems and tragedies, stories around the world have told of our struggles with such events (Nussbaum, 1986/2000). How do people adapt to a major natural disaster such as an earthquake? We examined this question using surveys sampling victims of the 1995 Hanshin-Awaji Earthquake.

Psychologists started to investigate hedonic reactions to major life events such as becoming disabled or winning the lottery in the late 1970s (e.g., Brickman, Coates, & Janoff-Bulman, 1978). Initial findings suggested that humans are capable of adapting to a diverse array of life events. Over the last decade, there have been large longitudinal studies aimed at studying these processes (Lucas, 2007; Lucas, Clark, Georgellis, & Diener, 2004). The main findings from these newer studies were that people tend to adapt to a positive life event, such as marriage, quickly (within a year or so), whereas people tend not to fully adapt to a major negative life event such as unemployment, widowhood, or divorce for an extended period of time (e.g., 7 years, see Diener, Lucas, & Scollon, 2006; Lucas, 2007 for review).

Despite the active research on hedonic adaptation over the last decade, however, we know relatively little about human adaptation to major natural disasters. What research does exist suggests that many victims suffer from post-traumatic stress disorder and depressive symptoms, though many of them also report personal growth over time (e.g., Lowe, Manove, & Rhodes, 2013). Sri Lankans who were victims of the 2004 tsunami in that country reported higher levels of depressive symptoms one year later than those who did not experience the tsunami (Wickrama & Ketring, 2011). However, the victims' depressive symptoms and physical health conditions did not differ from those of Sri Lankans who did not experience the tsunami 3 years later. Another study, of particular relevance to ours (Merdjanoff, 2013), analyzed Hurricane Katrina victims' emotional distress roughly one year after Katrina. The

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victims' level of distress remained quite high one year out, almost equivalent to that associated with mild mental illness. Furthermore, victims whose houses suffered serious damage were substantially more distressed than those whose houses were not damaged. Similarly, among the victims of two natural disasters in Greece, an earthquake and a wildfire, damage to property was a significant predictor of psychological distress one month after the earthquake and 11 months after the wildfire (Papanikolaou, Adamis, Mellon, Prodromitis, & Kyriopoulos, 2011).

To our knowledge, there is only one study that examined psychological adaptation to a major disaster over a more substantial period of time (McFarlane & Van Hooff, 2009). This study found that Australians who experienced a major wildfire in childhood had a higher probability of lifetime anxiety disorder than non-victims roughly 20 years later; though they were no more likely to suffer from a variety of other disorders measured (i.e., lifetime depressive disorder, any DMV-IV disorder, PTSD, or an eating disorder). None of the aforementioned studies examining adaptation to a major disaster, however, assessed positive aspects of well-being such as life satisfaction.

The current research investigates psychological adaptation of the victims of the 1995 Hanshin-Awaji Earthquake (Magnitude 7.3). The Hanshin-Awaji Earthquake took place on January 17, 1995. Its epicenter was close to the city center of Kobe, resulting in the death toll of over 6400, and the total destruction of over 100,000 homes in the city and its surrounding areas. To put the magnitude of the destruction in Kobe and its surrounding areas in perspective, the largest casualty count of any major earthquake in the U.S. over the last 100 years was 165 deaths in the 1946 Aleutian Islands earthquake and tsunami. Within the last 50 years, the largest casualty count of any earthquake in the U.S. was 65 deaths in the 1971 San Fernando earthquake (Magnitude of 6.6). The 1989 San Francisco-Oakland earthquake (also known as the Loma Prieta earthquake) and the 1994 Northridge earthquake, the two earthquakes most similar to the Hanshin-Awaji in a sense that they were close to a large city, had a magnitude of 6.9 and 6.7 and resulted in 63 and 33 deaths, respectively. Such comparisons (e.g., over 6400 deaths versus less than 70 deaths in the most major U.S. earthquakes over the last 50 years) make it clear that the 1995 earthquake in Kobe and its surrounding areas was a truly *major* natural disaster that likely affected the Kobe area's 3.3 million residents for an extended period of time.

Based on Merdjanoff (2013) and Papanikolaou et al. (2011), we predicted that housing damage would be an important predictor of the psychological adaptation of victims. In addition to housing damage, we also examined human loss, as previous research has shown relatively prolonged adaptation to the loss of a spouse or a child (Lehman, Wortman, & Williams, 1987; Lucas, Clark, Georgellis, & Diener, 2003). Because social relationships are often one of the strongest predictors of subjective well-being (e.g., Diener & Seligman, 2002), we expected that the effect of human loss would be stronger and more enduring than that of housing damage. Our survey data are ideally suited to examine the long-term effect of housing damage and human loss, as subjective well-being was assessed 6 years (2001), 8 years (2003), 10 years (2005) and 16 years (2011) after the earthquake.

2. Method

The Hyogo Life Recovery Panel Surveys covered the whole area of Kobe City, Japan, and surrounding areas (e.g., Akashi, Himeji, Nishinomiya, Ashiya) that experienced a level 7 earthquake on the Japanese earthquake scale, as well as areas where the gas supply was stopped because of the 1995 Hanshin-Awaji Earthquake. The respondents of the surveys were adults living in these areas. A stratified 2-stage sampling method was employed. Sampling with probability proportional to size was performed on the Basic Resident Register (see Kimura, 2007; Tatsuki, 2007 for details). The survey was mailed to 3300 residents in 2001, 2003, 2005, and 2011, respectively, and responses were considered valid if returned within 3 weeks. The respondents numbered 1203 in the 2001 survey, 1567 in the 2003 survey, 1028 in the 2005 survey, and 1534 in the 2011 survey. These surveys were not longitudinal; instead, as with the U.S. general social surveys, different respondents were randomly selected from the Basic Resident Register each year.

Out of the 1203 respondents in the 2001 survey, 8 respondents did not reside in Kobe or its immediate surrounding areas in 1995. Out of the 1567 respondents in the 2003 survey, 28 respondents did not provide information regarding where they resided in 1995 and 11 respondents lived in Hyogo prefecture but outside Kobe and the surrounding areas in 1995. Out of the 1028 respondents, 15 respondents did not provide information regarding where they resided in 1995 (all others were residing in Kobe or its surrounding areas). Out of the 1534 respondents in 2011, 4 respondents did not provide information regarding where they resided in 1995, and 17 resided in Hyogo prefecture but outside Kobe and the surrounding areas, 80 resided in another prefecture in the Kansai area, and 81 resided somewhere outside the Kansai area. We removed the respondents who did not reside in Kobe or its immediate surrounding areas (where the magnitude was 7.0 or more and the gas supply was stopped) from the analyses. In an earlier version of this paper, we included all the respondents. Due to the small number of excluded respondents, the results were nearly identical with or without the respondents excluded.

2.1. Materials

The survey included one item regarding human loss in the 1995 earthquake: "Among those family members who lived with you at the time of the 1995 earthquake, did anyone die because of the 1995 earthquake?" (coded as Yes/No). The question regarding the housing damage was as follows: "How much damage did your house (apartment) receive?" (0 = no damage, 1 = partially damaged or burnt, 2 = roughly half damaged or burnt, 3 = totally damaged or burnt). Life satisfaction was assessed with six items: "Currently, how satisfied are you with each of the following (1 = very dissatisfied, 2 = somewhat dissatisfied, 3 = neither dissatisfied nor satisfied, 4 = somewhat satisfied, 5 = very satisfied): everyday life, health, social relationships, finance, family life, and job" (α = .78 to .88). Negative affect was assessed with six items: "During the past month, how often did you feel each of the following? (1 = not at all, 2 = rarely, 3 = sometimes, 4 = often, 5 = always): restless, sad, blue, ruminative, unable to concentrate, and unmotivated" (α = .92 to .95). Physical symptoms were assessed with the following six items ("During the past month, how often did you feel each of the following? 1 = not at all, 2 = rarely, 3 = sometimes, 4 = often, 5 = always): palpitations, out of breath, headaches, chest pain, dizziness, and thirst" (α = .88 to .95).

In order to assess pre-earthquake socioeconomic status (SES), we used three items. First, home/condominium ownership at the time of the 1995 earthquake was reported in all surveys (1 = owner; 0 = renter). Second, the current occupation was assessed in all surveys and used as a proxy for pre-earthquake SES with the following options: (1) professional, (2) managerial, (3) administrative/sales, (4) service industry, (5) factor worker, (6) small business, (7) agriculture/fishing, (8) housewife, (9) student, (10) unemployed, or (11) retired. We created a measure of high occupational status by coding professional (e.g., doctor, lawyer, professor) and managerial position as 1 = high occupational status, and the rest as 0 in the analyses below. In the 2011 survey, there was an item that asked respondents' occupation at the time