Status and Power Differentials in the Generation of Fear in Three California Earthquakes

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Abstract

Natural hazards, particularly those that occur without warning are likely to generate fear in those in or near the area affected. While the expression of fear and other emotions are ubiquitous in a disaster situation, they are not universal nor are they uniform in intensity of expression. In this study, three California earthquakes will be the focus for a comparative analysis of survey findings that attempt to measure the expression and intensity of fear during the ground motion generated by these earthquakes. Though now occupying “historic” status, two of the three earthquakes examined in this study remain the most recent earthquake disasters to impact northern and southern California. The study is informed by the literature on the Sociology of Emotions and will test a theory by Theodore Kemper that associates emotional expression with status and power differentials in society. The results provide support for Kemper’s theory though there are significant determinants of fear that are not explained by the status and power theory of emotions. These factors, largely situational, merit further study and indicate that more comprehensive theories of emotion generation and expression are needed.

Keywords: emotion, fear, status, power, earthquakes

As defined in the broadest sense, fear is an emotion associated with, and in most cases a response to, some form of actual or perceived threat. Fear is often experienced during rapid onset disasters but has rarely been the primary focus of study by social scientists. While there is conventional wisdom regarding how intense fear affects disaster response, this paper will examine the situational, demographic and socio-cultural antecedents of fear rather than its behavioral consequences. Thus, the research question that drives this study is: who are the fearful in a significant and damaging earthquake and what factors are related to high and low levels of expressed fear? I will also test a sociological theory suggesting that differential power and status explain the expression of fear.

The Literature: Some Components of Fear

The last decade has witnessed a significant level of interest in the Sociology of Emotions including the publication of two “handbooks” summarizing empirical studies and theoretical orientations in this emerging field (Stets and Turner 2006; 2014). Though they do not ignore fear, they give it scant attention and do not address it at all in the context of natural disasters. Nevertheless, these volumes provide good summaries of research to date as well as theoretical orientations which will be employed in explaining our survey findings. Emotions can be defined as “transient, bio-psycho-social reactions to events that have consequences for our welfare and potentially require immediate action” (Matsumoto 2011) or “rapid information processing systems that help us act with minimal conscious deliberation” (Tooby and Cosmides 2008). Most sociologists who study emotions identify four basic, or primary, emotions including: satisfaction-happiness, aversion-fear, assertion-anger and disappointment-sadness (as summarized in

Turner 2014). Three of these four are regarded as “negative” emotions and my principal interest will be in aversion-fear, or just fear.

Shaver et al. (2001, p. 43) examined emotion prototypes as proposed by Fehr and Russell (1984) and suggest that “fear accounts begin with an interpretation of events as potentially dangerous or threatening to the self---most commonly, an anticipation of physical harm, loss, rejection or failure. The fear antecedents also include a set of situational factors (unfamiliar situation, being in the dark, being alone) that probably increase the person’s perceived vulnerability to such threats and impede his or her chances of coping effectively.” Shaver and colleagues also cite Osgood, et al. (1975, p.43) in describing the fearful person as “relatively weak or low in potency; some aspect of the self (e.g. physical well-being, social position, or sense of competence) is potentially under attack and the fearful person is relatively helpless to do anything about it...” (See also, Roseman, 1984).

In studies of emotion, fear and other negative emotions generally have been shown to vary with gender (Brody and Hall 2000; Shields et al. 2006; Schrock and Knop, 2014; Simon 2014), ethnic identification (Matsumoto 1993; Matsumoto and Hwang 2011; Wilkins and Pace 2014) and socio-economic status (Kemper 1978 1990 2000 2006 2014; Lively and Heise 2004; Turner 2014; Simon 2014; Webster and Walker 2014). Non-disaster related differences in emotional expression by gender have been reported in “culturally prescribed gender roles (e.g. the role of child caretaker vs. economic provider); social motives such as the need for intimacy vs. control; and adapting to the power and status imbalances between the two sexes, in which men typically have higher power and status than do women” (Brody and Hall, 2000, p.395; See also Brody 1997; 1999). Elsewhere, Brody observes that many negative emotions, including distress, feelings of vulnerability, fear and hurt are also reported more by women than men

(1999). Shields et al. caution that in self-reports of emotion, particularly in hypothetical or ambiguous situations, results are likely to reflect conformity to gender-emotion stereotypes rather than actual felt emotion (2006). Simon, in summarizing research on gender and emotion, states “women report significantly more frequent negative emotions (including anger, sadness and anxiety) as well as significantly fewer positive emotions (such as happiness and calm) than do men” (2014, p. 431). Schrock and Knop (2014) emphasize the role of socialization, that children are raised to associate their gender with particular emotions in the contexts of home, school, athletics and work.

Matsumoto found differences in several dimensions of emotions based on ethnicity (1993). This study, a rare examination of cultural differences on various measures of emotion within a country, found significant differences in “emotional judgements, display rules and self-reported emotional expressions as a function of ethnicity in an American sample” (1993, p. 118). In regard to fear, Hispanics and African-Americans differed significantly from Caucasians and Asians on intensity as assessed by the Affect Intensity Measure (Larsen and Diener 1987) indicating higher levels of fear among Hispanics and African-Americans based on the 40 item instrument which evaluates the intensity of typical emotional experiences. Citing “a history of oppression and subjugation” of African-Americans, Matsumoto suggests “the existence of large-scale, social-based influences... would effect changes in emotion systems in the different ethnic groups” (Matsumoto 1993, p. 119). In a more recent article (Matsumoto and Hwang 2011), the authors note that in different cultures (and presumably different ethnic subcultures) both the frequency and type of emotion initiating triggers will vary. Wilkins and Pace, in their summary of race and emotions, note that “social and economic disadvantages... make everyday life more

difficult, amplifies bad treatment from others, leads to more loss and fewer resources to solve problems, and marginalizes people” (2014, p. 390).

A number of studies have identified the unequal distribution of status and power as a basic determinant of emotional expression (Kemper 1978; 1990; 2000; 2006; 2014; Turner 2014; Webster and Walker 2014; Simon 2014). Essentially, those higher in the stratification system will express positive emotions to a greater extent than those lower in the system. In a general social context, Lively and Heise (2004) found that older persons, the better educated, those in more prestigious occupations and people with larger families all reported more positive emotions than the young, those with lower levels of education, occupants of less prestigious occupations and those with fewer children. Turner (2014, p. 180-81) states “those who receive larger amounts and a greater variety of resources will be morally valued over those who have fewer levels and a more limited variety of resources. Once these differential moral evaluations are established, individuals with higher or lower evaluations will experience different emotions. Those with higher evaluations and larger shares of resources will experience more positive emotions than those with low moral evaluations and fewer resources.”

Emotion has not been ignored in studies of disaster (e.g. see Cohn, et al. 2000 on the role of emotional expression in disaster response organizations) but research has concentrated on emotions that are perceived to be positive, particularly those associated with altruism (e.g. compassion). Certainly, case studies in numerous disasters have demonstrated the salience of altruism in the immediate post-impact phase of a disaster (see summaries of this extensive literature in Mileti 1999; Tierney et al. 2001). But, fear is also present, probably omnipresent during and immediately following a natural disaster, yet little attention has been paid to its generation or consequences. This differential emphasis on positive emotions may reflect a desire

to avoid fear as a negative emotion, often associated with a discredited “breakdown” model of human behavior in disaster that persists despite an overwhelming amount of empirical evidence to the contrary.

One notable exception is the explicit treatment of fear by Turner and colleagues (1986). Turner examined fear within the context of an earthquake threat as well as the actual experience of an earthquake, thus a review of the findings and implications is instructive. Using survey methods and a questionnaire item structured very much like the one used in the present study, Turner et al measured both prospective fear, that is fear of a hypothetical damaging earthquake in the future and, among those who had experienced an earthquake, fear during and immediately after its occurrence. They found that fear, both in anticipation of a damaging earthquake and as expressed by those who had experienced an earthquake (not necessarily a damaging event), was highly prevalent. Approximately 63% of those who anticipated a damaging earthquake, and 59% of those who had experienced an earthquake, reported being very frightened or somewhat frightened.

In addition to examining fear as an independent variable and looking at the consequences of varying levels of fear, Turner et al. also treated fear as the dependent variable. He found that women, non-Caucasians and young people reported higher levels of fear than men, Caucasians and older persons. Turner also found that information gleaned from informal discussion (in contrast to information from books, magazines and electronic media) tended to enhance fear of a future earthquake, possibly by virtue of the close association between informal discussion and rumor. Another intervening variable discovered by Turner and colleagues was fatalism, found to be prevalent among African-Americans, Mexican-Americans and those with lower levels of

education. Fatalism tended to deter people from taking earthquake threat information seriously despite high levels of fear.

The pattern which emerges from this review of the literature is that negative emotions, including fear, are likely to be expressed by those who are relatively powerless by virtue of socialized gender roles, social disadvantages imposed on some ethnic groups, and lower standing in the stratification hierarchy. I anticipate that women, ethnic minorities and people with lower incomes will be overrepresented among those who express higher levels of fear in the three earthquakes which are the subjects of this study. While status differences are likely to be salient, I will also examine other factors that may be operating, particularly the intensity of ground motion experienced, the level of confidence expressed in one's prior earthquake preparedness, the presence of others (particularly dependent children) during the earthquakes, experience with prior earthquakes and length of residence in California. These factors can be viewed as situational (e.g. ground motion intensity, experience with prior earthquakes, the presence of others and length of California residence) and those related to status (e.g. confidence in earthquake preparedness and possibly the presence of dependent children) in that preparedness may be more prevalent among more privileged groups and associated with a gender-based role of women to protect children in a crisis. In addition, I must add the caveat that this research applies specifically to the United States and that the results of this study should be viewed in this cultural context.

A Sociological Theory of Emotional Expression

Although emotions have been discussed in numerous sociological studies, including works by Marx, Durkheim, Weber, Simmel, Cooley, Mead, Elias and others (see summary in Scheff 2000), Theodore Kemper was perhaps the first to develop an explicitly sociological

theory of emotions (1978 200020062014). In differentiating the social component of emotion from that of other disciplines, Kemper (2000, p. 46) observes that sociologists and social psychologists “examine how emotions are triggered, interpreted, and expressed by virtue of human membership in groups defined by social class, occupation, gender, ethnicity, peer groups, families, communities, crowds and nations.” He identifies the individual as the locus of emotion and the unit of analysis, but gives primacy to the “social matrix (that) determines which emotions are likely to be expressed, when and where, on what grounds and for what reasons, by what means of expression and by whom.”

Social relations, particularly power, “a relational condition in which one actor actually or potentially compels another actor to do something he or she does not wish to do”, and status “a relational condition of voluntary compliance with the wishes, interests, and desires of another person” are the dimensions, according to Kemper and Collins (1990, p. 34), to which a large number of emotions can be understood as a reaction. Kemper claims that emotions are products of social interaction in which power and status are exercised.

Kemper’s theory is stated entirely in relational terms, excluding situations in which environmental hazards could trigger fear. This theory has utility however, in focusing on major social structural variables that are likely to be in operation and salient even in situations that appear remote from the exercise of power. Those groups and individuals within the community that are relatively powerless, for example, may exhibit greater levels of fear in an earthquake than the more empowered and there may be behavioral manifestations that mirror the responses hypothesized by Kemper in social interaction. Thus, my objective in this study is to test, and potentially extend, Kemper’s theory to the realm of environmental hazards, aware that stable

patterns of interaction in which status and power are exercised, are salient in crisis situations, just as they are in everyday interaction.

Background: The Earthquakes

The analyses presented in this paper are based on data collected through telephone interviews following three California earthquakes: the Whittier Narrows earthquake of October 1, 1987, magnitude 5.9; the Loma Prieta earthquake of October 17, 1989, magnitude 6.9 and the Northridge earthquake of January 17, 1994, magnitude 6.7.

Whittier Narrows: At 7:42 am on October 1, 1987, the Los Angeles metropolitan region experienced a moderate-size earthquake of M5.9 located approximately 15 km northeast of downtown Los Angeles. The earthquake and its main aftershock caused 8 deaths, over 200 injuries and \$358 million in property damage. The City of Whittier, located approximately 10 km from the earthquakes epicenter, experienced the heaviest shaking.

Loma Prieta: The Loma Prieta earthquake occurred at 5:04 pm on October 17, 1989. At M6.9, it was the largest earthquake to strike the Bay region since the Great San Francisco Earthquake of 1906. The earthquake was centered in the mountains about 16 kilometers east-northeast of the City of Santa Cruz and 100 kilometers southeast of San Francisco. The earthquake caused 62 deaths, 3,757 injuries and displaced over 12,000 people. Property damage estimates are approximately \$6 billion.

Northridge: The Northridge earthquake struck the Los Angeles area at 4:31 am on January 17, 1994 affecting a large area of the San Fernando Valley and west Los Angeles. The M6.7 earthquake caused 33 deaths and approximately 7,000 hospital-treated injuries. Over 20,000 people were displaced from their homes and economic losses stand at \$42 billion.

These surveys, though varying somewhat in content, were comparable on the items examined in this study. The objective in conducting the surveys was to collect basic data on response behavior, attitudes and emotional expression associated with a significant natural disaster, how information in the aftermath of the earthquakes was obtained, psychological impacts of the disasters and decision making regarding post-event recovery. The goal of the surveys was to provide insights into human response to disaster in a number of immediate and longer-term contexts that would advance the empirical and theoretical knowledge base in disaster research and inform practice in emergency management, particularly preparedness and mitigation planning.

Methods

The Samples¹

Whittier Narrows. A total of 690 interviews were conducted with 191 persons in a pre-designated high impact area and 499 persons proportionately distributed throughout the remainder of Los Angeles County. Based on the assumption that all or none of the contacted numbers would have reached eligible households, the response rate for the high impact zone was 75% to 80% and 42% to 57% in the reminder of the county.

The two sample strata differ ethnically with persons in the high impact area twice as likely to be of Mexican origin and the remainder of the sample to be African-American or Caucasian. While these distributions are consistent with those reported elsewhere, Asians might be under-represented in the high impact zone. The total sample was reduced to 623 as 67 persons reported being outside the area in which the earthquake was felt.

Loma Prieta. A representative sample of 656 persons was obtained from households in San Francisco, Alameda, Santa Cruz, and San Mateo Counties. Intentional over-sampling was done in two areas, the northeastern edge of the San Francisco Peninsula and Oakland and the Boulder Creek-Santa Cruz-Watsonville area where Modified Mercalli intensities were VIII-IX insuring that there were sufficient numbers of respondents from the areas most heavily impacted by the earthquake. Of the 656 persons interviewed, 83 were residents of San Francisco-Oakland, 122 were from Boulder Creek-Santa Cruz-Watsonville and the remainder of the sample of 451 persons was from the rest of the 5-county area. Response rates were between 70.3% and 80.6% in San Francisco-Oakland, 74.4% and 79.7% in Boulder Creek-Santa Cruz-Watsonville and between 68.9% and 74.4% in the rest of the 5-county area. The total sample was reduced to 620 as 36 persons reported being outside the area in which the earthquake was felt.

Northridge. In the Northridge earthquake survey an overall total of 1830 interviews were conducted, however, the question regarding fear was asked only in Wave I of that study resulting in a working dataset of 487 for this analysis. The interviews were conducted with residents of Los Angeles County. The response rate was between 46% and 60 % depending on the status of the 253 telephone numbers of unknown status. Interviews in this wave averaged 48 minutes in length, were conducted an average of 245 days after the earthquake and 18% were conducted in Spanish. The total sample was reduced to 451 as 36 persons reported being outside the area in which the earthquake was felt.

Data Collection

Telephone interviews lasting, on average, between 30 and 45 minutes were conducted by the Survey Research Center located in UCLA's Institute for Social Science Research for each of the three earthquake surveys. The Whittier Narrows earthquake survey was conducted between

October 1988 and May of 1989; the Loma Prieta earthquake survey, between April and August of 1990; and the Northridge survey interviews were conducted in three waves, Wave I between August and December 1994, Wave II between August and October 1995 and Wave III, between August and May 1996. The Kish (1965) method was employed to select an eligible respondent 18 years of age or older and a resident of the household at the time of each earthquake.

Interviews were conducted in either English or Spanish at the request of the designated respondent from each household.

The questionnaires used to collect data after the three earthquakes were similar though not identical and were based on a questionnaire first developed by Turner and colleagues for use if a significant earthquake occurred in Los Angeles County between 1978 and 1980 (Turner, et al., 1986). The variables to be examined in this study include fear as the dependent variable and several dimensions of status and power as well as some situational factors as independent variables.

Measures

The dependent variable is level of expressed fear, recorded in all three questionnaires as a five-category variable coded to create a single item rating scale (Spector, 2006) with “Very Frightened and Upset” the highest level of fear and “Enjoyed the Experience” as the lowest. In use of this scale, I am conscious that ordinal data are being analyzed as if they were interval but in doing so feel that: 1) the scale is a meaningful (Marcus-Roberts and Roberts, 1987; Knapp, 1990) assessment of expressed levels of fear, 2) more powerful descriptive statistics are possible in making this decision (Labovitz, 1967) and 3) strict adherence to measuring scales may lead to a waste of information (op cit, 1967). While a multi-item scale for fear would have been desirable in terms of validity and reliability, the survey administered was a broad-based attempt

to capture many dimensions of human behavior in three earthquake disasters and, at the outset, the salience of fear was unknown. The frequency distributions for the fear variable in each dataset are shown in Table 1 below.

****Table 1 About Here****

The independent variables include:

- gender
- age
- ethnicity
- income
- education
- place of birth
- length of residence in California
- number of earthquakes experienced
- level of shaking experienced
- the presence of dependent children
- self-evaluated extent of earthquake preparedness

These variables are described below.

Gender was recorded in all three studies as male and female based on the household roster that included other demographic information including age and relationship to the respondent. Age was recorded in all three surveys as the respondent's age in years at the time of the earthquake. Ethnicity was recorded as the category with which the respondent most closely identified and was presented as five basic groups: Caucasian, Hispanic (separating Mexican-Americans and non-Mexican Hispanic), Asian, African-American and other. Income was recorded as the total family income in dollars from all sources and before taxes for each household. Education was measured by the number of years of school respondents reported having completed and for which they had received credit. Place of birth was limited to birth in

the United States or outside the US and asked only in the Northridge earthquake survey. Length of California residence is the number of years respondents had lived in California.

The number of earthquakes experienced included any earthquake the respondent recalled regardless of magnitude. Level of earthquake shaking referred to the intensity (estimated Modified Mercalli or MMI) of the subject earthquake based on zip code of the respondent's residence. The presence of dependent children was one response alternative in an item that sought to determine who the respondent was with at the time of the earthquake that also included various categories of others (e.g. other adults in the household, adult children, etc.). Finally, the self-evaluation of preparedness was based on answers to the question: "How well prepared do you feel you were to deal with this earthquake? Were you very well prepared, somewhat prepared, fairly unprepared, or totally unprepared?"

Analytical Strategy

Data analysis will include both bivariate and multivariate techniques to examine the relationship between various situational and demographic independent variables on expressed fear, the dependent variable. We will employ multiple regression to examine the influence of several variables that are significantly associated with fear based on the bivariate analysis. In the bivariate analysis, Chi Square will be used as a test of statistical significance and the dependent variable fear will be dichotomized combining the very frightened and somewhat frightened vs. not very, not at all frightened and enjoyed the experience.

Results

Bivariate analyses indicated that in at least one of the three earthquakes, fear was associated with:

- gender
- ethnicity

- place of birth
- age
- income
- education
- length of residence in California
- number of earthquakes experienced
- level of shaking experienced
- presence of children
- level of preparedness (see Table 2).

Women were more likely than men to express fear in all three earthquakes, while persons with less than 13 years of schooling, those who resided in California for less than 28 years, who experienced higher levels of shaking, were with children during the earthquake, and felt that they were unprepared, expressed higher levels of fear following two of the earthquakes. Place of birth was only asked in the Northridge earthquake survey where it was a significant predictor of fear with those born outside the United States more likely to express high levels of fear.

Women, Hispanics, the foreign born, the young, those with lower incomes, the poorly educated, those who had fewer years of residency in California at the time of the earthquakes, persons who had less experience with earthquakes, those who experienced high levels of shaking during the earthquakes, persons who were with dependent children, and the poorly prepared expressed the highest levels of fear. Based on preliminary bivariate analysis, the highest levels of fear in the earthquakes were expressed by those in lower statuses and more vulnerable positions.

Although this analysis must be considered preliminary and subject to more sophisticated multivariate analysis, it may be instructive to take a closer look at these data before moving on to further analysis. When we consider only characteristics related to social status, we find that—women, ethnic minorities, the young, the economically disadvantaged, the poorly educated and those with little confidence in their preparedness for a damaging earthquake—express the highest

levels of fear. In what might be termed the more vulnerable, regardless of their social status—those who were in the presence of dependent children at the time of the earthquakes, those who were relatively new to earthquake-prone California, those with little or no experience with previous earthquakes and persons who experienced the strongest shaking in the earthquakes, also tended to be quite frightened.

****Table 2 About Here****

Multiple regression was used to regress fear on all the independent variables that were significantly related to fear in the bivariate analysis. As a final step in the multivariate analysis of fear in all three earthquakes, the SPSS procedure Regression-Linear was employed with fear (as a five category variable ranging from least to greatest expressed fear) as the dependent variable and gender, education, ethnicity, age, length of California residence, the number of earthquakes experienced, level of shaking intensity experienced, the presence of dependent children and level of perceived earthquake preparedness as independent variables. The variables were entered into an R^2 change model in three stages or steps using the ENTER procedure in SPSS. The first included the demographic variables with education and age entered as continuous variables and ethnicity and gender as categorical variables. Ethnicity was coded as dummy variables for Caucasian, African-American, Asian, Mexican-American and (non-Mexican) Hispanic; Caucasian was excluded from the analysis as a reference category.

Several situational variables were entered into the model as a second step. They included length of California residence, the number of earthquakes experienced (both entered as continuous variables), the presence of dependent children and level of earthquake shaking experienced (coded as high or low). A final step included the one perceptual variable, the level of perceived earthquake preparedness coded as a four category variable ranging from totally unprepared to very well-prepared. The models for Whittier Narrows and Northridge were run unweighted and Loma Prieta was weighted (See Footnote 1). Table 3 summarizes the results.

****Table 3 About Here****

The final model for Whittier Narrows indicated that women, those with low educational attainment, the ethnically Hispanic, those in the presence of dependent children during the earthquake, and people who expressed little or no confidence in their pre-earthquake preparedness had higher levels of fear during the earthquake. Dropped from the model were: age, income and the number of previous earthquakes experienced. The length of California residence and the shaking intensity experienced, though not significant factors in the model, were retained due to their significance in the models for other earthquakes. Place of birth was not available in this data set. Gender ($\beta=.28$), education ($\beta=-.12$) and ethnicity ($\beta=.13$) account for most of the explained variance and the total explained variance R^2 is .187.

The results are rather similar in the Loma Prieta earthquake, with three of the five variables in the Whittier Narrows model being significant here. The model revealed that being female ($\beta=.28$), having experienced the earthquake in the presence of dependent children ($\beta=.09$), and expressing little or no confidence in one's pre-earthquake preparedness ($\beta=-.18$), were associated with high levels of fear during the earthquake. Dropped from the model was income while education, Hispanic ethnicity, length of residence in California and earthquake shaking intensity experienced were retained to assure that all models include the same variables. Gender and preparedness level account for most of the explained variance and the total explained variance in the model R^2 is .167.

The results for Northridge indicate that two variables were retained from the Whittier Narrows analysis and two new variables were added. The model revealed that being female ($\beta=.33$), residence in California for fewer years ($\beta=-.12$), having lower educational attainment ($\beta=-.10$) and experiencing higher shaking intensities ($\beta=.26$) were associated with high levels of

fear during the earthquake. Though ethnicity, the level of earthquake preparedness and the presence of dependent children during the earthquake were significant predictors in other models, they were not factors in the Northridge earthquake. Gender and shaking intensity account for most of the explained variance and the total explained variance in the model R^2 is .202.

Discussion

The relationship between gender and fear is the most robust of all variables tested. Table 2 showed that women were significantly ($p < .001$) more likely to express fear than men in all three earthquakes. Moreover, gender remained a significant predictor in all three multivariate models of fear; indeed, it was the only factor to prove significant in models constructed for all three earthquakes. The presence of dependent children is also associated with high levels of fear, although the relationship fell slightly short of statistical significance in the Northridge earthquake dataset. The presence of dependent children was a significant predictor of fear in the regression models for the Whittier Narrows and Loma Prieta earthquakes but not for Northridge.

Those who described their level of preparedness for an earthquake as “totally unprepared” were significantly more fearful than those who were more confident of their readiness to deal with an earthquake though the measures of association between fear and preparedness were not as high as those observed for gender and the presence of dependent children. Like the presence of dependent children, low levels of preparedness were significant predictors of fear in both Whittier Narrows and Loma Prieta models, but not in Northridge.

Hispanics tended to express higher levels of fear though the results were somewhat ambiguous. In Whittier Narrows, non-Mexican Hispanics expressed significantly higher levels of fear than any other ethnic group, including Mexican-Americans who tended to express fear to

a greater degree than other ethnic groups. In Loma Prieta, it was the Mexican-Americans who were more frightened while other Hispanics were no more likely to be frightened than any other ethnic group. In the Northridge survey, respondents were asked if they were born outside the US. With the opportunity to test the effects of foreign birth, I discovered that nearly 70% of the Hispanics in the Northridge sample were foreign born and, when the foreign born Hispanics and those born in the US are compared in terms of fear, the foreign born showed high levels of fear while those born in the US were no different than other ethnic groups. The interaction of Hispanic ethnicity and being foreign born, however, was not a significant predictor of fear in the Northridge regression model for fear.

Lower education was a significant predictor of higher fear in Whittier Narrows and Northridge, but not in Loma Prieta. Younger people were significantly more fearful in the Whittier Narrows survey but the relationship was less evident in the other two earthquakes and age was not predictive of fear in any of the multivariate analyses. Length of residence in California was associated with fear in the bivariate analyses of Whittier Narrows and Northridge earthquakes but not in Loma Prieta. In the multivariate analyses, those with fewer years of residence were more likely to express higher levels of fear during the Northridge earthquake, but not during the Whittier Narrows or Loma Prieta earthquakes.

Thus, the strongest consistent predictors of fear during the three earthquakes were female gender, the presence of dependent children during the earthquake, the lack of adequate preparedness for an earthquake disaster, being Hispanic and having lower levels of educational attainment. Less salient, though significant predictors in one of the three earthquakes were length of California residence and the intensity of shaking experienced. Other factors suggested

in the preliminary bivariate analysis as possible predictors of fear including age, income, the number of previous earthquakes experienced fell short of significance in all three models tested.

Finally, a factor worth noting is the relatively weak influence of seismic intensity, more specifically higher levels of intensity, in generating intense fear. Only in the Northridge earthquake did shaking intensity have a significant relationship to fear. And even there, social and demographic factors were also salient. Most intensity scales seem to make the assumption that fear is a product of seismic intensity, and little else. This study has demonstrated that emotions expressed in disaster have complex multi-dimensional causation and suggests that the behavioral components of seismic intensity scales be reexamined in view of these findings and others generated by social scientists who have examined emotion in the context of disaster.

Conclusions

Majorities of respondents in all three surveys reported high levels of fear (“very” or “somewhat frightened and upset”) during and immediately following the earthquakes examined in this study. High levels of fear were not, however, universal and there were relatively consistent patterns in the expression of fear based on a number of sociological variables.

Findings indicate that the expression of fear and its intensity vary according to certain situational, demographic and socio-cultural factors and that these factors appear consistent with a sociological theory of emotion developed by Theodore Kemper. Kemper postulated that “a very large class of emotions results from real, imagined, or recollected outcomes of social interaction” (2002) and that expression of emotion is driven by power and status. In short, Kemper’s social interactionist theory of emotion suggests that power and status differences generate fear and that the relatively powerless in American society are more likely to express fear than more secure and powerful groups. Although he has not extended this theory to behavior in natural disasters, the

findings of this study are consistent with Kemper's theory. The most likely to be fearful-- women, ethnic minorities, the poorly educated, those who have little confidence in their preparedness to cope with a damaging earthquake and those who are relatively new to earthquake-prone California, tend to be less powerful and more socially vulnerable.

But these factors do not speak for themselves and we should not be tempted to say simply that the power and status factors that provide some explanation for differential emotional expression in interaction translate easily to disaster response. In defense of the easier path, however, we might speculate that power and status differences that are imbedded in social structure and continuously reinforced through socialization and daily redefinition are very unlikely to disappear as individuals face an unexpected crisis. The variables associated with fear include a mix of power and status factors on one hand, and situational vulnerability on the other, and both merit a closer examination, which is the task of the remainder of this paper.

Gender proved to be the most robust predictor of fear in all three earthquakes. We have already reported that gender differences in the expression of certain emotions, including fear, is well documented in the social science literature. And while the lower status and power of women relative to men is undoubtedly a factor in higher levels of expressed fear, we must note that our analysis indicated that fear tended to be exacerbated by the presence of dependent children, a factor that adds the dimension of role performance to that of gender. But the influence exercised by the presence of dependent children was not consistent across earthquakes, nor does this situational factor explain the relationship between gender and fear. In the Loma Prieta earthquake, women who were with children were significantly more fearful than women who were alone or with other adults.

Two caveats regarding gender must be mentioned based on the insights of Brody and Hall (2000, p. 339) who argue that self-reports of emotional expression may conform to prevailing stereotypes present in our culture: “stereotypes about gender and emotion..., shape the reality of gender differences in at least two ways. First, in any given interaction, gender stereotypes may generate expectancies about our same- and opposite-sex partners that influence and elicit particular behaviors and emotional expressions from them, becoming self-fulfilling prophecies (citing Hall and Briton 1993). Second, stereotypes have a strong implicit prescriptive aspect, taking the form of display rules, which are cultural norms regulating how, when and where emotions can be expressed by males and females in any particular culture.” Thus, caution must be observed in interpreting emotion reports based on gender and interpreting the results as valid empirical indicators.

In addition to gender, four other factors that vary on the dimensions of status and power were salient predictors of fear in one or more of the earthquakes examined. These factors include ethnicity, educational attainment, self-reports of confidence in one's earthquake preparedness and length of residence in California. These latter variables require some explanation. Confidence in one's preparedness may express personal efficacy and a lack of confidence probably indicates a lack of efficacy and recognition that, as an individual or household, little had been done to learn self-protective measures to ensure personal safety. It may also indicate that few, if any, measures had been implemented to mitigate hazards in the home or store recommended supplies for use in the aftermath of a disastrous earthquake. The length of residence in California implies a possible differential experience with the occurrence of earthquakes and level of immersion in an earthquake subculture. Longer residence implies that one has experienced at least moderate-size earthquakes as well as possessing greater familiarity

with the disaster culture, which includes historical knowledge and preparedness and mitigation strategies. Thus, a lack of confidence in one's preparedness and shorter residence in California may signify both a lack of personal efficacy and limited understanding of how to cope with a damaging earthquake.

Ethnicity and education are more straightforward indicators of status and power with Caucasian and well-educated persons enjoying higher status and generally greater power than those with low educational attainment or representing African-American or Hispanic ethnic groups. Recall that Turner and colleagues (1986) discovered that lower education and ethnic minority status were associated with fatalism, an attribute linked to attitudes of resignation to the potential impacts of disaster as well as having taken fewer actions to prepare for damaging earthquakes or mitigate potential hazards. The findings appear to indicate that lower levels of education, Hispanic minority status, having fewer years of residency in California (a trait associated with Hispanic ethnicity) and a lack of confidence in one's preparedness for an earthquake (possibly an indication of fatalistic attitudes) result in higher levels of fear in a damaging earthquake.

Finally, there remain two situational factors unrelated to status or power differentials that are predictors of fear in at least one of the earthquakes under investigation---the presence of dependent children and the intensity of shaking experienced. We have already mentioned the first of these predictors in discussing gender, the two linked by role obligation as women are culturally identified as caretakers of young children to a greater extent than are men. We might conclude that elevated levels of fear expressed by women who were also in the presence of their dependent children at the time of the earthquake simply represents the compounding of emotional expression based on both gender and role performance. But the picture isn't quite that

clear; at least in the case of the Whittier Narrows earthquake as men who were in the presence of dependents were also more fearful.

The fact that shaking intensity was a significant predictor of fear in the Northridge earthquake and was significant in the bivariate analysis of Whittier Narrows suggests that very strong ground motion may also trigger high levels of fear. Naturally, we controlled for the intensity of ground motion at a particular site and some areas in all three earthquakes experienced damaging level ground motions, but intensity of ground motion experienced was associated with fear only in the Northridge earthquake. A review of Table 3 reveals that gender and intensity of ground motion experienced were the most robust predictors of fear in the Northridge earthquake and that the other two predictors, one a status and power dimension (education) the other a situational dimension (years of residence in California) were relatively weak.

One must ask why ground shaking intensity would be such a strong predictor of fear in the Northridge earthquake when it failed to predict fear at all in the other two multivariate models for Whittier Narrows and Loma Prieta. One possible interpretation may lie in the demographics of the Northridge earthquake, that is, the areas that were subject to the highest levels of earthquake ground motion were White middle-class areas of the San Fernando Valley. Though gender is clearly a dimension on which status and power vary, the strength of association between intensity of ground motion and fear in this earthquake raises the interesting possibility that in the absence of multi-dimensional status and power factors that might otherwise differentiate expressed fear in a population that experienced a disaster, situational factors will prevail.

This study suggests that status and power dimensions that exist prior to the occurrence of a community level disaster are carried into the immediate disaster situation as they influence the differential expression of fear, a finding consistent with the theory of emotional expression proposed by Theodore Kemper. Groups and individuals who have relatively little power and are lower in social status express higher levels of fear than older, Caucasian, male, well-established and better educated groups. However, our data analysis of the Northridge earthquake suggests that when a population affected by an earthquake disaster is relatively homogeneous on status and power dimensions, situational factors like the intensity of shaking experienced or possibly the presence and identity of others during the shaking may account for differences in expressed fear. Clearly, the findings in this study must be considered preliminary and additional studies, including studies of the emotional component of disaster in other cultures, particularly “negative” emotions that are often ignored, are necessary. As a follow-up to this study, the author plans to examine fear and other potential determinants of immediate response behavior by analyzing the same survey data, in short, testing fear as one of several independent variables, examining their effect on behavioral response in these earthquakes.

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Note

¹ In all three earthquakes, respondents who did not feel the earthquake or were outside the area of impact were eliminated from the samples. Weighting factors were employed in the Loma Prieta sample due to over-representation of persons residing in the Boulder Creek-Watsonville area of California. Weighting factors were not assigned in the Whittier Narrows and Northridge samples.

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Table 1: Level of Expressed Fear by Earthquake

Variable: Fear	Earthquake Data Set					
	Whittier		Loma Prieta		Northridge	
	N	%	N	%	N	%
Very Frightened and Upset	173	27.8	198	31.9	136	30.2
Somewhat Frightened and Upset	203	32.6	211	34.0	180	39.9
Not Very Frightened and Upset	132	21.2	110	17.7	59	13.1
Not at All Frightened and Upset	90	14.4	71	11.5	63	14.0
Enjoyed the Experience	25	4.0	30	4.8	13	2.9
N	623	100	620	100	451	100

Table 2: Percent of Respondents Who Felt the Earthquake and Experienced a High Level of Fear by Selected Demographic and Exposure Characteristics (See note)

Demographic and Situational Characteristics	Respondents Who Felt the Earthquake and Experienced a High Level of Fear					
	Whittier Narrows		Loma Prieta		Northridge	
	N=623		N=620		N=423	
	%	N	%	N	%	N
Gender						
-Female	71.8	250*	76.9	269*	80.7	196*
-Male	45.4	124	51.9	140	57.7	120
Ethnicity						
-Caucasian	53.5	178*	65.5	288	66.1	150
-African-American	61.4	35	72.5	37	74.4	29
-Mexican-American	66.2	94	84.6	33*	76.8	86
-Non-Mexican Hispanic	81.8	36*	57.1	20	76.5	26
-Asian	68.6	24	56.4	31	67.9	19
Place of Birth						
-United States	NA		NA		66.0	194
-Not US					77.7	122*
Age						
-Respondent is ≤ 39 Years	65.5	192*	77.1	81	74.4	163
- Respondent is ≥ 40 Years	55.6	179	68.5	146	67.2	137
Income						
-Total Family Income ≤ \$35,000	64.3	169	75.4	89	77.0	134*
-Total Family Income >\$35,000	57.5	207	71.8	94	63.0	102
Education						
-Respondent has ≤ 12 Years Education	66.9	212*	75.0	87	77.5	148*
-Respondent has ≥ 13 Years	53.6	164	69.3	140	65.5	152

Education						
Length of Residence in CA						
-Resided in CA $\leq$ 27 Years	67.5	214*	75.0	87	75.6	177*
-Resided in CA $\geq$ 28 Years	52.9	162	69.3	140	65.1	123
No. of Earthquakes Experienced						
- 3 or Fewer Earthquakes	66.4	221*	78.4	40	NA	
- 4 or More Earthquakes	53.4	155	70.0	187		
Level of Shaking Experienced						
-Low (MMI<8)	57.5	256	65.8	306	66.7	226
-High (MMI $\geq$ 8)	67.4	129*	66.5	103	80.4	90*
With Children <18 During EQ						
-Yes	70.7	94*	82.7	67*	84.4	27
-No	57.6	282	63.5	342	69.0	289
Self-Reported Level of Preparedness						
-Prepared	54.4	148	57.3	185	69.3	156
-Unprepared	65.0	227*	75.4	224*	70.9	158

* Pearson Chi Square at least $p < .05$

Note: The N in Table 2 is the number of respondents who reported being “very” or “somewhat” frightened by the earthquake (i.e. expressed high levels of fear) and the % represents the proportion of all respondents in the sample with a particular demographic or situational characteristic (e.g. an N of 250 women expressed high levels of fear which represents 71.8% of all women in the sample).

Table 3: Linear Regression Model of Fear in Three Earthquakes: Standardized Betas and Significance Levels (T Test)

Variable: Fear	Whittier Narrows N=601	Loma Prieta N=620	Northridge N=420
Female	.284**	.280**	.325**
Education	-.123*	-.037	-.103*
Hispanic (non-Mexican)	.132*	-.050	-.015
With Dependent	.091*	.085*	.051
Level of Preparedness	-.093*	-.183**	.007
Years CA Residence	-.056	-.074	-.115*
EQ Intensity	-.091	.025	.255**
Model R Square	.187	.167	.202

* $p < .05$

** $p < .001$