

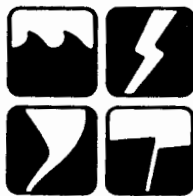
Natural Hazard Research

LOCUS OF CONTROL, REPRESSION-SENSITIZATION AND
PERCEPTION OF EARTHQUAKE HAZARD

by

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LOCUS OF CONTROL, REPRESSION-SENSITIZATION,
AND PERCEPTION OF EARTHQUAKE HAZARD

This paper assesses the relationship between two independent personality variables, locus of control and repression-sensitization, and a dependent variable, perception of earthquake hazard. Randomly selected respondents in Newlands, Wellington, were surveyed to identify their attitudes to earthquake hazard and to determine specific personality traits.

Individuals who were identified through the locus of control measure as believing that events are influenced mainly by their own actions and not merely by fate were likely to choose hypothesized preventive measures to restrict earthquake impact, but did not favor proposed reparative measures to alleviate earthquake damage. Through the use of the repression-sensitization measure a group, "moderates", of respondents was identified which reacted to anxiety stimuli by neither repressing and denying the stimuli nor attempting to control the stimuli through excessive worrying or intellectualization. These moderates indicated active coping mechanisms to diminish seismic damage. Moderates also had a high anticipation of future household disruption by the same hazard.

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PREFACE

This paper is one in a series on research in progress in the field of human adjustments to natural hazards. It is intended that these papers will be used as working documents by the group of scholars directly involved in hazard research as well as inform a larger circle of interested persons. The series was started with funds granted by the U.S. National Science Foundation to the University of Colorado and Clark University but now is on a self-supporting basis. Authorship of papers is not necessarily confined to those working at these institutions.

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INTRODUCTION

This study considers earthquake threat in terms of human perception, a vital component of which is personality. Personality represents the structural and dynamic properties of an individual or individuals which may be reflected in characteristic responses to situations (Pervin, 1970). Responses to earthquake hazard are therefore likely to be associated with personality. This paper specifically analyzes the responses to a survey conducted in Newlands, Wellington, New Zealand, which attempted to determine the association between two dimensions of personality--locus of control and repression-sensitization (the independent variables)--and respondents' attitudes to earthquake hazard (the dependent variable). A more detailed consideration of the topic is provided by Simpson-Housley (1976). See also Simpson-Housley (1977) and Simpson-Housley and Bradshaw (1978).

Locus of control is a personality measure which categorizes an individual as either external, believing events are mainly beyond his/her control and dependent on chance or fate, or internal, conceiving of events as generally contingent upon one's own behavior. The repression-sensitization scale identifies individuals in terms of the types of defense mechanisms which are employed to reduce anxiety. At one extreme are the repressors who avoid anxiety by repression or denial. At the other extreme, the sensitizers attempt to control the anxiety stimulus by such defense mechanisms as intellectualization, obsessive behaviors, and ruminative worrying.

It is hypothesized here that individuals possessing these diverse personality traits will have considerably different perceptions of environmental threats and that responses to hazardous events will depend on these individual perceptions.

THEORYGeneralized Expectancies for Internal Versus External Locus of Control

The acquisition and performance of human skills and knowledge is strongly influenced by the role of reward, reinforcement or gratification. Particular successful outcomes and particular failures, however, are perceived as reinforcements by some persons but not by others. Response to outcomes is strongly influenced by the degree to which an individual perceives an outcome to be a consequence of his own actions or behavior as opposed to attributes of the environment. When an event is interpreted to be mainly, if not entirely, contingent upon chance, luck, fate or factors outside the actor's control, this indicates a belief in external control. If the consequences of an event are conceived by the actor as contingent upon his own decisions or action, this credence may be labeled as a belief in internal control (Rotter, 1960).

The theoretical background for this conception of nature and reinforcement is derived from social learning theory (Rotter 1954, 1955, 1960). A reinforcement, gratification or reward for a particular behavior or reaction strengthens the expectancy that a similar reinforcement, gratification or reward will follow that particular behavior or reaction in the future. Extinction of the reinforcement leads to extinction or reduction of the expectancy of that particular reinforcement for that specific behavior in the future. When an individual perceives that reinforcement is noncontingent upon his own behavior, the expectancy of the reoccurrence of the reinforcement is not increased as much as when the reinforcement is perceived as a consequence of the individual's own behavior. Conversely, reduction of expectancy is also smaller following the reinforcement's nonoccurrence than when it is seen as contingent. Individual biographies lead different per-

sons to differing attributions of reinforcements.

Expectancy is defined as the "probability held by the individual that a particular reinforcement will occur as a function of a specific behavior on his part in a specific situation or situations" (Rotter, 1954, p.107). Expectancies generalize from specific situations to a wider domain of perceived similar situations. The choices made by individuals from the range of available potential behaviors is affected by generalized attitudes, beliefs and expectancies derived from the perception of causal relationships between the actor's actions and their consequences. Specific expectancies act in combination with these generalized expectancies to determine choice behavior in specific situations. Characteristic differences in personal behavior result from different generalized expectancies.

Phares (1957) began the initial attempt to measure individualized differences in a generalized expectancy or belief in external control as a psychological variable. His work studies the influence of chance and skill effects on expectancies for reward. A Likert type format was adopted in which 13 items exhibited external attitudes, and 13 exhibited internal attitudes. An attempt at predicting behavior within a task situation provided some evidence that subjects with external attitudes showed fewer shifts of expectancy, more unusual shifts, and smaller magnitude of increments and decrements than subjects who exhibited internal attitudes. James (1957) revised Phares' test. Again a Likert format was used comprising 26 items based on Phares's most successful items. Fillers were added. In trials to extinction externals showed fewer signs of recovery, exhibited more unusual shifts in expectancy, responded to success and failure with smaller increments and decrements, and showed a lower degree of expectancy or reinforcement when transferred from one task to another than internals.

After work on and testing of locus of control scales by Seeman and Evans (1962) and Rotter, Liverant and Crowne (1961), Rotter (1966) produced a 29 item forced choice scale, six items being fillers (Appendix A).

There is evidence suggesting that Rotter's locus of control scale is multidimensional. Gurin, et al. (1969) conducted a factor analysis of the responses of black students and obtained evidence for two separate factors, one related to personal control and the other to ideological or general beliefs. Collins (1974) identified four dimensions of Rotter's Internal-External scale--the difficult/easy world, the just/unjust world, the predictable/unpredictable world, and the politically responsive/unresponsive world. Thus external scores on Rotter's Internal-External scale may result from the respondent's belief that the world is complex and difficult, that his ability and effort do not lead to a just reward, that the world is governed by random and chance factors, or that the world is politically unresponsive. Rotter (1966) commented as a result of several factor analyses that one general factor and several additional factors were isolated but contended that that the additional factors did not indicate clearcut subscales.

Phares (1976) notes that there is considerable disagreement regarding the multidimensionality of Rotter's scale. Some authors have identified two dimensions while others have found as many as five. Also some researchers have created modified internal-external scales, and thus are no longer assessing Rotter's scale. It has yet to be demonstrated that enhanced prediction results from using subscales of Rotter's Internal-External scale. The author of this study will therefore utilize Rotter's validated locus of control scale unidimensionally.

Locus of control studies have ramifications for the related areas of resistance to influence, deferred gratification, achievement behavior, and

response to success and failure, sources of control expectancies, and changes in locus of control (Lefcourt, 1972). The author hopes to demonstrate that there are also significant associations between a subject's locus of control expectancies and attitudes to seismic threat.

Repression-Sensitization

Unconsciously motivated anxiety-reducing activities are called defense mechanisms. Repression-sensitization is a unidimensional categorization which developed out of perception research in the 1940s encompassing many diverse defense mechanisms. At the repressing extreme of the continuum, rationalization, repression and denial are the defense mechanisms employed to enable the repressing individual to avoid the anxiety arousing stimulus. Attempts are made to approach and control the stimulus and its consequences by sensitizers whose defense mechanisms are located at the other end of the continuum. Sensitizer's defense mechanisms include intellectualization, obsessive behavior and ruminative worrying (Byrne, 1964). In a survey conducted by the author, a 107 item version of a repression-sensitization scale developed by Byrne (1961) was used (see Appendix C). The original buffer items included in the 127 item scale were excluded.

What Other Studies Have Shown

The role of personality as a variable influencing hazard perception has received little attention in geographical studies. Past research has tended to relate the frequency, magnitude and recency of the threatening stimulus to respondent's perceptions of it (Kates, 1962). Saarinen (1966), however, included personality as a variable when he considered perception of drought hazard on the Great Plains. Results from a thematic apperception test demonstrated that farmers who believed that man controls nature were less perceptive of the drought risk than those who believed the opposite, i.e., man

is controlled by nature.

Few geographers have attempted to associate Rotter's locus of control measures with perceptions of natural hazards, and the author knows of no other geographer who has utilized the repression-sensitization measure. Sims and Baumann (1972) examined locus of control in an attempt to solve a geographical problem. Recorded tornado deaths are higher in the southern United States than in other regions; yet the area with the greatest potential tornado hazard is located in a zone running from Dallas, through Topeka to Chicago and Detroit. Attempts to explain the higher death rate in the south in terms of greater incidence of nocturnal storms, greater frequency of violent storms, kind and quality of housing and differences in warning systems failed to yield significant results. The Sims and Baumann study (1972) examined locus of control and the effectiveness of coping mechanisms employed to mitigate tornado threat as explanatory variables. Sentence completion methods were employed to measure these variables and comparisons were obtained of Illinois citizens and Alabama residents. Three of the five sentence stems intended to measure coping mechanisms focused on attitudes to tornado warnings. In completing their sentences, the Illinois citizens relied on the media and praised the qualities of the Weather Bureau, whereas Alabama residents relied on their own senses and signs in the sky for prediction. The other stems oriented to coping mechanisms were related to the aftermath of a tornado. Alabama residents responded by indicating negative or positive emotions while coping orientations typified Illinois citizens' responses. Three stems were used to measure locus of control. The completions of the first indicated that Alabama residents to a greater extent than Illinois residents supported the view that God was dominant and important, and that he interfered in human destiny. The second stem revealed

that belief in luck was much more a property of Alabama residents than of Illinois citizens, and the third stem illustrated that Illinois citizens more than Alabama residents believed that getting ahead in the world resulted from their own efforts. Thus Alabama residents were more external than Illinois residents and thus the former would consider themselves less capable than the latter of controlling environmental threats. Singular causation or explanation of the different death rates in the north and south was rejected, but the authors contended that differences in coping mechanisms and locus of control could be significant factors.

Baumann and Sims (1974) used the same methodology to measure human response to the hurricane with the same sentence stems being used to measure locus of control. Puerto Ricans were compared with people from the continental U.S. The responses to the stems indicated that continental U.S. respondents believed that success in the world was a result of their own efforts while Puerto Ricans placed greater stress on the role of luck. Puerto Ricans also placed more emphasis on the direct intervening influence of God in their lives than continental U.S. respondents. Puerto Ricans were thus revealed to be more external than continental U.S. subjects and thus would feel less capable of restricting hurricane threat. It was concluded that studies of such psychological variables as locus of control are important if one is to understand fully man's response to and ability to cope with the traumatic experiences of natural hazards.

A third example of the application of the locus of control dimension of personality to natural hazard research is provided by Schiff (1977). A five item personal control subscale obtained from factor analysis of Rotter's Internal-External scale and a scale measuring sensation seeking were administered to 328 London, Ontario, Canada residents. It was hoped

to demonstrate that the adoption of adjustments to hazards is related to these two dimensions of personality. The hypothesis was not substantiated but further analysis positively linked previous experience with adoption of adjustments to hazards.

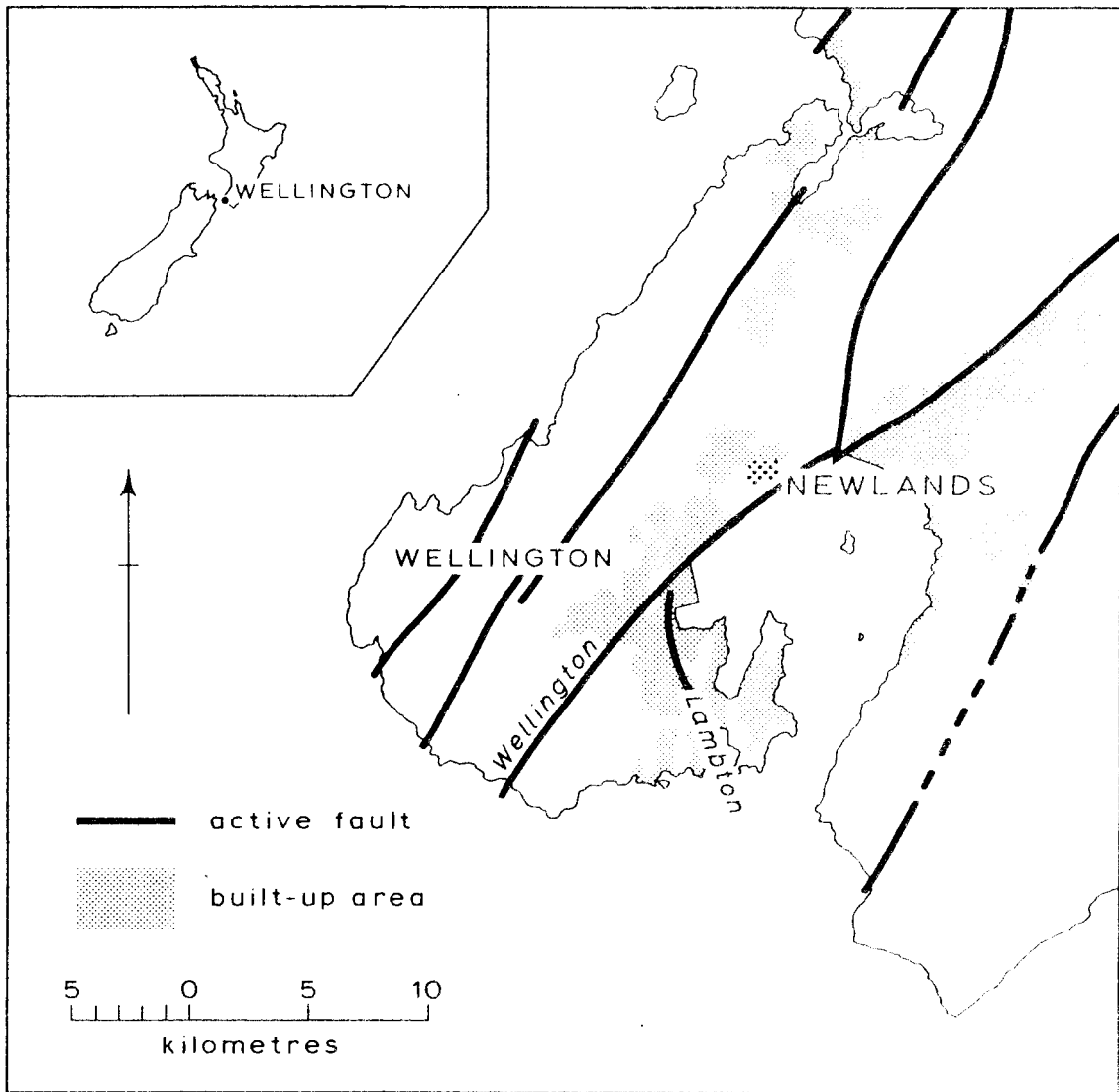
RESEARCH DESIGN

Study Site

Newlands may be regarded as a north-eastern suburb of Wellington, many of its residents commuting daily to the central business district (see Figure 1). Wellington is located on the south-western shore of a partly enclosed sea-filled tectonic depression at the southern end of New Zealand's North Island axial chain. Much of the topography is best classed as high hills and low mountains, the greater part of the flat land being contained in three valleys aligned north to south (Grant-Taylor, 1974). The basement rock is greywacke which in parts of the valleys is covered with recent alluvial deposits. The unweathered massive greywacke provides excellent foundation materials, but deep chemical weathering and crush zones related to recurrent fault activity have resulted in surface instability both in the regolith and greywacke.

There are two recognized active faults in the Wellington area, the Wellington Fault (a Class I Fault), and the Lambton Fault (a Class II Fault). A Class I active fault is one that has shown repeated movement over the last 5,000 years, but may also include those with a single movement in the last 5,000 years and repeated movement in the last 50,000 years. A Class II active fault is one which has moved frequently over the last 50,000 years, but this category also includes those with a single movement in the last 5,000 years and repeated movement in the period 50,000 to 500,000 years ago (Officers Geological Survey, 1966). Class II faults thus have little relevance for planning, while Class I faults have considerable

FIGURE 1
ACTIVE FAULTS IN THE WELLINGTON AREA



planning importance since the displacement along them can be as much as 4.5 meters during the lifespan of a building.

Since 1840 there have been 22 shocks of MMVI (Modified Mercalli scale) or greater (see Table 1), and 16 shocks of at least MMV in the Wellington area since 1940. Adams (1974) notes that earthquakes with MMVIII and greater have been recorded in 1848, 1855 and 1904. Shocks with intensity of MMVII and greater recur about once every 25 years, those with MMVI and greater about once every 10 years, while a glance at the recordings since 1940 shows that tremors with an intensity of MMV and greater have an approximate recurrence interval of two years.

Considerable damage resulted from earthquakes in 1942 and 1968. Damage from the 1942 earthquakes totaled £900,000. Private residential damage accounted for £80,000 of this total (Luke, 1943). The earthquake of November, 1968 resulted in 900 claims being submitted to the Earthquake and War Damage Commission demanding a sum of over \$100,000 (Northey, 1974).

Methodology

One hundred and ninety-seven Newlands householders were selected on the basis of abstracting every first Newlands name on every second page of the Wellington telephone directory. This represents a 3.20% sample of the Newlands population of 6,153. Since the area is inhabited by upper socio-economic class residents, the probability of homeowners not having a telephone is low. There were 10 refusals which reduced the sample size to 3.04%. Thus 187 respondents in Newlands were given a questionnaire on perception of earthquake hazard (Appendix A), the locus of control questionnaire (Appendix B), and a revised form of the repression-sensitization scale (Appendix C).

The earthquake hazard perception questionnaire is a modified version of one used extensively in natural hazard research, designed by White (1974).

TABLE 1

EARTHQUAKES REPORTED FELT AT WELLINGTON AT INTENSITIES OF MMVI OR GREATER FROM 1840 TO 1975.

Year	Date (N.Z.)	Depth (kms)	Intensity	Magnitude	Distance from Wellington (km)
1840	May 26		VI	6	80?
1843	Jul 08		VI	7½	160?
1848	Oct 16		VIII	7.1	65?
	17		VII	6?	
	19		VI-VII	6?	
	24		VII	6?	
1855	Jan 23		X	8?	30?
	24		VII		
	25		VII-VIII		
1893	Feb 12		VI+	6-7	130
1897	Dec 08		VI	6-7	160
1904	Aug 09		VIII	7½	190
1914	Feb 08		VII	6	30?
1929	June 17		VI	7 3/4	220
1934	Mar 05		VI	7½	110
1942	June 24		VI-VII	7	100
	Aug 02	55	VII	7	100
1943	Feb 26		VI	5½	30
1966	Apr 23	12	VI	6	50
1968	Nov 01		VI	5½	30
1973	Mar 25	74	VI	5½	14
1975	Jan 04	128	VI	6	26

(After Adams, 1974; post 1971 data was obtained from the Geophysics Department, Department of Scientific and Industrial Research.)

Even with reduction and simplification of the original questionnaire format, the interviews with each respondent lasted approximately two hours. The revised format of the questionnaire elicits information concerning decisions made relating to earthquake hazard and adaptations personally adopted. Attitudes are assessed by implementation of a sentence completion test which ascertains expected reactions and feelings towards earthquakes. Respondents were shown various completion options and asked to indicate the one most consonant with their anticipated reaction. This method reduced interview time compared to the method suggested in the original questionnaire of requesting respondents to formulate their own terminations to the stems and eliminated the problems resulting from independent judges subjectively assessing the category of the completion.

In this study the responses to the hazard perception questionnaire were not only utilized directly, but were also related to the identified personality measures.

After answering the hazard perception questionnaire, the respondents completed the personality measures. Rotter's 29 item scale posed few problems, but the time required to complete the 107 item repression-sensitization scale necessitated that considerable encouragement be given to respondents to complete the measure. All who participated in the survey eventually succeeded in completing the repression-sensitization scale.

Data Evaluation

Rotter's scale allows categorization of respondents as internals (those attributing the consequences of their lives to lawfulness in nature and their own dispositional tendency) or externals (those who have a generalized expectancy for fate control and who attribute consequences to situational context). For purposes of analysis respondents in this study were divided

into internals, moderates and externals. It was hoped that this would isolate the more extreme credences and augment the possibility of significant relationships being obtained between locus of control expectancies and response to earthquake hazard. Since there are no absolute cutting points for personality differentiation on Rotter's locus of control measure, the author utilized the 33rd and 66th percentile points to achieve a division, this type of split being quite normative in much psychological research. Respondents falling below the 33rd percentile point (8.06) on the scores on Rotter's locus of control scale were termed internals (71 in number), those between the 33rd percentile point and the 66th percentile point (12.16) were designated as moderates (61 in number), while respondents whose scores were higher than the 66th percentile point were classified as externals (55 in number). The mean score was 10.11 and the standard deviation 4.13. Scores ranged from zero to 20.

The relationship between repression-sensitization and perception of earthquake hazard was also desired. Respondents were divided into repressers, moderates and sensitizers for the purposes of analysis. Respondents falling below the 33rd percentile point (45.01) on the scores on the 107 item scale were classified as repressers (64 in number), those between the 33rd percentile point (50.05) as moderates (60 in number), and those above this limit as sensitizers (63 in number). The mean score was 48.08 and the standard deviation 7.11. Scores ranged from 27 to 68. The intermediate group on the repression-sensitization measure, moderates, comprises those subjects who show no definite bias either for repressing defense mechanisms or for sensitizing defense mechanisms.

Sentence completion and other responses were then related to locus of control expectancies and degree of repression. Each individual subject's

classifications on the personality scales, for example internal, moderate or external on the locus of control measure, were associated with the respondent's answers to the hazard perception questionnaire. Question four, which requests views regarding anticipation of a future earthquake, provides an example. (See Appendix A.) There are three possible answers to this question, yes, don't know and no. Therefore it is possible to calculate how many of each personality category on the locus of control measure opted for each specific answer to question four. Associations between personality categories and the responses to the question on the hazard perception questionnaire can then be made. Chi-square tests were used to assess whether differences between personality types in their suggested responses to earthquake threat arose from sampling error.

The reader is cautioned that the two dimensions of personality are related to hypothetical behaviors and not actual ones.

RESULTS DERIVED FROM THE PERSONALITY MEASURES

Locus of Control and Perception of Earthquake Hazard

Locus of control is a generalized rather than a specific abstraction which develops from myriads of environmental, situational and behavioral experiences which vary in their degree of validation or reinforcement. Individuals differ according to whether they consider environmental consequences predictable and hence controllable or whether they consider they are random or fate determined. Individuals also differ on the basis of the degree to which they feel the consequences of an event can be attributed to the actor's dispositional tendency and the degree to which they believe consequences to be a function of environmental context.

Since internals have a dispositional tendency affirming the predictability of nature and a predilection for expecting the consequences of their

life to result from their own actions, the author hypothesized that preventive action to reduce earthquake hazard would be positively related to internality. On the other hand, since internals consider nature to be more predictable and subject to control, they would be less disposed to consider reparative action to control earthquake effects compared to moderates or externals. Since externals consider themselves to be pawns of fate and environmental situations, it was assumed that negative emotions such as fear and anxiety in response to earthquake threat would be intimated more by externals than internals in their responses to the hazard perception questionnaire. Externals' alleged fear of earthquakes could be assumed to result partly from their perceived inability to confront the threat, but could also be influenced by a possible higher expectation of the hazard. Thus a hypothesis was established to ascertain whether or not a positive relationship exists between externality and expectation of future earthquakes.

Previous research has demonstrated that cognitive awareness is positively related to generalized expectancies for internal locus of control (Seeman and Evans, 1962, and Seeman, 1963). It was therefore hypothesized that internals' awareness of potential earthquake disruption and damage to their households would be greater than that of externals. (See Table 2 for hypotheses.)

Hypotheses one and two are discussed together since both refer to measures taken to mitigate earthquake disaster. Significance at the .05 level was achieved for both assumptions regarding the associations between locus of control expectancies and active measures to confront earthquake threat. As anticipated, internals suggested more active preventive responses to earthquake hazard than externals, while moderates and externals demonstrated a greater dispositional tendency than internals to intimate active

TABLE 2

HYPOTHESES RELATING LOCUS OF CONTROL TO PERCEPTION OF EARTHQUAKE HAZARD

<u>Hypotheses</u>	<u>Chi-square Value</u>	<u>p</u>
1. Declared preventive active measures to mitigate earthquake threat are positively associated with internality.	5.70	.05
2. Declared reparative active measures to mitigate earthquake dislocation are negatively associated with internality.	5.46	.05
3. Declared negative emotions in response to earthquake threat are positively associated with externality.	0.58	non-sig- nificant
4. Expectation of a future earthquake is a positive function of externality.	1.53	non-sig- nificant
5. Expectation of household disruption by an earthquake is a positive function of internality.	4.33	.025
6. Expectation of a high degree of household earthquake damage is a positive function of internality.	3.33	.05

reparative responses. This trend was especially strong with moderates. Perhaps those who are more external generally feel more helpless in the wake of an earthquake.

For hypothesis three that declared negative emotions in response to earthquake threat are positively associated with externality, significance was not achieved, but the trend suggests that externals indicate a higher degree of anxiety and fear of seismic hazard than internals.

Significance was approached but not quite reached for hypothesis four which stated that expectation of a future earthquake is a positive function of externality, but again the trend was in the direction hypothesized. Since only 20 respondents had any doubts about the recurrence of another earthquake, it may reasonably be argued that significance would have been reached with a slightly larger sample.

Hypothesis five that expectation of household disruption by an earthquake is a positive function of internality was highly significant while hypothesis six, expectation of a high degree of household earthquake damage is a positive function of internality, reached significance at the .05 level. It is thus seen that the cognitive awareness of internals in comprehending potential disruption from a possible future earthquake is much greater than that of externals, a finding congruent with other research associating locus of control expectancies and cognitive perception.

Perhaps the most important finding in this section is the one demonstrating that internals' intimated actions to prevent and mitigate damage resulting from earthquakes are vastly superior to the coping mechanisms suggested by externals. Survival in seismic catastrophe could be a positive function of internality if the results of this investigation are valid in a real earthquake situation.

Repression Sensitization and Perception of Earthquake Hazard

Bruner and Postman (1947) refer to perception as a form of adaptive behavior which reflects the values, attitudes and needs of the individual as well as sensorineural processes. Its operation involves selection, accentuation and fixation. Certain stimuli are selected at the expense of others from the multiplicity of total possible stimuli. Some of those selected are then vivified and accentuated in contrast to others.

Fixation or what is habitually seen in stimuli results from past perceptual experience. Perceptual differences in response to threat enable differentiation between repressers and sensitizers. The former utilize denial, repression and rationalization to control the threatening stimulus while intellectualization, ruminative worrying and obsessive behaviors are utilized by sensitizers to control the threatening stimulus and its consequences. Earthquake hazard represents a threatening stimulus which will lead observers to adopt different forms of perceptual defense. Jackson and Mukerjee (1974) found that many respondents living in earthquake hazard zones deny earthquake threat. Denial is a represser's defense mechanism, further suggesting that the repression-sensitization scale is an appropriate method to measure human response to seismic threat.

The author hypothesizes that moderates on the repression-sensitization scale will propose more effective preventive and reparative active measures to cope with earthquake threat than repressers and sensitizers. Repressers, using denial mechanisms to reduce anxiety, find psychological reassurance within the restraints of these coping mechanisms, which obviates their perceived necessity for direct action to counter earthquake threat. Sensitizers, on the other hand, utilizing obsessive behaviors and ruminative worrying to approach and control the threatening stimulus, could inhibit

their own effective action by application of these defense mechanisms. Greater declared anxiety in response to earthquake threat is assumed to be a more likely property of repressers and sensitizers than of moderates on the same measure since the defense mechanisms of the former could be termed less reassuring than the assumed direct action of moderates. This greater anxiety anticipated of repressers and sensitizers may partly result from a higher expectation of future earthquakes. A hypothesis to assess the relationship between degree of repression-sensitization and expectation of future earthquakes was therefore established. It was also hypothesized that moderates would expect a greater degree of household disruption from a future earthquake than repressers and sensitizers. Thus two hypotheses are based on the assumption that repressers would utilize their normative denial mechanisms to extinguish fear of future seismic damage while sensitizers would intellectualize ruminatively to dispel perceptions of possible future dislocation. Thus repressing and sensitizing defense mechanisms would result in a poor appraisal of earthquake hazard damage potential since they operate to obfuscate the perceived amount of dislocation. (See Table 3 for hypotheses.)

Hypothesis one, a negative association between repression and sensitization and declared preventive actions, was significant at the .025 level. Hypothesis two, a negative association between repression and sensitization and declared reparative actions, failed to reach significance although the existential trend was in the anticipated direction. Moderates thus indicate their belief in preventive coping mechanisms to counter earthquake threat to a greater extent than repressers and sensitizers. In terms of saving life and reducing property damage, the declared reactions of moderates represent a superior adaptation to the perceptual threat of a seismic hazard (if they

TABLE 3
 HYPOTHESES RELATING REPRESSION-SENSITIZATION
 TO PERCEPTION OF EARTHQUAKE HAZARD

<u>Hypotheses</u>	<u>Chi-square Value</u>	<u>p</u>
1. Declared preventive active measures to mitigate earthquake threat are negatively associated with repression and sensitization.	4.96	.025
2. Declared reparative active measures to mitigate earthquake dislocation are negatively associated with repression and sensitization.	0.68	non-sig- nificant
3. Declared negative emotions in response to earthquake threat are positively associated with repression and sensitization.	0.93	non-sig- nificant
4. Expectation of a future earthquake is a positive function of repression and sensitization.	2.44	non-sig- nificant
5. Expectation of household disruption by an earthquake is a negative function of repression and sensitization.	0.26	non-sig- nificant
6. Expectation of a high degree of household earthquake damage is a negative function of repression and sensitization.	4.67	.025

are actually utilized).

The trend for hypothesis three, that declared negative emotions in response to earthquake threat are positively associated with repression and sensitization, was in the predicted direction but significance was not reached. Thus it is only possible to infer that repressers and sensitizers suggest more anxiety in response to seismic threat than moderates.

Hypothesis four, that expectation of an earthquake is a positive function of repression and sensitization, approached significance. In view of the fact that only 20 respondents denied or expressed doubts about earthquake recurrence, one may hypothesize that in areas where the earthquake recurrence interval is large, a highly significant positive relationship would be obtained between expectation of a future earthquake and degree of repression and sensitization. The fact that in Newlands repressers and sensitizers tend to have a higher expectation of a future earthquake than moderates may be partially causal in influencing the trend suggesting that anxiety in response to seismic hazard is related to repression and sensitization.

The results from hypothesis five, that expectation of household disruption by an earthquake is a negative function of repression and sensitization, were not significant. Hypothesis six, that expectation of a high degree of household earthquake damage is a negative function of repression and sensitization, was significant at the .025 level. Repressers utilize their denial coping mechanisms to extenuate perceived possible future hazard while sensitizers can be expected to meditate on the threatening stimulus in attempts to extinguish it. The necessity for utilizing these mechanisms was enhanced by repressers' and sensitizers' high positive credences regarding expectations of future seismic activity.

The author concludes that moderates both in their suggested preventive

measures to reduce earthquake damage, and in their expectations of a relatively high degree of damage in the event of a future shock, are better adapted to their real seismic landscape than repressers and sensitizers. The defense mechanisms of repressers and sensitizers distort their appraisal of seismic threat and result in their suggested proclivity for lack of preventive action.

RECOMMENDATIONS AND RESEARCH NEEDS

It is illogical and unfeasible to force residents out of hazardous areas. Pond (1969) stresses that the state should assume active responsibility for "regionalized environmental education", and recommends that this should be achieved by compelling schools to study and consider specific hazards relevant to their area, by forcing real estate agents to disseminate full information of the hazard risk to all prospective buyers in high risk areas, and by the government making available to the general public all sources of information on the relevant hazard. Although Pond's recommendations applied to the State of California, the suggestions apply just as strongly to New Zealand. Building codes should be strictly enforced, and comprehensive disaster programs implemented. Only when all this has been achieved will the state have fulfilled its responsibilities to its citizens. People could then locate in a hazard-prone area with full knowledge of the risk, and face the chances of burying their dead there.

Regarding personality, it has been shown (Lefcourt, 1976) that locus of control expectancies are susceptible to influence and change by factors such as age. Since hope of success and competence are correlates of a belief in internal locus of control, there is reason to attempt to change external expectancies to internal expectancies. Studies indicate possibilities for this. Lefcourt (1967) demonstrated that by giving explicit in-

structions to externals, a salutary effect on their control-related behavior is possible, and Lefcourt and Ladwig (1965) showed that expectations of reinforcement could be increased when a task to be performed by a subject could be linked to one in which the subject has achieved success. If greater internality is achieved, the perceived ability of subjects to cope with obstacles would also increase.

The results of this research demonstrate the utility of incorporating psychological concepts in social geography investigations. Personality influences an individual's attitudes to, interpretation of and response to geographical phenomena in various environments. Personality types also vary spatially. For example, Spanish Americans have been shown to be more external than Anglo-Americans (Jessor, et al., 1968). Urban geographers could assess the association between locus of control beliefs and residential choice and planning decisions, and economic geographers could study with profit the association between locus of control expectancies and willingness of workers to relocate to meet new industrial demands. Finally, in the domain of natural hazard research, there is considerable scope for examining the association between various dimensions of personality and decisions and behavior in threatening situations.

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APPENDIX AQUESTIONNAIRE ON EARTHQUAKE HAZARD (after White, 1974)

The only questions included are those which were related to the personality variables.

Sentence Completion Test

1a. If an earthquake is predicted, I

IF NO EXPERIENCE WITH HAZARD

If an earthquake were predicted,
I would

Make preparations (unspecified) (1)

Keep on the alert (2) Feel fear/anxiety (3) Seek refuge (4) Other (5)

1b. During an earthquake, I

IF NO EXPERIENCE WITH HAZARD

During an earthquake I would

Make preparations (1) Pray (2) Communicate with others (3) Feel fear/
anxiety (4) Protect myself (5) Protect others (6) Proceed normally (7)
Other (8)

1c. The emotions I feel while I am going through an earthquake are

IF NO EXPERIENCE WITH HAZARD

The emotions I would feel while I was going through an earthquake would
be

Fear (1) Anxiety (2) Negative emotions (unspecified) (3) Concern for
the consequences (4) Stay calm (5) Other (6)

1d. When an earthquake is over, I

IF NO EXPERIENCE WITH HAZARD

When an earthquake was over I would

Feel positive emotions (1) Check results (2) Thank God (3) Begin
restoration (4) Aid victims (5) Feel negative emotions (fear, anxiety)
(6) Other (7)

2. If by some misfortune this area is affected by an earthquake, in what
way do you think it would affect your household?

a. Nothing

For Yes (1) No (2)

- b. Are the damages considered to be
Total (80-100%) (1) Substantial (21-79%) (2) Slight (1-20%) (3)
Nonexistent (0%) (4)
3. What measures do you adopt to deal with an earthquake threat?
- A1 Do nothing
 - A2 Pray
 - A3 Evacuate
 - A4 Protect home against fire and looters
 - A5 Structural changes to home
 - A6 Earthquake Insurance
 - A7 Move to an open space
 - A8 Shelter in a safe place
- Yes (1) No (2)
4. Do you think an earthquake will come again in your lifetime?
- Yes (1) Don't Know (2) No (3)

APPENDIX BROTTER'S LOCUS OF CONTROL MEASURE

1. a. Children get into trouble because their parents punish them too much.
b. The trouble with most children nowadays is that their parents are too easy with them.
2. a. Many of the unhappy things in people's lives are partly due to bad luck.
b. People's misfortunes result from the mistakes they make.
3. a. One of the major reasons why we have wars is because people don't take enough interest in politics.
b. There will always be wars, no matter how hard people try to prevent them.
4. a. In the long run people get the respect they deserve in this world.
b. Unfortunately, an individual's worth often passes unrecognized no matter how hard he tries.
5. a. The idea that teachers are unfair to students is nonsense.
b. Most students don't realize the extent to which their grades are influenced by accidental happenings.
6. a. Without the right breaks one cannot be an effective leader.
b. Capable people who fail to become leaders have not taken advantage of their opportunities.
7. a. No matter how hard you try some people just don't like you.
b. People who can't get others to like them don't understand how to get along with others.
8. a. Heredity plays the major role in determining one's personality.
b. It is one's experiences in life which determine what they're like.
9. a. I have often found that what is going to happen will happen.
b. Trusting to fate has never turned out as well for me as making a decision to take a definite course of action.
10. a. In the case of the well prepared student there is rarely if ever such a thing as an unfair test.
b. Many times exam questions tend to be so unrelated to course work that studying is really useless.
11. a. Becoming a success is a matter of hard work, luck has little or nothing to do with it.
b. Getting a good job depends mainly on being in the right place at the right time.

12.
 - a. The average citizen can have an influence in government decisions.
 - b. The world is run by the few people in power, and there is not much the little guy can do about it.
13.
 - a. When I make plans, I am almost certain that I can make them work.
 - b. It is not always wise to plan too far ahead because many things turn out to be a matter of good or bad fortune anyhow.
14.
 - a. There are certain people who are just no good.
 - b. There is some good in everybody.
15.
 - a. In my case getting what I want has little or nothing to do with luck.
 - b. Many times we might just as well decide what to do by flipping a coin.
16.
 - a. Who gets to be the boss often depends on who was lucky enough to be in the right place first.
 - b. Getting people to do the right things depends upon ability, luck has little or nothing to do with it.
17.
 - a. As far as world affairs are concerned, most of us are the victims of forces we can neither understand, nor control.
 - b. By taking an active part in political and social affairs the people can control world events.
18.
 - a. Most people don't realize the extent to which their lives are controlled by accidental happenings.
 - b. There really is no such thing as "luck".
19.
 - a. One should always be willing to admit mistakes.
 - b. It is usually best to cover up one's mistakes.
20.
 - a. It is hard to know whether or not a person really likes you.
 - b. How many friends you have depends upon how nice a person you are.
21.
 - a. In the long run the bad things that happen to us are balanced by the good ones.
 - b. Most misfortunes are the result of lack of ability, ignorance, laziness, or all three.
22.
 - a. With enough effort we can wipe out political corruption.
 - b. It is difficult for people to have much control over the things politicians do in office.
23.
 - a. Sometimes I can't understand how teachers arrive at the grades they give.
 - b. There is a direct connection between how hard I study and the grades I get.

24.
 - a. A good leader expects people to decide for themselves what they should do.
 - b. A good leader makes it clear to everybody what their jobs are.
25.
 - a. Many times I feel that I have little influence over the things that happen to me.
 - b. It is impossible for me to believe that chance or luck plays an important role in my life.
26.
 - a. People are lonely because they don't try to be friendly.
 - b. There's not much use in trying too hard to please people, if they like you, they like you.
27.
 - a. There is too much emphasis on athletics in high school.
 - b. Team sports are an excellent way to build character.
28.
 - a. What happens to me is my own doing.
 - b. Sometimes I feel that I don't have enough control over the direction my life is taking.
29.
 - a. Most of the time I can't understand why politicians behave the way they do.
 - b. In the long run the people are responsible for bad government on a national as well as on a local level.

APPENDIX C
REPRESSION-SENSITIZATION MEASURE

	True	False
1. I have strong political opinions.		
2. Someone has control over my mind.		
3. Most any time I would rather sit and daydream than do anything else.		
4. Sometimes some unimportant thought will run through my mind and bother me for days.		
5. I am a special agent of God.		
6. I work under a great deal of tension.		
7. Even when I am with people I feel lonely much of the time.		
8. I have had attacks in which I could not control my movements or speech but in which I knew what was going on around me.		
9. In school I was sometimes sent to the principal for cutting up.		
10. I think I would like the work of a librarian.		
11. I have had periods of days, weeks or months when I couldn't take care of things because I couldn't "get going".		
12. I find it hard to make talk when I meet new people.		
13. There is very little love and companionship in my family as compared to other homes.		
14. I know who is responsible for most of my troubles.		
15. I have numbness in one or more regions of my skin.		
16. A windstorm terrifies me.		
17. I am worried about sex matters.		

	True	False
18. At times I have a strong urge to do something harmful or shocking.		
19. No-one cares much what happens to you.		
20. I sweat very easily even on cool days.		
21. I am certainly lacking in self-confidence.		
22. I am afraid of being alone in a wide open place.		
23. At times I hear so well it bothers me.		
24. I deserve severe punishment for my sins.		
25. When in a group of people I have trouble thinking of the right things to talk about.		
26. I have several times given up doing a thing because I thought too little of my ability.		
27. Evil spirits possess me at times.		
28. It wouldn't make me nervous if any members of my family got into trouble with the law.		
29. I am afraid of losing my mind.		
30. Most people make friends because friends are likely to be useful to them.		
31. It takes a lot of argument to convince most people of the truth.		
32. I am inclined to take things hard.		
33. I have had very peculiar and strange experiences.		
34. Often I can't understand why I have been so cross and grouchy.		
35. I prefer to pass by school friends, or people I know but have not seen for a long time, unless they speak to me first.		
36. I cannot understand what I read as well as I used to.		
37. If I were a reporter I would very much like to report sporting news.		

	True	False
38. I think I would like the work of a building contractor.		
39. I am afraid when I look down from a high place.		
40. I have the wanderlust and am never happy unless I am roaming or traveling about.		
41. I don't seem to care what happens to me.		
42. I feel hungry almost all the time.		
43. I have one or more faults which are so big it seems better to accept them and try to control them rather than to try to get rid of them.		
44. I worry quite a bit over possible misfortunes.		
45. I believe I am being plotted against.		
46. I wish I were not so shy.		
47. I like dramatics.		
48. I have had blank spells in which my activities were interrupted and I did not know what was going on around me.		
49. I wish I were not bothered by thoughts about sex.		
50. I do not try to cover up my poor opinion or pity of a person so that he won't know how I feel.		
51. I like to poke fun at people.		
52. I played hooky from school quite often as a youngster.		
53. I liked "Alice in Wonderland" by Lewis Carroll.		
54. I certainly feel useless at times.		
55. At times I feel like picking a fist fight with someone.		
56. I am afraid of using a knife or anything very sharp or pointed.		
57. I believe I am being followed.		

58. I have more trouble concentrating than others seem to have.
59. I frequently notice my hand shakes when I try to do something.
60. I have at times stood in the way of people who were trying to do something, not because it amounted to much but because of the principle of the thing.
61. Almost every day something happens to frighten me.
62. I am easily embarrassed.
63. One or more members of my family is very nervous.
64. I think most people would lie to get ahead.
65. The only interesting part of newspapers is the "funnies."
66. I cannot do anything well.
67. My hardest battles are with myself.
68. At times I have fits of laughing and crying that I cannot control.
69. Whenever possible I avoid being in a crowd.
70. I never worry about my looks.
71. I am sure I am being talked about.
72. In school I found it very hard to talk before the class.
73. Once a week or oftener I become very excited.
74. I am never happier than when alone.
75. At times I have enjoyed being hurt by someone I loved.
76. As a youngster I was suspended from school one or more times for cutting up.
77. Often I feel as if there were a tight band about my head.

True	False
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	True	False
78. Once in a while I think of things too bad to talk about.		
79. At times I have worn myself out by undertaking too much.		
80. I seem to make friends about as quickly as others do.		
81. I usually work things out for myself rather than get someone to show me how.		
82. Most nights I go to sleep without thoughts or ideas bothering me.		
83. Once in a while I put off until tomorrow what I ought to do today.		
84. I like movie love scenes.		
85. I have no dread of going into a room by myself where other people have already gathered and are talking.		
86. At times I feel I can make up my mind with unusually great ease.		
87. What others think of me does not bother me.		
88. I enjoy the excitement of a crowd.		
89. The only miracles I know of are simply tricks that people play on one another.		
90. I have no patience with people who believe there is only one true religion.		
91. I would like to wear expensive clothes.		
92. I am apt to hide my feelings in some things, to the point that people may hurt me without their knowing about it.		
93. I am a good mixer.		
94. I believe in law enforcement.		
95. I have never had a fit or convulsion.		

96. Christ performed miracles such as changing water into wine.
97. I enjoy detective or mystery stories.
98. My relatives are nearly all in sympathy with me.
99. I am almost never bothered by pains over the heart or in my chest.
100. It is great to be living in these times when so much is going on.
101. I frequently find it necessary to stand up for what I think is right.
102. I like to study and read about things that I am working at.
103. I usually "lay my cards on the table" with people that I am trying to correct or improve.
104. I like to attend lectures on serious subjects.
105. I believe women ought to have as much sexual freedom as men.
106. The sight of blood neither frightens me nor makes me sick.
107. I am liked by most people who know me.

True	False
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APPENDIX D
SCORING CODES FOR THE PERSONALITY MEASURES

LOCUS OF CONTROL MEASURE CODE

2a, 3b, 4b, 5b, 6a, 7a, 9a, 10b, 11b, 12b, 13b, 15b, 16a, 17a,
18a, 20a, 21a, 22b, 23a, 25a, 26b, 28b, 29a.

Concurrence with the above represents externality.

DEPRESSION-SENSITIZATION MEASURE CODE

1F, 2F, 3T, 4T, 5T, 6T, 7T, 8F, 9T, 10T, 11F, 12T, 13F, 14T, 15T,
16T, 17F, 18T, 19T, 20F, 21T, 22T, 23T, 24F, 25T, 26F, 27T, 28T,
29F, 30T, 31T, 32T, 33T, 34T, 35T, 36F, 37T, 38T, 39T, 40F, 41T,
42T, 43T, 44F, 45T, 46T, 47T, 48T, 49F, 50T, 51T, 52T, 53T, 54T,
55F, 56T, 57T, 58T, 59T, 60F, 61T, 62T, 63T, 64T, 65T, 66T, 67T,
68T, 69T, 70T, 71T, 72T, 73T, 74T, 75T, 76T, 77T, 78T, 79T, 80T,
81T, 82F, 83T, 84T, 85T, 86T, 87T, 88T, 89T, 90T, 91F, 92T, 93T,
94T, 95T, 96T, 97T, 98T, 99T, 100T, 101T, 102T, 103T, 104T, 105T,
106T, 107T.

Concurrence with the above represents sensitization.