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Original Article

Disadvantage and prosocial behavior: the effects of the Wenchuan earthquake☆

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Abstract

The May 12, 2008, Chinese earthquake of 8.0 magnitude on the Richter scale placed residents in devastated areas in a disadvantaged position. We conducted three sequential surveys in both devastated and non-devastated areas to test our hypothesis that residential devastation would evoke more prosocial behavior. As expected, the results revealed that the degree of prosocial behavior increased with an increasing level of residential devastation, but decreased with the passage of time. However, we also found evidence that a catastrophic disaster leaves a long-lasting effect on prosocial behavior. These findings should improve the conceptual understanding of the origin of prosocial behavior.

Keywords: Dictator Game; Disadvantage; Prosocial behavior; Residential devastation; Wenchuan earthquake

> During World War II, an American pilot and a marooned Japanese navy captain are deserted on a small uninhabited island in the Pacific Ocean. There, they must cease their hostility and cooperate in order to survive, in spite of their two countries being at war.
>
> — The plot of *Hell in the Pacific* (John Boorman, director, 1968)

1. Introduction

The origin of cooperative or prosocial behavior is one of the most prominent unsolved problems in current research (Gurven, 2004; Jiménez, Lugo, Cuesta, & Sánchez, 2007; Pennisi, 2005; Van Segbroeck, Santos, Nowe, Pacheco, & Lenaerts, 2008). Various researchers have suggested possible mechanisms for inducing prosocial behavior, such as kin selection (Hamilton, 1964), group selection (Eshel, 1972; Wilson & Sober, 1994), reciprocation (Axelrod & Hamilton, 1981; Trivers, 1971), social exchange (Van Vugt & Van Lange, 2006) and many more.

Recent research (Han, Li, & Shi, 2009) identified an interesting phenomenon in connection with prosocial behavior. In their experimental study, a prosocial behavior, measured by the number of game offers that a child provided to others, was induced when the player was at a disadvantage. They found that preschool children playing in their own classroom made fewer offers in the game than did children playing in a classroom other than their own (Han et al., 2009). The disadvantage, i.e., not being on one's own turf and not having the power to dictate in the Ultimatum Game, was seen as an underlying reason why the children proposed more offers to their partners. Han et al. (2009) considered such a disadvantage to be a somewhat primary cause of prosocial behavior, compared with other causes that have been reported in the literature on cognitive and moral development and socialization (Eshel, 1972; Hamilton, 1964).

Inspired by the Han et al. study, in this article we propose a mechanism that can elucidate a basic premise of prosocial behavior from an evolutionary perspective, that is, why and when people exhibit prosocial behavior.

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When threatened by natural hazards such as earthquakes, droughts, floods, cyclones, epizootic diseases and wild animals, an independent/isolated individual seems to be helpless and powerless. In the struggle to survive, human beings come to each other's aid at such times (Higgins, 2008; Himma, 1998). Such aid can be possible between relatives, friends, strangers and even enemies. In emergency situations, they may even put their own lives at risk to aid complete strangers (Latane & Darley, 1970).

Mutual aid can serve as an adaptive mechanism to increase an individual's survival opportunities, and thus the reproductive potential for their genetic information, when they are at a disadvantage. Obviously, this adaptive mechanism can impact the survival of the human species as well. Being inclined to give aid when one is oneself in need could enhance the group's interests at the expense of an individual's self-interest. This pattern is often called strong reciprocity (Gintis, 2000; Gintis, Bowles, Boyd, & Fehr, 2003). However, being inclined to give aid when one is oneself in need might also enhance an individual's interests through mechanisms of direct or indirect reciprocity (Axelrod & Hamilton, 1981; Trivers, 1971). The interaction between these two advantages could be the reason why human beings favor group living.

Over a long history of natural selection and evolution, the benefits of mutual aid when a person was at a disadvantage may have been so substantial that individuals who possessed such an adaptive reaction to their inferior/disadvantaged status might have been more successful in passing on their genes to the next generation than individuals without this adaptive reaction, thus causing this capacity to spread through the population. From an evolutionary perspective, such an adaptive reaction to their inferior/disadvantaged status might, very likely, be genetically inherited.

On May, 12, 2008, an 8.0-magnitude (Richter scale) earthquake occurred in Wenchuan, China. It was the deadliest and strongest earthquake to hit China since the Tangshan earthquake in 1976. Official figures confirmed 88,928 dead, as of May 24, 2009, with more than 374,640 listed as injured (Mu, 2009). Direct economic losses reached 1.175 trillion yuan (about US$173 billion), of which more than 70% came from damaged dwellings, school and hospital facilities and infrastructure such as roads and bridges (Mu, 2009; Sun, 2008). Moreover, the earthquake deprived 1.15 million rural people in Sichuan Province of their livelihood, as the tremors wreaked havoc on their leased farmland and forests (Yangtze, 2008). Even giant pandas were forced to be on a diet because the quake damaged bamboo forests (An, 2008). All these factors placed residents in devastated areas in an inferior position in terms of health, property, housing, employment and their residential environment. Therefore, we can logically assume that residents in quake-devastated areas experienced a significant disadvantage following this natural disaster.

The massive earthquake presented us with an opportunity to test the assumption that being at a disadvantage affects prosocial behavior in a real-world setting. We conducted two studies to investigate (1) whether residential devastation stimulated prosocial behavior in the quake areas and (2) whether the degree of prosocial behavior decays with the passage of time.

2. Study 1

2.1. Method

From June to July 2008, a total of 2447 residents in three non-devastated areas (the Tangshan area in Hebei Province, Fujian Province and Beijing City) and in two devastated areas (Sichuan Province and Gansu Province) participated in a post-earthquake survey. All participants were recruited by going door to door and asking people to take a survey, and were given a small present (such as a bar of soap, a towel or a packet of washing powder) in return for their participation. The institutional review board of the Institute of Psychology, Chinese Academy of Sciences approved the project.

The degree of prosocial behavior was assessed using a Dictator Game and a Volunteer Problem. The Dictator Game was derived from Hoffman et al. (Hoffman, McCabe, Shachat, & Smith, 1994; Hoffman, McCabe, & Smith, 1996), whereas the Volunteer Problem was developed based on a true story of a surviving high school teacher (Shi, 2008). The problems are shown here exactly as they were posed to participants, other than being translated.

> DICTATOR GAME: Suppose now that you were provided with ¥100 in cash and asked to propose a division of ¥100 between yourself and an anonymous person:
> you will offer ¥_____ to the anonymous person.
> VOLUNTEER PROBLEM: On May 12, a high school teacher considered switching from a mathematics lecture to a PE (physical education) one, but decided against it. He later found that he would have saved 40 students' lives had he changed the schedule.
> Suppose that you were the teacher and you were faced with an opportunity to engage in a charity work as a volunteer, please indicate the number of days you would be willing to volunteer your services (up to 100 days).

In the Dictator Game, the amount offered by the interviewee was used as the measure of prosocial behavior. In the Volunteer Game, the number of volunteer days was considered as a separate measure of prosocial behavior.

Demographic questions included the respondents' gender, age, education and occupation. To assess the level of residential devastation, a self-evaluation was carried out. Each resident in the devastated areas was asked to classify their residence into one of three categories: slightly devastated, moderately devastated or extremely devastated.

2.2. Results and discussion

2.2.1. Sample

Table 1 shows the demographic characteristics of the participants in this study. Comparisons with the 2008 Census