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Perceived Self Efficacy To Cope With Earthqakues

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ABSTRACT

A sample of 155 Mexican participants who experienced severe earthquakes was required to read a set of 32 scenarios each describing a hypothetical earthquake scenario. After reading a scenario, participants judged their own self efficacy to deal with the described scenario. Analysis of results from an information integration theory approach showed that all participants can be grouped into four clusters. Participants of three clusters used a summative cognitive rule to integrate information of location, magnitude of seismic activity, earthquake type and other people´s reactions to the earthquake. Here, magnitude and other people´s reactions were the most relevant, but these factors had different valuation through cognitive ruled groups. Location and civil protection indications were relevant to groups having moderate and low self-efficacy to cope with disaster. Thus, systematic integration of information from scenarios and differential valuation of factors relate to judgment formation producing different degrees self-efficacy to cope with disaster.

Keywords: Self-efficacy, earthquakes, Mexicans, cognitive algebra.

INTRODUCTION

Natural disasters (e.g., earthquakes, tsunamis, extreme temperatures, floods, etc.) might happen suddenly without any warning implying in many occasions material devastation [38] and human tragedy. It is estimated that only between the years of 2000 & 2017 around 193,000 persons were severely affected by natural disasters leaving 77,144 deaths from which 46,173 deaths were caused by earthquakes [15].

In addition to material consequences, natural disasters have a significant impact in our live styles (specially for people who have suffered one) since their possibility of occurrence becomes a primary stressor like posttraumatic stress [20] or a secondary one like considering insurance claims or dealing with financial troubles. In turn vulnerability to these stressors might lead people to develop either mental disorders [24] or health problems that include phobia, depression and other disorders [23].

The effects of earthquakes depend on multiple factors, such as the type of event, duration of the event, magnitude of event, among other factors" [13]. In short, population vulnerability towards natural hazards relates not only to material factors but also to human nature. Here it is argued that by exploring the cognitive and emotional processes people experience during catastrophic events it is possible to specify coping strategies that can be helpful to minimize psychological consequences as well as to empower people with appropriate judgment formation to decision making and problem solutions during a natural disaster situation. Academic research in this direction has appointed that level of preparation regarding disasters [1], previous experience [43], resilience [28], perceived self-efficacy to deal with disasters [20] become relevant factors that make people either to maximize or minimize the effect that a natural disaster has on them.

Variables affecting people´s experience of a natural disaster: The earthquake case

Academic research has identified several factors having significant effects on peoples´ perception and coping strategies when confronted against a natural disaster. For instance, in relation to earthquakes it has been documented that previous experience of a disaster survivor modifies her/his strategic behavior to survive another one [43, 39]. Regarding this, Tekeli-Yeşil, Dedeoğlu, Tanner, Braun-Fahrlaender and Obrist [48] reported from a study conducted in Stanbul that people who suffered from a previous natural disaster seemed more proactive and willing to actively cope in a disaster situation. Specifically, they reported solidarity actions with others as a relevant factor to survive. Learning to take precautions and have a compromise to take future actions was another reported aspect to have in mind. Furthermore, these authors observed that people with higher level of education presented better mitigation and readiness strategies than the rest of the study participants to deal with disaster. As it will be pointed later this was also the case for the current study.

Further research conducted by Muldoon, Acharya, Jay, Adhikari, Pettigrew and Lowe [33] pointed out that collective identity is an attenuation factor on experiencing an earthquake capable of producing posttraumatic stress. As a matter of fact, these authors reported that collective identity as well as collective efficacy to deal with disasters lead to self-growth in earthquake survivors. Collateral academic efforts by Masten and Obradovic [27] revealed that type of agency (either external or internal), emotional attachment, behavior regulation, social interactions with family members and school mates mediate recovering speed from earthquakes.

Thus, understanding human adaptative mechanisms to cope natural disasters is relevant not only to empower people for survival but self-growth. Thus, Guerra et al [20] reported that agency mechanism and self-regulation strategies used to cope with disaster are also used to diminish negative effects of living through a high magnitude disaster which in turn changes emotional and behavioral patterns. Take for instance reports on how varying degrees of self-efficacy to cope with stressful situations during a natural disaster relate to frequency and severity of posttraumatic symptoms [25] leading to belief that self-efficacy in these situations is an inoculation factor for posttraumatic behavior. However, Nygaard, Hussain, Siqveland, and Heir [35] have reported that even when self-efficacy might be related to levels of posttraumatic behavior, this does not necessarily imply that a disaster survivor will recover from trauma.

Self-efficacy research regarding earthquakes

Perceived self-efficacy can be understood as a set of beliefs about oneself´ capacity to deal with those events affecting your life. Thus, this mental construct refers to an intellectual variable affecting people´s cognitive and motivational processes as well as their emotional world and the way they take decisions and solve problems. That is, a mental activity affecting the way people cope daily events [5]. Here, self-efficacy variables regarding the way people use to moderates their behavior to confront adversity are relevant for the current discussion [9]. Take for instance self-efficacy variables that positively affects/control emotion reactivity in adversity, especially when these are related to natural disasters [20]. High or low perceived self-efficacy seems to lead a person to self-habilitation or self-disabling against adversity [6]. Thus, high level self-efficacy individuals seem to conceptualize adverse events as challenges or opportunities to solutions and they tend to be more persistent to cope with negative situations [25-26, 51].

Additional support to this observation was also reported by Guerra et al. [20], who reported that people´s beliefs regarding their capacity to deal with adversity minimize emotional reactivity after a natural disaster as it is the case of readiness behavior to deal with earthquakes [39] or other natural disasters [34].

Even when many reports on perceived self-efficacy can be found as a principal factor on protective behavior, readiness, preparation, coping and recovering from trauma caused by natural disasters [34, 20, 39], there are no many specific academic explorations in relation to seismic disasters. Take for instance, the amount of “Disasters magazine” publications between the year period of 1998 and 2019. Only 118 out of 860 were related to seismic events which in turn contained topics on economic damage [46, 44], and emotional sequels caused by earthquakes [36, 49]. Additional reports on organized response behavior to earthquakes were presented in (7, 22, 10), as well as preparation programs [45]. However, very few reports on perceived self-efficacy during earthquakes can be found [29].

Similar results can be found by consulting other academic sources. Thus, in 2009 Luszczynska et al. [26] carried over a literature review having in mind a possible relation between self-efficacy beliefs and psychosomatic manifestations due to collective traumatic events (e.g. earthquakes, floods, fires). They selected 28 academic documents out of 3000 as being representative of this quest. However, only one was concerned with self-efficacy coping (SC) as a predictor of anguish and avoidance behavior in a Turkish population who survived the Marmara earthquake in 1999 [47]. This paper reported a direct relationship between SC, extreme intrusion and extreme anxiety (distress).

Therefore, the general picture obtained from an academic background is that much more is needed to really consider a corpus of data explaining the relation between self-efficacy and natural hazards. From a cognitive point of view this scope gets narrower. Even when self-efficacy is conceptualized as a central cognitive mechanism to coping [1] and human agency [9], there are very few cognitive empirical reports exploring this phenomenon.

There is, however, some identifiable aspects regarding self-efficacy that are supported by current literature. Zulfabli, Bin, Tareq, Bin and Islam [52], present a list of factors to be enrolled in self-efficacy development, namely: previous experience in a domain (mastery), vicar experiences, others verbal and social persuasion and personal emotional states [8]. Framing seismic events by these listed variables it can be observed that efficacy to deal with disaster mediates people reactivity and recovering from trauma [43, 39, 48]. This previous experience includes the possibility of receiving some previous kind of training [4]. Other listed variables relate to gender [4, 20] and even materials used to reconstruct affected locations by seismic activity [4].

The aforementioned research constitutes an excellent opportunity to deepen our understanding from a cognitive science point of view by bringing identified self-efficacy variables under the scrutiny of modern robust experimental cognitive techniques. Here it is argued that by using the cognitive algebra analysis paradigm from the Information Integration theory or IIT [2], it is possible to achieve cognitive specification of processing parameters underlying people´s judgment to cope disaster situations (earthquakes). In order to do this, a brief introduction to cognitive algebra is presented followed by a description on how to put under IIT scrutiny self-efficacy judgment coping with natural hazards described by hypothetical but ecological valid scenarios.

Cognitive algebra and Self-efficacy Judgment formation to cope with seismic disasters.

Every day, people consciously or unconsciously select, valuate and integrates pieces of information from their external or internal environment to produce systematic judgment and thinking that empowers them with adaptability to deal with daily demands. This observation about our behavior was synthetized by Anderson [2] in his functional information integration diagram described in Figure 1. The IIT diagram shown in figure 1 is considered inside the context of a possible seismic activity situation. Accordingly, a person experiencing this scenario might look for different sources (S) of information from her/his environment. Then psychological valuation (Ψ_1) upon selected sources becomes activated through a cognitive operator (V). Finally, these valuated sources of information are integrated in a meaningful way by a psychological functional (ρ) typified by a specifiable integration cognitive operator (I). In turn this cognitive mental activity is oriented to produce a desired response (R) through an action operator (A).

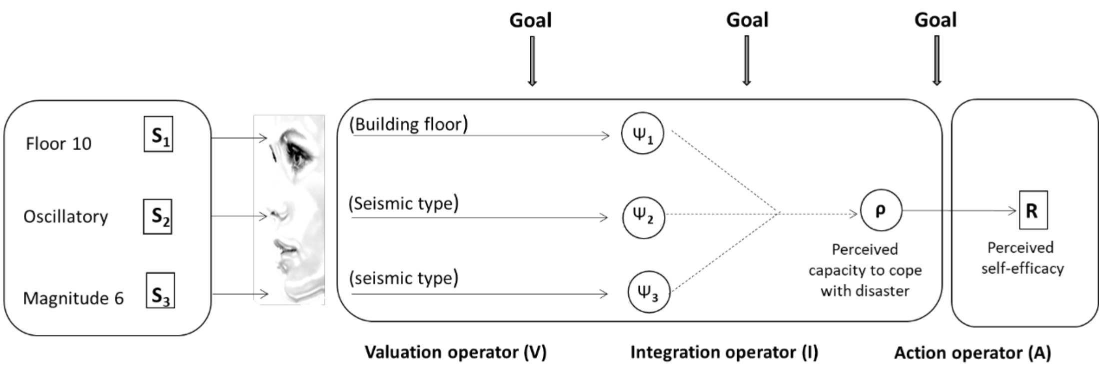

Figure 1. Information Integration Information Diagram (IITD) adapted to illustrate human judgment during a hypothetical seismic scenario. Here, three main cognitive operators (V-I-A) are assumed to participate between perceived stimuli and an observable behavioral response (Adapted from [2]).

The IIT cognitive approach to judgment formation is a robust experimental technique that has been used to study a wide diversity of human behavior topics like romantic relationships [16]sexuality and disability (Morales, 2012), inclusion of people with intellectual disabilities [30-31], human deception [12] self-efficacy in educational settings [11, 50], etc.

Until we know, there are no IIT reports on judgment formation (using V, I, A) in the context of natural hazards. Thus, an opportunity opens to establish a new cognitive empirical direction by considering previous research on human judgment to cope with disasters and the IIT approach. Before describing how to approach this opportunity let us firs to consider additional research framing our current study.

Study context

Mexico is considered as one the most seismic activity in the world [41]. The main city of Mexico has a high constant probability of devastation to earthquakes due to its soil properties and one of the highest population concentrations in a city (24 million individuals). This city has been a target of constant seismic activity during the last 200 years [14]. As an example, take September 19th of 1985 when this city suffered a massive magnitude 8.1 earthquake (Richter scale) where 150,000 people were severely affected and 6000 people died [21]. Another relevant earthquake occurred in September 19th of 2017 causing severe affectation on 192 people and 139 deceased people [37].

Since Mexico City is considered a zone with one of the highest probabilistic of seismic activity in the country, different governmental institutions efforts have been taken place to educate and create consciousness regarding de dangers of living in this kind of places. The institutional agenda has in mind to empower people with coping strategies to deal with disaster. This intention currently contrasts with a very poor academic corpus of data describing how Mexicans copy with natural hazards. To this respect, initial reports were presented by Santos-Reyes, Santos-Reyes, Gouzeva & Velazquez-Martinez [40] in a study how a sample of 817 children from Oaxaca-Mexico (another Mexican state with high seismic activity) is prepared to deal with seismic activities and how these children perceive these events. They found that at least 50% of the participants experienced no fear to experience seismic activity and around 19% of the children reported not having any ability to cope with a disaster event. In this study boys showed to have lower fear and more sense of self-efficacy to deal with disaster than girls and children belonging to a rural Oaxaca zone seemed to be less prepared than children living in an urban city.

Furthermore, Santos-Reyes et al. [40] conducted another study on how citizens of Mexico City perceive seismic disaster. This sample study considered 410 participants of different age ranges, young adults between 20 and 34 years old and adults with 35 or more years. Here, 35% of participants experienced the 1985 earthquake. Results showed that at least 33% of the sample considered that the possibility of experiencing an earthquake was one of the threatening experiences they feared. However, participants showed poor preparation in proportion to the risk of having an earthquake and it seemed they do not care on following basic civic protection recommendations for survival. In another cross-sectional study dealing with risk perception [40] concluded that gender, school hour, participation in prevention and educational programs on seismic activity risks and even talking about this topic at home affect people´s perception, knowledge and coping seismic risk.

In summary, this appointed research provides information regarding the level of preparation, knowledge, knowledge and risk perception of seismic events in children [42] teenagers [40] and general population [19]. However, as valuable as these reports are, none of them provide cognitive specification on judgment formation to cope with natural hazards.

By taking in consideration international and Mexican academic reports some initial risk factors regarding earthquakes were considered to implement the following IIT study on a Mexican population. Consideration of the following two research questions become a way to explore this academic intention.

How does people´s self-efficacy judgment valuate seismic and situational factors during an earthquake?

What is the cognitive integration mechanism regulating self-efficacy to cope with a seismic event?

METHOD

The goal of the current study is to determine if Mexican people´s self-efficacy judgment to cope with earthquakes is systematically regulated by an information integration cognitive rule. To achieve this, this IIT study implies using the cognitive algebra experimental paradigm.

Some notes on the cognitive algebra paradigm.

The IIT cognitive approach assumes that measurement of psychological activity is constrained by multifactorial causality. Thus, multifactorial experimental designs are considered a necessity inside the IIT approach since controlled manipulation of factors provides the opportunity to graphically observe through factor integration graphs data patterns that graphically represent the presence of a cognitive rule to integrate information (summative, multiplicative, average). Take the case of parallel lines describing the way data was distributed in a bidimensional graph. This will indicate the use of a summative rule by participants in a cognitive algebra study [2-3]. Here it is important to emphasize that the IIT orientation assumes multiple determination or causality where people are not viewed as information consumers but as systematic integrators of meaningful pieces of information. This idea is clearly illustrated in Figure 2.

Study design

The current study design contemplated combination of five orthogonal factors each representing a piece of information related to an earthquake situation. Thus, a within experimental design was considered having a 2(place: Floor 10 vs floor 1) x 2(Earthquake magnitude: Medium vs. high) x 2 (Seismic type: Oscillatory vs. trepidatory) x 2(Safety indicators: Available vs. absent) x 2 (Others human reactions: Calm vs. emotionally disturbed) factor combination. Therefore, 32 experimental conditions are obtained by factor combination.

Instruments and material

The cognitive algebra instrument.

Thirty-two earthquake scenarios were built by considering experimental factor combination. Each scenario described a hypothetical seismic event situation. This scenario was presented in its bottom part with a question requiring the readers to provide a judgment on their own perceived self-efficacy to cope with the described situation. Their response evaluation had to be marked in a ten-point scale that was left anchored with the label “Null elf efficacy” and right anchored with the label “High Self-efficacy” (see Appendix 1).

Participants

A total of 190 out of 250 invitations to participate in the study were responded. Finally, 155 participants were included in the study sample. Here, the sample consisted of 105 females and 50 males whose age ranged between 15 and 73 years old (M = 31.16, SD = 14.66). Furthermore, 51.61% were catholic, 3.8 Christians and 32.25% preferred not to specify a religion. The 94.8% of the participants experienced the September 19th of 2017 earthquake in Mexico City. All participation was voluntary, and no economic remuneration was provided.

Procedure

There were three phases to this study. The first one relates to invitations for participation to possible candidates. Invitations were personal and comprehensive debrief was provided to each participant and verbal consent was required. A second phase required participants to fill a personal information questionnaire (gender, religion, etc.). In addition, participants had to get familiar with the study by taking a practice session. The third phase required through all the study by reading one by one each of the 32 randomly presents scenarios and evaluating their own self-efficacy to cope seismic events in each of them.

RESULTS

An ANOVA was carried over participants´ raw data by considering a mixed design of 2 (Gender: Female vs Male) x 2 (Place: Floor 10 vs floor1) x 2 (Seismic magnitude: medium vs high) x 2 (Seismic type: Oscillatory vs. trepidatory) x 2 (Safety indications: Present vs. absent) x 2 (Human reactions: Calms vs. emotionally disturbed). The significance criterium for analysis was set up to $p < .001$.

Analysis results showed no main effect on gender regarding the Index of Perceived Self-efficacy to cope with Earthquakes (IPSE) where woman scores ($M = 5.807$, $SD = 1.965$) were similar to male scores ($M = 6.236$, $SD = 2.36$), $F(1, 153)= 1{,}410$, $p= 0.236$, partial $\eta^2= 0.009$. A first glance on results showed that most relevant factors were the seismic magnitude [$F(1, 153)= 51.743$, $p=.001$, partial $\eta^2= 0.252$], followed by the human reactions factor [$F(1, 153)= 42.278$, $p=.001$, partial $\eta^2= .216$], and place where people stands during an earthquake [$F(1, 153)= 37.220$, $p=.001$, partial $\eta^2= .009$]. No significative interactions among study factors were found. In addition to this first analysis a Cluster analysis was carried on to look for if participants could be grouped by different response patterns.

Cluster analysis

Four groups of pattern response could be identified through the study sample (η^2=.828). The first group consisted of 56 people (36%) that consisted of the highest IPSE scores (Range: 6.8-10, $M = 8.167$ $SD = .913$). The second group included 43 people (28%) represented by moderate IPSE scores (Range: 3.7-6.8, $M = 5.213$ $SD = .852$). Then a third group was created by 31 participants (20%) whose IAPT was also represented by moderate IPSE scores (Range: 4.187 - 6.687, $M = 5.556$ $SD = .751$). In contrast to the second group, study factors had no effect on the third group judgments. The last group concentrated 25 participants (16%) whose IPSE scores were the lowest (Range: .25 - 3.937 $M= 2.710$ $SD = .987$).

ANOVA for each cluster

An ANOVA was applied over each cluster data by considering a 2 (Place: Floor 10 vs. floor1) x 2 (Seismic magnitude: medium vs high) x 2 (Seismic type: Oscillatory vs. trepidatory) x 2 (Safety indications: Present vs. absent) x 2 (Human reactions: Calms vs. emotionally disturbed). The significance criterion for analysis was set up to $p \leq .001$.

As can be noticed from Table 1 the most relevant factor for three out of the four groups was the seismic magnitude factor. Situational factors like the place/location of experiencing the earthquake and the safety instructions were considered as the second most relevant for cluster 2 and 4. The human reactions factor was considered as the less relevant for cluster 1, 2 and 4 but it was valuated in a different way through groups. The type of seismic factor has no relevance for all of the four groups.

Table 1. ANOVA Results for Each Cluster.

<< Cluster 1 >>

<<High self-efficacy independent of circumstances >>

Source	***df***	***MS***	***df***	***MS***	**F**	***p***	η^2
Place (P)	1	36.002	55	5.644	6.378	ns	.10
Seism (S)	1	5.805	55	1.097	5.288	ns	.08
Magnitud (M)	1	74.752	55	4.664	16.024	.001	.22
Safety Instructions (SI)	1	15.749	55	5.292	2.976	ns	.05
Human Reactions (HR)	1	33.770	55	2.459	13.728	.001	.19
P *S	1	1.750	55	1.071	1.633	ns	.02
P *M	1	3.223	55	1.178	2.734	ns	.04
P * SI	1	0.645	55	1.712	0.376	ns	.00
P * HR	1	8.0357	55	2.255	3.563	ns	.06
S*M	1	4.723	55	1.742	2.710	ns	.04
S* SI	1	0.270	55	0.8091	0.333	ns	.00
S* HR	1	1.285	55	1.541	0.834	ns	.01
M* SI	1	4.520	55	2.698	1.675	ns	.02
M* HR	1	6.035	55	1.507	4.004	ns	.06
SI * HR	1	0.645	55	0.668	0.964	ns	.01

<< Cluster 2 >>

<<Moderate self-efficacy dependent of circumstances>>

Place (P)	1	718.049	42	9.925	72.340	.001	.63
Seism (S)	1	0.235	42	4.168	0.056	ns	.00
Magnitud (M)	1	1515.360	42	16.210	93.482	.001	.68
Safety Instructions (SI)	1	397.965	42	7.204	55.236	.001	.56
Human Reactions (HR)	1	1498.616	42	23.915	62.663	.001	.59
P*S	1	2.119	42	4.337	0.488	ns	.01
P*M	1	11.906	42	4.084	2.915	ns	.06
P*SI	1	.011	42	2.429	0.004	ns	.00
P*HR	1	.104	42	3.522	0.029	ns	.00
S*M	1	.941	42	4.324	0.217	ns	.00
S*SI	1	14.244	42	3.742	3.805	ns	.08
S*HR	1	5.127	42	2.376	2.157	ns	.04
M*SI	1	5.886	42	3.908	1.505	ns	.03
M*HR	1	6.979	42	4.757	1.466	ns	.03
SI*HR	1	9.444	42	6.279	1.504	ns	.03

<< Cluster 4 >>

<< Low self-efficacy independent of circumstances >>

Place (P)	1	375.100	154	9.094	41.245	.001	.21
Seism (S)	1	3.407	154	2.200	1.548	ns	.00
Magnitud (M)	1	842.325	154	14.702	57.291	.001	.27
Safety Instructions (SI)	1	262.016	154	6.305	41.550	.001	.21
Human Reactions (HR)	1	714.097	154	14.306	49.912	.001	.24
P*S	1	1.561	154	2.286	0,682	ns	.00
P*M	1	3.000	154	2.663	1.126	ns	.00
P* SI	1	5.033	154	2.318	2.170	ns	.01
P*HR	1	1.164	154	2.740	0.425	ns	.00
S*M	1	10.480	154	2.406	4.354	ns	.02
S*SI	1	3.512	154	2.066	1.699	ns	.01
S*HR	1	0.039	154	2.090	0.018	ns	.00
M*SI	1	4.781	154	3.141	1.522	ns	.00
M*HR	1	4.180	154	2.880	1.451	ns	.00
SI *HR	1	8.064	154	2.928	2.753	ns	.01

In addition, no significant interactions are obtained among cluster 1, 2, and 4 (see Table 1 and Figure 2).

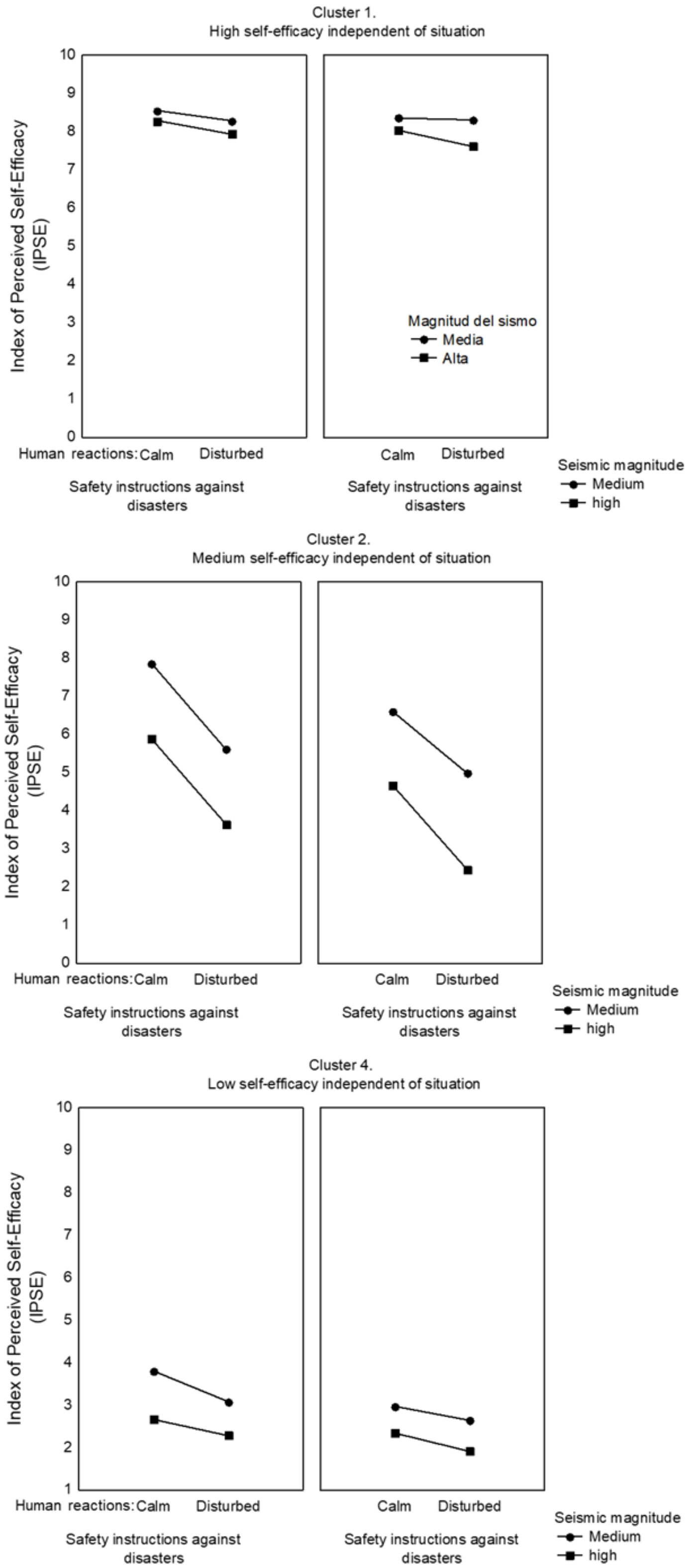

Figure 2. Interaction graphs for the three most relevant factors in cluster 1 (top panel) cluster 2 (middle panel) and cluster 4 (bottom panel).

DISCUSSION

This study aimed to explore systematic cognitive judgment underlying Mexican citizens regarding their self-efficacy to cope with earthquake disasters. Study results suggest that there are at least four different response patterns to judgment formation (see Table1) but only three out of these patterns are typified by the use of a summative cognitive rule to integrate information from disaster scenarios (Figure 1). Differences among these last three groups are no related to systematicity but the way they valuate factor information. For instance, participants in the high self-efficacy group (cluster 1) reported that seismic magnitude and human reactions to seismic events are central factors of information to elaborate their self-efficacy judgments. It is interesting to notice that this group did not put so much interest on the place they were located nor the safety instructions since these are factors to successfully deal with disaster.

To this respect Santos-Reyes et al. [41] reported that some participants in their study sample typified by low preparation to cope with problems ins a disaster situation do not seem to follow civil safety instructions. It is possible that our current results relate to this report. However, there is no way to know if self-efficacy by itself is responsible for selection and valuation of information sources or factor valuation and selection moderate self-efficacy. Thus, it might be the case that participants in cluster 1 discarded safety instructions since they assume they already know this knowledge which in turn makes them believe they are more capable. On the other hand, could be the case they simple do not care for these instructions since they do not consider this knowledge for survival. Since participants already experienced earthquakes we are inclined to believe they already had some information. Academic sources have reported that this experience factor affects proactive behavior to cope with seismic activity [43, 39, 48]. Furthermore, it can be hypothesized that familiarity with safety instructions contributes to higher self-efficacy perception due to an increased sense of security and control knowing what to do in dangerous situations.

The group with moderate self-efficacy (cluster 2) considered the seismic magnitude, the physical context (location during a seismic event) and human context (human reactions and civil protection), relevant to their judgment formation. That is their judgment is highly context dependent. For instance, it can be observed from figure 2 that perceived self-efficacy to cope with seismic activity in cluster 2 dramatically falls whenever people strongly reacts to disaster. This suggest that participants in cluster 2 is very sensitive to human factors which opens the opportunity for stress management training for this population.

Results from cluster 3 suggest moderate self-efficacy but in contrast to other clusters participants inside this cluster did not report systematic thinking to deal with seismic activity. This kind of cognitive behavior is compatible with a study carried on by Santos-Reyes et al. [41] reporting that not knowing or ignoring implications of seismic activity leads to a false sensation of control even if people had previous experiences. This false perception might relate to believing there is no need for a systematic approach to cope with disaster.

The fourth group is represented by participants having in mind they have low self-efficacy levels to deal with seismic hazards. Their factor selection was similar to those participants from cluster 2 but valuation weighting was different between both groups. Here, the most relevant factor was the seismic magnitude followed by others reaction to seismic activity and place of experiencing the earthquake. It is interesting that in this low self-efficacy group human reactions and safety instructions acquired so much relevance. This might be related to the possibility that under extreme circumstances it is highly necessary to look for external information, that is, external locus of control. This might constitute a preferred survival strategy. Further research is needed to explore this possibility.

CONCLUSIONS

Academic contributions can be derived from this study. First, from a theoretical perspective a new line of empirical contribution opens to enable theoretical development regarding human behavior coping with natural hazards. Take for instance that cognitive specification of judgment in this paper suggest that most study participants used a systematic approach to deal with seismic disaster typified by a cognitive rule. Secondly, participants´ previous experience seems to be a relevant factor that needs to be explored in future research.

Methodologically speaking the current study described benefits of using the cognitive algebra paradigm for cognitive specification. For instance, the appointed summative rule in this study can be formally understood as:

$$\text{Self-Efficacy} = f({}_{WP}\text{Place} + {}_{WM}\text{Magnitude} + {}_{WT}\text{Type} + {}_{WI}\text{Indicators} + {}_{WR}\text{Reactions})$$

In this equation, the w_{source} express the weighting for each component. Notice that many different component blends are possible. This allows researchers to cognitive parameter estimation and enables future formal comparison through different populations to determine self-efficacy coping styles. Moreover, in this way the cognitive algebra paradigm can be used as a tool to diagnose the effect of survival training to cope with earthquakes.

APPENDIX 1

You find yourself in the 7th floor of a ten-floor building. Suddenly, you feel the occurrence of a seismic event causing the building to balance from one side to another. The earthquake has a magnitude of between 5 and 5.5 (Richter scale). The earthquake can be felt by everyone in the floor and heavy furniture changes its location. The movement caused light damage to the building´s structure. However, no exit signals can be devised, neither reunion point signals are indicated nor indications of what to do in case of seismic vents. All people surrounding you are running and screaming and crying. They seemed very disoriented they do not know what to do.

How capable would you feel to cope with this situation?
Nothing 0—0—0—0—0—0—0—0—0—0—0 very capable

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