Journal of Environment and Biological Science

Research Article

JEBS-25-04

Household Seismic Adjustments: The Influence of Inconvenience and Efficacy Perceptions

Nicole E Anderson*

Department of Psychology, Brigham Young University, Utah, USA

***Corresponding author:** Nicole E Anderson, Department of Psychology, Brigham Young University, Utah, USA, E-mail: nicand7096@gmail.com

Received date: April 29, 2025; **Accepted date:** May 09, 2025; **Published date:** May 29, 2025

Citation: Anderson NE (2025) Household Seismic Adjustments: The Influence of Inconvenience and Efficacy Perceptions. J Environ Biol Sci. Vol.1 No.1: 04.

Abstract

Social psychological theory and empirical evidence suggest that peoples' perceptions of household seismic adjustments, in addition to their perceptions of earthquakes themselves, should predict the likelihood that seismic adjustments are performed. However, little research has been done to address this issue. While past research has found peoples' perceptions of the effectiveness of household adjustment to influence adjustment levels, peoples' perceptions of inconvenience of household seismic adjustments namely the cost, time, effort, required cooperation and required knowledge involved in making these adjustments have been found to not influence seismic adjustment. However, this study did find that the higher the perceived inconvenience of an adjustment, the less likely people are to perform that adjustment. Findings suggest that hazard managers should stress the relative ease and convenience of seismic adjustments when talking about mitigation generally while emphasizing both efficacy and convenience when speaking about individual adjustments. These findings are applicable to other disasters. Natural hazard agency officials, managers, and app designers should seek to reduce cost, time, effort, required knowledge, and required cooperation dimensions of household adjustments for all natural hazards.

Keywords: Seismic adjustments; Perceived inconvenience; Perceived efficacy; Protective Action Decision Model (PADM); Household preparedness; Natural hazard mitigation

Introduction

Millions and millions of US residents live in moderate or high-risk areas for earthquakes [1]. Despite advances in technology allowing for greater communication of earthquake information, many homeowners still do not have their residences adequately prepared [2,3]. Residential earthquake codes can vary and result in differing levels of quality of earthquake protection [4,5]. If an earthquake occurs in the 16 hours other than the eight hours people are typically at work (and this occurs less frequently in today's post-COVID work-from-home era), residents could be more adversely affected from these disasters than if they experienced the earthquake in a public building. Human lives and millions of dollars can be saved in the event of an earthquake if homeowners have previously engaged in minor, simple adjustments called seismic adjustments.

Researchers have studied variables associated with homeowners' decisions to implement seismic adjustments. For example, peoples' risk perceptions have been found to be related to levels of adjustment, or how many earthquake adjustments people have carried out [6,7]. Risk perception has been linked to another variable called risk personalization. Despite accurate perceptions of risk, if people fail to personalize the risk, adjustments may not be carried out [8,9]. If people believe they, as well as government emergency agencies and scientists, are personally responsible for preparing for earthquakes, they are more likely to adopt seismic adjustments [6,10]. There is also evidence that seismic adjustment adoption increases following a warning of an impending earthquake, mass media awareness programs and information seeking behaviors such as attending an earthquake preparedness meeting [6,11,12]. There is considerable evidence that seismic adjustment adoption is correlated with previous earthquake experience [13,14]. Researchers are still assessing the complex relationships of fault proximity, adoption of past adjustments and demographic variables to household seismic adjustment [6,13,15].

Insufficient research has focused on homeowners' perceptions of the adjustments themselves [13,16,17]. One aspect that hasn't been studied thoroughly is how difficult

Copyright © 2025| https://biology.academicsquare-pub.com/

homeowners believe it is to complete different seismic adjustments. Homeowners' perceptions of adjustment inconvenience may act as implementation barriers that inhibit them from making earthquake adjustments. These include such dimensions as: (a) the monetary cost of the adjustment; (b) the time requirements involved; (c) the personal efficacy, or homeowners' perceived self-knowledge and ability to carry out the adjustment; (d) the physical implementation barriers that must be overcome before a given adjustment can be performed; and (e) the amount of cooperation required from other people. Earthquake hazard research has focused on variables that may enhance adjustment activity but has largely neglected the idea that there are barriers that may inhibit earthquake preparedness activities. However, general theory in social psychology suggests that barriers will impede action and are thus important to peoples' decisions of whether or not to engage in any given behavior.

Social psychological theories and empirical studies

Ross and Nisbett (1991) discuss three principles upon which social psychology rests [18]. One principle is that individual psyches must be understood as systems in a state of tension [19]. Some forces acting on an individual are driving forces that encourage a response, while others are restraining forces that deter that response. Change in the psychological system can be accomplished in two very different ways. One can add or increase impelling forces and thereby increase the tension in the system as the relevant restraining forces increasingly make their opposing influence felt; or one can weaken or eliminate the restraining forces that impede the desired change, and in so doing decrease the tension in the system. This latter strategy involves decreasing the inconvenience associated with an action to increase that action.

An example of this principle is found in a classic study by Leventhal, et al., who manipulated specificity of instructions in trying to get students to get inoculations at a local clinic [20]. The comparison group of subjects was told of the effectiveness of shots and that shots were available at the University Health Clinic. The program group of students was given the same information on the effectiveness of the inoculations, as well as written instructions of the Clinic location along with times inoculations were administered there. The students were also given a campus map with the University Health Building clearly circled, and they were requested to pick a time in their schedules when they could stop in and get the shots. The program group was significantly more likely to get shots than the control group. The specific instructions removed knowledge barriers of where and when inoculations were available, and saved time and effort students would have had to take to obtain these instructions.

Disease-prevention actions, such as getting inoculations, may be similar to hazard adjustments in that most people know they should be protecting themselves from these risks, yet both preventative health behaviors and hazard adjustments have immediate costs and only long-term rewards [21]. If those dispersing earthquake information were to decrease barriers in implementing earthquake adjustments, as those dispersing inoculation information decreased barriers in getting disease inoculations, similar improvements in compliance may be found.

In summary, there is support from general social psychological theory and empirical evidence from other risk-related fields to suggest that removing barriers associated with household seismic adjustments may increase adjustment behaviors. However, most earthquake hazards research has addressed only the strategy of trying to increase the impelling forces that will motivate people to action. This is evident in the abundance of research on such variables as risk perceptions, social influences, and perceived protection responsibility. The implementation barriers or inconvenience characteristics of adjustments have not been adequately addressed in earthquake hazards research; therefore, interventions that seek to reduce inconvenience in facilitating earthquake preparedness have not been carried out. This is unfortunate, because according to Jackson and Mukerjee's survey of San Francisco residents, the suboptimal level of household adjustments (such as upgrading the house structure, protecting the house from fire and looters, and buying earthquake insurance) reported by San Francisco residents couldn't be explained by a lack of knowledge of these adjustments, since residents reported they knew these adjustments existed. Some of these adjustments, such as structural changes, insurance, and evacuation were rated as "good" things to do by higher proportions of the respondents than had in fact adopted these adjustments. In fact, the residents spontaneously mentioned cost and implementation barriers as reasons for making decisions about hazard adjustment adoption.

Despite the lack of thorough empirical research on these characteristics in the natural hazards' literature, the role of the inconvenience dimensions of adjustments can be seen in theoretical models developed in natural hazards research. Much of the research on earthquake adjustment has been interpreted within the framework of the Protective Action Decision Model, or PADM [22]. Consistent with the Theory of Reasoned Action, or TRA [23], PADM hypothesizes that

Copyright © 2025| https://biology.academicsquare-pub.com/

protective action intention is a function of one's attitude toward an action and normative influences to engage in an action **(Figure 1)**.

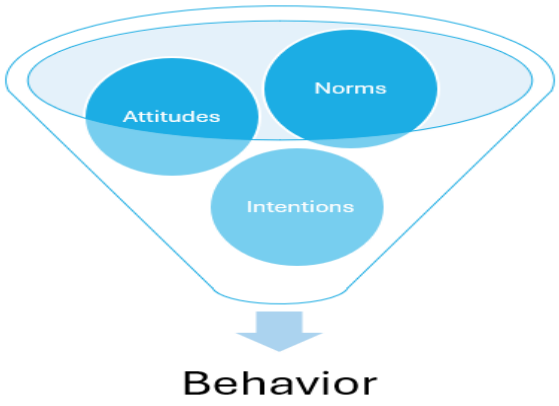

Figure 1: Theory of Reasoned Action (TRA) components [23].

PADM theorizes that evaluation of alternative actions (TRA's attitude toward a behavior) is motivated by perception of a hazard (TRA's attitude toward an object) as threatening to oneself. Therefore, because beliefs about a protective action are more proximal to the adjustment adoption decision than are beliefs about a hazard event, the former are expected to be more highly correlated with adjustment adoption decision than are the latter **(Figure 2)**.

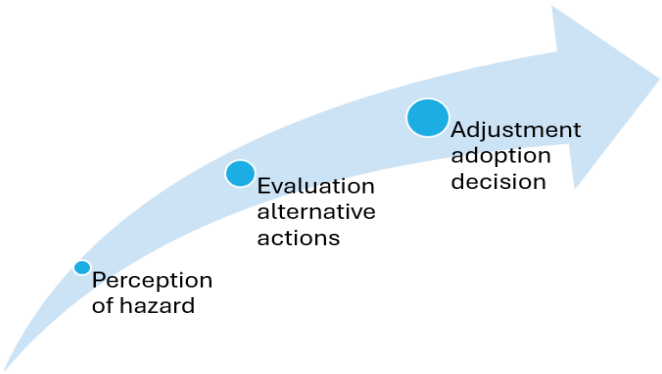

Figure 2: PADM components [22].

PADM is also compatible with Mulilis, et al., PrE theory, a model that was originally adapted from Protection Motivation Theory to explain seismic adjustment [24,25]. Despite the different constructs of these two theories, the five inconvenience characteristics are found in the PADM as common salient beliefs about protective action and in the PrE as components of self-efficacy.

The importance of the five dimensions in earthquake preparedness is further underscored by empirical evidence that suggests that risk perceptions alone are insufficient to account for households' adoption of hazard adjustments. Weinstein and Nicholich (1993) have conducted methodological analyses showing that the correlations of risk perception with the adoption of hazard adjustments must inevitably tend toward zero as time goes on [26]. As people engage in more and more adjustment activities, they will report lower adjustment scores over time as there are fewer and fewer behaviors left to accomplish. At later time periods, a small correlation may indicate the presence of barriers that keep people with high perceived risk from acting. Instead, their model predicts that the adoption of a hazard adjustment will be more strongly correlated with that adjustment's perceived effectiveness than with perceived risk from the hazard agent.

The TRA posits that one's attitude toward an object (*e.g.,* seismic hazard) is less predictive of behavior than one's attitude toward an act (seismic adjustment adoption) relevant to that object. Consistent with this reasoning, Lindell, et al., obtained ratings of three different protective actions for a chemical emergency: (a) evacuation; (b) sheltering in-place; and (c) expedient respiratory protection [22]. These researchers found obtained ratings could account for respondents' preferences among these actions.

These three different lines of analysis all indicate that hazard adjustment adoption will be more strongly correlated with attitudes towards hazard adjustments than with attitudes towards the hazard itself. Simply put, whether or not I strap down a water heater to prepare for an earthquake may depend not so much on how I feel about earthquakes, but more on how I feel about strapping down a water heater. Therefore, perceptions of adjustments may be more important than variables regarding the hazard itself, such as risk perceptions, previous earthquake experience, and fault proximity in predicting seismic adjustment adoption. In addition, other variables linked to earthquake preparedness, namely demographic and personality characteristics, do not provide very useful information to those trying to increase levels of household hazard adjustment because peoples' demographics and personality characteristics are difficult to impossible to alter. From a practical perspective, focusing on peoples' perceptions of the adjustments themselves may prove the most useful in increasing household seismic adjustment.

Research questions

Based on the review of this previous research and theory, three research questions were asked. Hypotheses were specified for some aspects of the research questions based on

Copyright © 2025| https://biology.academicsquare-pub.com/

past findings, while other aspects were not hypothesized due to inconsistent past findings.

Perceived inconvenience and perceived efficacy and adjustment intentions (RQ1)

RQ1a: Is there a correlation between the perceived inconvenience of adjustments, consisting of: (a) cost; (b) time; (c) effort; (d) required cooperation and (e) required knowledge, with intentions to engage in household seismic adjustment? It was hypothesized that the inconvenience perceptions towards adjustments would be inversely correlated with intentions to perform these adjustments.

RQ1b: Is there a correlation between the perceived efficacy of adjustments, consisting of: (a) effectiveness of protecting persons; (b) effectiveness of protecting property and (c) the utility of the adjustment for purposes other than earthquake preparedness, with intentions to engage in household seismic adjustment? It was hypothesized that efficacy perceptions towards adjustment would be positively correlated with intentions to perform these adjustments.

Perceived inconvenience and perceived efficacy and adjustment behaviors (RQ2)

RQ2a: Is there a correlation between perceived inconvenience and actual behaviors? It was hypothesized that there would be an inverse correlation between inconvenience and behaviors.

RQ2b: Is there a correlation between perceived efficacy and actual behaviors? It was hypothesized that there would be a positive correlation between efficacy and behaviors.

Perceived inconvenience and perceived efficacy (RQ3)

RQ3: Are there correlations between inconvenience perceptions and efficacy perceptions of each individual adjustment? No hypotheses were formulated due to the lack of research in this area.

Materials and Methods

Participants

Two samples of convenience were recruited. First were a group of Salt Lake City, Utah homeowners (n=128) the second sample consisted of Brigham Young University undergraduate students in introductory psychology classes in Provo, Utah (n=110). Therefore, the entire sample consisted of n=238 participants.

Homeowners (n=128) consisted of n=81 females (64.3%) and n=45 males (35.7%). The sample was relatively older (μ age=50.4, s=15.3). Most of the respondents were White/Caucasian (95.2%), with 1.6% Hispanic/Latino, 0.8% Asian and 2.4% Native American/American Indian. This sample tended to be educated, with 30.2% reporting some college, 41.3% being college graduates, 23.8% had attended graduate school and 4.7% had completed only high school. The sample was also considered affluent at the time, with 21.8% reporting incomes between $35,000 and $49,000, and 53.8% with incomes over $50,000 [27]. The majority in the sample were married (70.6%), with 18.3% single, 6.3% divorced, and 4.8% widowed.

In the student sample (n=110), females comprised the majority (71.8%). This sample was much younger (μ age=19.8, s=1.8). A slightly lower percentage than the homeowner sample were White/ Caucasian (89.1%), with the remaining students consisting of 3.6% Hispanic/Latino, 1.8% Asian, 2.7% Black/African American, and 1.8% Mixed race/ethnicity. Whether or not these students were homeowners was not assessed, it was assumed that the majority of these students were renters.

Instrument

The study used a revised version of an instrument used in a previous study by Lindell, et al., [16]. With their permission, the list of 12 items was expanded upon with some revisions to a list of 25 items **(Table 1)**.

Potentially vague items from Lindell, et al., survey such as 'developing a household emergency plan' were broken out into separate items (adjustments 9-12). Items that asked the respondent to rate two or more adjustments with one set of ratings were divided into separate items so that the respondent could rate each component separately (adjustments 6-8, 15-17). Due to a concern of a lack of variety of adjustments, new items not previously measured were included to result in a more comprehensive list of seismic adjustments.

The 25 adjustments were rated by homeowners on three efficacy characteristics and five inconvenience characteristics. Response categories consisted of 5-point Likert scales ranging from 1 (not at all) to 5 (very great extent).

Subjects also rated the 25 adjustments on the statement 'this adjustment is something I am likely to do' on a 5-point Likert scale, ranging from 1 (not at all) to 5 (very great extent). Respondents were able to alternately check a 'yes' box in answer to the statement 'I have done this adjustment' if they had already performed the adjustment.

Procedure

Homeowner surveys were collected by the author. Students' surveys were filled out immediately after class in return for extra credit. Informed consent was obtained

Copyright © 2025| https://biology.academicsquare-pub.com/

before administering surveys. All analyses were conducted in IBM SPSS Statistics 10.

Table 1: Preparedness items were categorized based on their nature and purpose in earthquake readiness.

Preparedness Item	Adjustments to Modified Survey
1	Buying and maintaining a radio with spare batteries (O)
2	Buying and maintaining four gallons of food (O)
3	Buying and maintaining a four-day supply of water (O)
4	Buying and maintaining a first-aid kit (O)
5	Buying and maintaining a fire extinguisher (O)
6	Learning how to shut off gas (S)
7	Learning how to shut off water (S)
8	Learning how to shut off electricity (S)
9	Teaching safest spot in each room (S)
10	Teaching danger spot(s) in each room (S)
11	Choosing out-of-state family members to contact (S)
12	Conducting practice drills (S)
13	Learning location of nearby medical centers (O)
14	Attending meetings on earthquake preparedness (O)
15	Strapping water heaters to walls (S)
16	Strapping tall objects to walls (S)
17	Strapping heavy objects to walls (S)
18	Installing cabinet latches (O)
19	Purchasing earthquake insurance (O)
20	Developing self-network between neighbors (N)
21	Moving flammable materials from heat sources (N)
22	Changing hanging plants from heavy to light pots (N)
23	Removing dead tree limbs that could fall on house (N)
24	Having neighbors agree to hang out white flag (N)
25	Storing important records in safety deposit box (N)

Note: 'O' indicates item originally found in Lindell, et al., survey, 'S' indicates Lindell, et al., compound item split into individual item, 'N' indicates new item not found in Lindell, et al. See Anderson (2000) for exact wording of items and complete copy of survey [28].

Analysis and Results

Some aspects of the hypotheses were confirmed; many new correlations were also found.

Inconvenience and efficacy perceptions and seismic adjustment intentions (RQ1)

Participant responses to inconvenience and efficacy items were analyzed in a factor analysis with varimax rotation, which produced two factors that clearly represented the two constructs of efficacy and inconvenience. Reliability analyses were extremely high for items in the efficacy scale (Cronbach's α =.98, n=172) and inconvenience scale (Cronbach's α =.98, n=158).

For the relationship between intentions to perform seismic adjustments and inconvenience and efficacy perceptions, scales were computed for both constructs, and these were correlated with intention ratings. Correlations were collapsed across all adjustment as averages. Multiple items for inconvenience and efficacy were averaged, and then averages were computed for each variable across each of the 25 individual seismic adjustments. The homeowner sample and student sample showed the same pattern of responses, with correlations being slightly stronger for the student sample.

RQ1a: A high correlation was found between inconvenience perceptions and intentions (r=-.64, p=.001),

Copyright © 2025| https://biology.academicsquare-pub.com/

demonstrating that the more inconvenient an adjustment is perceived to be, the less likely people are to intend to perform it.

RQ1b: The correlation between efficacy perceptions and intentions was marginally significant (r=.39, p=.057), indicating that the more efficacious on adjustment is perceived to be, the more likely people are to intend to perform it.

Inconvenience and efficacy perceptions and seismic adjustment behaviors (RQ2)

Both efficacy and inconvenience perceptions were subjected to a point biserial correlation to look at their relationship to actual behavior. Participants had either performed each adjustment or they had not. A positive 'yes' answer was coded as a '1' and a negative 'no' answer was coded as a '0'.

RQ2a: Efficacy perceptions and behaviors were not significantly correlated (r=.29, p=.16).

RQ2b: There was a large inverse correlation between inconvenience perceptions and behaviors (r=-.57, p=.003).

Inconvenience and efficacy perceptions (RQ3)

A correlation matrix was computed on the inconvenience perceptions with the efficacy perceptions for each of the 25 adjustments **(Table 2)**. Many correlations were statistically significant.

Table 2: Correlations between inconvenience, efficacy and disaster preparedness behavior and intentions.

Correlations by Adjustment	Inconvenience and Behavior	Inconvenience and Intentions	Efficacy and Behavior	Efficacy and Intentions
Buying and maintaining a radio with spare batteries	-.432**	-.250**	.138*	.298**
Buying and maintaining four gallons of water	-0.016	-0.198	-0.058	0.194
Buying and maintaining a four-day supply of food	-0.032	0.138	-0.009	.328**
Buying and maintaining a first aid kit	-0.018	-0.068	0.108	.408**
Buying and maintaining a fire extinguisher	-0.031	-0.002	.143*	.362**
Learning how to shut off gas	-.146*	-0.048	-0.076	.300**
Learning how to-shut off water	.239**	-0.013	0.112	.483**
Learning how to shut off electricity	-.252**	0.099	0.018	0.47
Teaching safest spot in each room	-0.066	0.124	.139*	.396**
Teaching danger spot(s) in each room	0.022	-0.056	.231**	.297**
Choosing out-of-state family members to contact	0.113	0.115	0.105	.566**
Conducting household practice drills	-0.066	0.104	0.111	.621**
Learning location of nearby medical centers	-0.105	0.022	0.004	.233**
Attending meetings on earthquake preparedness	-0.142	0.025	0.069	.524**
Strapping water heaters to walls	-0.093	-0.044	.171**	.408**
Strapping tall objects to walls	0.013	0.128	.154**	.583**
Strapping heavy objects to walls	0.047	.237**	0.115	.545**
Installing cabinet latches	-0.101	0.038	.132*	.473**
Purchasing earthquake insurance	-0.111	.193**	.129*	.353**
Developing self-network between neighbors	-0.114	0.092	0.056	.393**
Moving flammable materials from heat sources	-0.134	0.066	.181**	.493**
Changing hanging plants from heavy to light pots	-0.075	0.14	.288**	.404**
Removing dead tree limbs that could fall on house	0.043	.200**	.267**	.490**
Having neighbors agree to hang out white flag	-0.049	0.042	0.106	.461**
Storing important records in safety deposit box	-0.063	0.089	.157*	.346**
Note: * = sig. at .05, ** = sig. at .01, n=25.				

Discussion

Previous research had found that efficacy perceptions, but not inconvenience perceptions, were correlated with homeowner seismic adjustment [16,29]. In this study, both efficacy and inconvenience perceptions were significantly correlated with the implementation of these adjustments. When overall correlations were computed, inconvenience perceptions were significantly correlated with both adjustment intention and behavior, while efficacy perceptions were only marginally correlated with intention. However, when separate correlations were computed for each adjustment (n=25), efficacy perceptions had a more powerful relationship with behavior, and especially intentions, than inconvenience perceptions. Taken together, these findings indicate that people are more likely to do or

Copyright © 2025| https://biology.academicsquare-pub.com/

intend to do seismic adjustments when they believe they are generally quick and easy. But when people are considering specific household adjustments, they pay more attention to the efficaciousness of that particular adjustment. Therefore, when hazard managers are trying to induce general earthquake adjustment compliance, they should stress the relative ease and convenience of seismic adjustments. However, if speaking about adjustments individually, the effectiveness of each adjustment should be emphasized.

A statistical issue may explain why this study found inconvenience perceptions a predictor of seismic adjustments when previous research did not. Lindell, et al., did not correlate inconvenience and efficacy perception scores with intention scores at the individual adjustment level [22]. Rather, they obtained individual correlations for each row of data, or participant. This method of calculating a correlation may wash out relationships between variables that actually exist [30]. Since the calculations for the data obtained in the Davis, et al., study was performed in a post-hoc analysis, it is possible that Lindell and Whitney's, et al., study actually contains similar results to this study. This would bridge the discrepancy between established theory and findings of these few studies addressing the relationship between inconvenience perceptions and seismic adjustment adoption [23].

Additionally, positive correlations were found between inconvenience perceptions and efficacy perceptions on 20 of the 25% or 80% of the individual adjustments. On a specific seismic adjustment level, homeowners may perceive most adjustments that are effective as necessarily being inconvenient. They may reason that anything that is really going to protect their homes effectively is going to require a lot of time, effort, and/or knowledge. However, this doesn't mean that reducing inconvenience isn't an effective strategy to increase household seismic adjustment. By providing specialized knowledge and instruction easily and conveniently, the driving forces impelling the desired change may not be lessened because the knowledge requirement is not reduced. Adjustments still require special expertise and therefore have a high level of perceived efficacy, but the restraining forces may be reduced by conveniently delivering homeowners this knowledge as much as is possible.

Implications for natural hazard mitigation

Since this study was originally carried out 25 years ago, reducing Lewinian implementation barriers has been used as a strategy in applied settings other than natural hazards. These have included health care business, medicine, and environmental sustainability [31-34]. However, researchers continue to note the limited attention paid to Lewin's restraining forces in comparison to compelling forces [35-37].

Global warming and overcrowding make natural hazards increasingly costly and deadly and these hazards can be interconnected [39,40]. Earthquakes can be followed by tsunamis, as has happened in Oceana or by mudslides, as has happened in the Caribbean [41,42]. Residents in Mount Shasta, California are at risk for earthquakes, volcanos, and wildfires [43].

Findings from this study have relevance to natural disasters other than earthquakes. Standard adjustments of buying and maintaining a radio with spare batteries, first aid kit, fire extinguisher, four-day supply of food, and four-day supply of water are needed for all natural disasters [7,44]. Additional items to include in today's first aid kits include medicine, hygiene articles, and energy and communication devices [36]. While these first aid kits currently exist in many households, there is a noticeable shortage of emergency supplies in resident vehicles [45].

Smoke detectors, fire extinguishers, and fire blankets can be lifesaving household equipment in the event of a fire. Practice drills for using a hand-held fire extinguisher and implementing a household escape plan are also effective fire mitigation strategies [44,46]. Fire blankets are now being developed for entire structures that have demonstrated evidence of effectiveness in preventing residential ignition. These blankets can block fire from entering vulnerable spots (*e.g.* gutters, eaves, vents) and reflect thermal radiation from adjacent burning houses to give homeowners more time to collect valuables and escape to safety [47]. Toweled ice packs have been proven effective items that can easily and inexpensively be incorporated into existing first-aid kits for heat stroke caused by extreme heat events [48].

Despite extreme unpredictability, escape plans are needed in the event of floods, landslides, and mudslides [38]. Adjustments tailored to homes include dry floodproofing, or installing external barriers preventing water from entering the structure; another is wet floodproofing, or moving equipment such as furnaces to higher floors while allowing flood water to enter the structure [7]. These adjustments may not be widely known to at-risk homeowners. Caribbean residents were found to lack technical knowledge of mudslide household adjustment. Household retaining walls were built that address soil erosion and slope failures without addressing surface water infiltration, leading to rarely successful mitigation [42]. Kelmanet al., found a lack of homeowner personal efficacy towards mitigating mudslide disasters in Papua New Guinea. Residents reported being aware that community reforestation through tree planting

Copyright © 2025| https://biology.academicsquare-pub.com/

could provide some mitigation, yet still had not engaged in these efforts.

NOAA (National Oceanic and Atmospheric Administration) radios are a national network of stations that broadcast continuous weather information directly from the nearest National Weather Service office to homeowners and provide information on hurricanes, tornados, and tsunamis. Yet few homeowners in these risk zones have purchased NOAA radios [49]. Installing cabinet latches and strapping down water heaters are useful adjustments for these disasters as well as earthquakes.

Technological advancements have facilitated timely communication of personalized information in natural disasters, leading to increased risk personalization [8]. Disaster apps have been developed that can be used to receive risk information regarding multiple natural disasters for one structure simultaneously [50]. Early emergency warning system apps are lessening response times [51]. Cloud-based Internet of Things (IoT), smartphones, and social media can be used as interconnected networks to transmit minute-by-minute disaster information obtained from local sensors. However, language barriers in these technologies still exist and internet reliability and user interface experience need to be improved [45,52].

Conclusions

In the field of natural hazards, technological advancements have allowed for improvements in information dispersal, preparedness levels, and disaster response times. Yet, the problem of Lewinian implementation barriers has not been adequately addressed. Current technology has not been fully utilized, along with social psychological theory, to its maximum effect.

The potential for removal of Lewinian barriers has not been sufficiently communicated, implemented, and studied. The author therefore calls upon agency officials, hazard managers and app designers to find ways to reduce the cost, time, effort, required knowledge, and required cooperation dimensions of household adjustments for increasingly interrelated and dangerous natural hazards.

References

1. US Geological Survey (2015) Nearly half of Americans exposed to potentially damaging earthquakes.
2. Kolathaya S, Karan KV, Rohith VR, Priyatham K, Nikil S, et al., (2019) Development of mobile application to assess and enhance earthquake preparedness level of individuals and community in India. In Sustainable design and construction for geomaterials and geostructures: Proceedings of the 5th GeoChina International Conference 2018-Civil Infrastructures Confronting Severe Weathers and Climate Changes: From Failure to Sustainability. Springer International Publishing 197-216. [Google Scholar]
3. Rivera JD (2020) The likelihood of having a household emergency plan: Understanding factors in the US context. Nat Hazards (Dordr) 104: 1331-1343. [Crossref], [Google Scholar], [Indexed]
4. Lewis J (2003) Housing construction in earthquake-prone places: Perspectives, priorities and projections for development. Aust J Emerg Manag 18: 35-44. [Google Scholar]
5. Vaughan E, Turner J (2013) The value and impact of building codes. Environmental and Energy Study Institute White Paper 20: 501-517. [Google Scholar]
6. Ao Y, Zhang H, Yang L, Wang Y, Martek I et al. (2021) Impacts of earthquake knowledge and risk perception on earthquake preparedness of rural residents. Nat Hazards 107: 1287-1310. [Crossref], [Google Scholar]
7. Grover H, Lindell MK, Brody SD, Highfield WE (2022) Correlates of flood hazard adjustment adoption in four coastal communities. Int J Disast Risk Re 68: 102728. [Crossref], [Google Scholar]
8. Luna-Ramírez WA, García-Zepeda JC, Ortiz-Hernández G (2023) SMRP: A mobile application for earthquake personal risk alarms. IADIS International Journal on WWW/Internet 21: 18. [Google Scholar]
9. Johnston KA, Taylor M, Ryan B (2022) Engaging communities to prepare for natural hazards: A conceptual model. Nat Hazards 112: 2831-2851. [Crossref], [Google Scholar]
10. Han Z, Wang L, Cui K (2021) Trust in stakeholders and social support: Risk perception and preparedness by the Wenchuan earthquake survivors. Environ Hazards 20: 132-145. [Crossref], [Google Scholar]
11. Papadopoulos AN, Böse M, Danciu L, Clinton J, Wiemer S (2023) A framework to quantify the effectiveness of earthquake early warning in mitigating seismic risk. Earthq Spectra 39: 938-961. [Crossref], [Google Scholar]
12. Amiresmaili M, Zolala F, Nekoei-Moghadam M, Salavatian S, Chashmyazdan M et al. (2021) Role of social media in earthquake: A systematic review. Iran Red Crescent Med J 23: e447. [Crossref], [Google Scholar]
13. Lindell M (2013) North American cities at Risk: Household responses to environmental hazards. In: Joffe H, Rossetto T, Adams J (eds) Cities at Risk. Advances in natural and technological hazards research, Springer, Dordrecht 33. [Crossref], [Google Scholar]
14. Shapira S, Aharonson-Daniel L, Bar-Dayan Y (2018) Anticipated behavioral response patterns to an earthquake:

Copyright © 2025| https://biology.academicsquare-pub.com/

The role of personal and household characteristics, risk perception, previous experience and preparedness. Int J Disast Risk Re 31: 1-8. [Crossref], [Google Scholar]

15. MacPherson-Krutsky C, Lindell MK, Brand DB (2023) Residents' information seeking behavior and protective action for earthquake hazards in the Portland Oregon Metropolitan Area. Risk Anal 43: 372-390. [Crossref], [Google Scholar], [Indexed]

16. Lindell MK, Whitney DJ (1999) Correlates of household seismic hazard adjustment adoption. Risk Anal 20: 13-26. [Crossref], [Google Scholar], [Indexed]

17. Pereira SM, Mónico LDSM, Rego IE (2024) Household earthquake readiness: Conceptualization and measurement. Int J Disast Risk Re 110: 104649. [Crossref], [Google Scholar]

18. Ross L, Nisbett RE (1991) The person and the situation: Perspectives of social psychology. Boston: McGraw Hill. [Google Scholar]

19. Lewin K (1951) Field theory in social science; selected theoretical papers (edited by Dorwin Cartwright). New York: Harper.

20. Leventhal H, Singer R, Jones S (1965) Effects of fear and specificity of recommendation upon attitudes and behavior. J Pers Soc Psychol 2: 20-29. [Crossref], [Google Scholar], [Indexed]

21. Gollwitzer PM, Oettingen G (1998) The emergence and implementation of health goals. Psychol Health 13: 687-715. [Crossref], [Google Scholar]

22. Lindell MK, Perry RW (1992) Behavioral Foundation of Community Emergency Planning. Washington, DC: Hemisphere Press. [Google Scholar]

23. Ajzen I, Fishbein M (1975) A Bayesian analysis of attribution processes. Psychol Bull 82: 261-277. [Crossref], [Google Scholar]

24. Mulilis JP, Duval TS (1995) Negative threat appeals and earthquake preparedness: A person-relative-to-event PrE model of coping with threat. J Appl Soc 25: 1319-1339. [Crossref], [Google Scholar]

25. Rogers RW (1975) A protection motivation theory of fear appeals and attitude change1. J Psychol 91: 93-114. [Crossref], [Google Scholar], [Indexed]

26. Weinstein ND, Nicolich M (1993) Correct and incorrect interpretations of correlations between risk perceptions and risk behaviors. Health Psychol 12: 235-245. [Crossref], [Google Scholar], [Indexed]

27. (2000) CPI Inflation Calculator.

28. Anderson N (2000) Seismic adjustments: The influence of inconvenience and efficacy perceptions, state of residence, and demographic factors. Brigham Young University.

29. Davis MS (1989) Living along the fault line: An update on earthquake awareness and preparedness in Southern California. Urban Resources 5: 8-14.

30. Cooksey RW, Cooksey RW (2020) Correlational statistics for characterizing relationships. Illustrating Statistical Procedures: Finding Meaning in Quantitative Data 141-239.

31. Heath M, Porter T, Dunnigan K (2022) Obstacles to continued use of personal health records. Behav Inf Technol 41: 574-587. [Crossref], [Google Scholar]

32. Blumenauer A (2023) Leadership strategies small business owners might consider to reduce workplace bullying. University of the Southwest.

33. Colvin CJ, de Heer J, Winterton L, Mellenkamp M, Glenton C et al. (2013) A systematic review of qualitative evidence on barriers and facilitators to the implementation of task-shifting in midwifery services. Midwifery 29: 121-1221. [Crossref], [Google Scholar], [Indexed]

34. Kump B (2023) Lewin's field theory as a lens for understanding incumbent actors' agency in sustainability transitions. Environmental Innovation and Societal Transitions 46: 1-11. [Crossref], [Google Scholar]

35. Roh T, Lee K, Yang JY (2021) How do intellectual property rights and government support drive a firm's green innovation? The mediating role of open innovation. J Clean Prod 317: 128422. [Crossref], [Google Scholar]

36. Kohler K, Hauri A, Roth F, Scharte B (2020) Measuring individual disaster preparedness. ETH Zurich. [Crossref], [Google Scholar]

37. Paillé P, Paillé P (2020) Employees and pro-environmental behaviors: Obstacles, constraints, and barriers. Greening the Workplace: Theories, Methods, and Research, 91-112. [Crossref]

38. Lin S, Shaw D, Ho MC (2008) Why are flood and landslide victims less willing to take mitigation measures than the public? Nat Hazards 44: 305-314. [Crossref], [Google Scholar]

39. Kelman I (2020) Disaster by choice: How our actions turn natural hazards into catastrophes. Oxford University Press. [Google Scholar]

40. Abramovitz J (2001) Unnatural disasters. Worldwatch Institute. [Google Scholar]

41. Apatu EJ, Gregg CE, Richards K, Sorensen BV, Wang L (2013) Factors affecting household adoption of an evacuation plan in American Samoa after the 2009 earthquake and tsunami.

Copyright © 2025| https://biology.academicsquare-pub.com/

Hawaii J Med Public Health 72: 267-272. [Google Scholar], [Indexed]

42. Andersson-Sköld Y, Bergman R, Johansson M, Persson E, Nyberg L (2013) Landslide risk management-a brief overview and example from Sweden of current situation and climate change. Int J Disast Risk Re 3: 44-61. [Crossref], [Google Scholar]

43. Perry RW, Lindell MK (2008) Volcanic risk perception and adjustment in a multi-hazard environment. J Volcanol Geotherm Res 172: 170-178. [Crossref], [Google Scholar]

44. Nilson F, Bonander C (2020) Household fire protection practices in relation to socio-demographic characteristics: Evidence from a Swedish national survey. Fire Technol 56: 1077-1098. [Crossref], [Google Scholar]

45. Dirie AN, Rahmat SR, Tarmizi NAA (2024) Enhancing disaster preparedness : Evaluating factors influencing the use of proposed mobile disaster management application for risk reduction. In Conference on Accounting and Business (ICAB2024).

46. Runyan CW, Bangdiwala SI, Linzer MA, Sacks JJ, Butts J (1992) Risk factors for fatal residential fires. N Engl J Med 327: 859-863. [Crossref], [Google Scholar], [Indexed]

47. Takahashi F (2019) Whole-house fire blanket protection from wildland-urban interface fires. Front Mech Eng 5: 60. [Crossref], [Google Scholar]

48. Rogerson S, Brearley M (2024) Suspected exertional heat stroke: A case study of worker cooling in a hot and humid field environment. Work 79: 2103-2108. [Crossref], [Google Scholar], [Indexed]

49. Chaney PL, Weaver GS, Youngblood SA, Pitts K (2013) Household preparedness for tornado hazards: The 2011 disaster in DeKalb County, Alabama. Weather, Climate, and Society 5: 345-358. [Crossref], [Google Scholar]

50. Damalas A, Mettas C, Evagorou E, Giannecchini S, Iasio C et al. (2018) Development and Implementation of a decatastrophize platform and tool for the management of disasters or multiple hazards. Int J Disast Risk Re 31: 589-601. [Crossref], [Google Scholar]

51. Zambrano AM, Calderón X, Jaramillo S, Zambrano OM, Esteve M et al. (2017) Community early warning systems. Wireless Public Safety Networks 3 39-66. [Crossref]

52. Ezeonu NA, Hertelendy AJ, Adu MK, Kung JY, Itanyi IU et al. (2024) Mobile apps to support mental health response in natural disasters: Scoping review. J Med Internet Res 26: e49929. [Crossref], [Google Scholar], [Indexed]

Copyright © 2025| https://biology.academicsquare-pub.com/