Public Intention to Prepare for Earthquakes: Psychometric Properties of Persian Version

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Abstract

Background: People are still not prepared for earthquakes in vulnerable areas although preparedness considered an effective way of reducing the disastrous consequences. A proper tool was needed to assess the predicting factors of mitigation behaviors in a large vulnerable community who speak Persian. This study aimed to introduce the valid and reliable Persian version of public intention to prepare against earthquakes.

Methods: Translation, validation and reliability checking articulated according to the standard methodology for Forward-Backward translation and psychometric evaluation. Totally, 369 Tehran households were selected through stratified random sampling from Oct 2016 to Jun 2017. Exploratory Factor Analysis used to check the construct validity of all scales.

Results: Face, content and construct validity of all scales confirmed (S-CVR: .65) and (S-CVI/Universal: .98). The finalized Persian version (69 items in 8 scales) showed good reliability over time in test-retest (ICC: .92) and high internal consistency both in the pilot (α: .94) and main studies (α: .94). No significant floor and ceiling effects were found in any of scales.

Conclusion: Persian version of Earthquake Public Intention to Prepare is applicable as a valid and reliable instrument for research regarding disaster preparedness in Persian speaking communities.

Keywords: Earthquake; Intention to prepare; Translation; Psychometric properties

Introduction

Earthquake is one of the most destructive unpredictable natural hazards with a long history in major parts of Middle East (1-3). Since 1990, natural disasters in Iran, predominantly earthquakes and floods (4, 5) have left significant cas-

ualties and huge economic losses (4). In different earthquake scenarios with medium severity in Tehran, moderate but considerable damage to urban structures, injuries, fatalities (6, 7) and excessive economic losses have been estimated (8).

Destructive consequences mostly depend on the proximity of urban areas to seismic epicenters, the preparedness parameters that close inhabitants heeded (9) and the harmful human interferences (i.e. Contravening construction standards, civil manipulations, etc.) rather than the earthquake magnitude itself (10, 11).

Preparedness contributes in minimizing quake-related deleterious consequences and preventing losses (12, 13); however, the actual beliefs people hold towards seismic risk vary from denial to acceptance. Even amongst those who accept, the nature and level of mitigation/preparedness are different (13). Although the serious earthquake threatens public health and more likely surprise people when they are unable to respond effectively (14), preparation has not ever been a priority whether in the developed, developing or underdeveloped countries (14, 15). Several factors accounted for various preventive measures that people take. The prominent here are the individual attitude, cultural and socioeconomic issues (13).

Despite the efforts to public disaster education and a generally good level of risk perception among Tehran citizens (75%>Median score) (15), the majority are not prepared for the probable earthquake yet (10, 15-17). The governmental and local attempts to enhance earthquake preparation in general, were not capable of facilitating sufficient public preparedness (18). This highlights the need for a better understanding of the factors influencing on high- risk communities preparedness (10, 19). Obviously, accommodating sociocultural characteristics with local community capabilities and social networks is essential for measuring the vulnerable population preparedness (20-23). Accordingly, a Persian tool potentiated of assessing both the earthquake preparedness and the influencing factors was needed, whereas many residents in high-risk area of Middle East speak Persian.

The Earthquake Public Intention to Prepare (EPIP) has been developed in English with good predictive utility based on the socio-cognitive model (24). Translating the tool was more cost-effective and less time consuming than developing a new one. EPIP was preferred to the other available Persian tools (10, 15, 20, 25-27) as the latter was designed to look for specific objectives rather than using a holistic approach. The original instrument developed in another culture; so, psychometric properties should be evaluated to determine its applicability in the Persian speaking countries.

Methods

This is a methodological study to assess the cross-cultural equivalence of Earthquake Public Intention to Prepare (EPIP); it entailed the processes of translation, face, content and construct validation, cultural adaptation and the reliability assessment of the Persian version.

Instrument

The original EPIP developed in Australia (28-30), composed of 8 scales–Negative/Positive Outcome Expectancies, Community participation, Collective efficacy, Empowerment, Trust (Trust to Emergency authorities, General Trust) and Intention to Prepare - in 77 items with 5-Likert scoring in three domains (i.e. Individual, Environmental and Social) (31). The instrument derived from the socio-cognitive model of earthquake preparedness (24). It has been used in several studies reporting authentic validity and reliability (21, 28, 31-35). However, assessing the cross-cultural equivalence of the measures is essential to ensure its reliability and validity when applied in different contexts (36).

Translation

The international protocol (37) used for Forward-Backward Translation, cultural adaptation and psychometric evaluation of Persian version.

Two independent bilingual translators translated items to Persian. The research team plus three experts in English translation, Persian linguistics and social sciences rated the translation quality (i.e. clarity, severity and comparability of language) of all items in a visual scale (0-100). The sentences were retranslated if scored < 50 and

modified if scored for more. The reconciled version provided at the end of this stage (Forward translation). Two other translators returned the reconciled items to English blind to the original ones. A glossary provided to preserve the parallelism in specific definitions, expressions and interpretations. Two translations merged and modified to a unified form (Backward translation); then, evaluated for the conceptual assimilation and similarity of interpretations (38). The Forward-Backward process eligibility confirmed through quality check by experts (Table 1).

Table 1: The expert views about quality of translation in Forward-Backward phases

Quality of Translation Items	Clear	Plain	Using common words and expressions	Conceptual assimilation
Forward Translation	93 % clear +7% relatively clear	74% plain + 25% relatively plain+ 1% difficult	93% common +7% need to modify	-
Backward Translation	-	-	-	96% similar+ 4% need to modify

Psychometric evaluation

Validity refers to the ability to measure the attributes and characteristics of the target construct (39). The qualitative face validity of the instrument has been evaluated and modified based on the participants' conceptual understanding and interpretations. Overall, 18 experts in psychology, social sciences, epidemiology and disaster management rated all the items (response: 90% from 20 experts) as *essential* (=2), *useful but unessential* (=1) or *unessential* (=0). The minimum value of Item Content Validity Ratio (CVR) for 18 panelists is 0.49 (40). To quantify the inter-rater consensus, we used CVR and the mean score (=1.5) for each item that shows at least 75 percent of raters believe the item is essential.

Content Validity Index (CVI) calculated in two rounds for each item and the whole scale (S-CVI). Eleven different experts rated each item's relevancy to the main variable on a 4-point scale (1 =*not relevant*, 2 =*somewhat relevant*, 3 =*quite relevant*, 4 =*highly relevant*). We measured *modified Kappa* (K*) to eliminate the chance from inter-rater agreements *(formula 1)*. K* shows the inter-rater agreements about the item *relevancy* and excludes their agreement on *irrelevancy* (41). Item K* rated from *excellent:* ≥ .75; *Good:* .74 - .60 to *Fair:* .59 - .40 or less.

$$Formula\ 1:\ K^* = \frac{I\ CVI - P_c}{1 - P_c}$$

The internal consistency among the items evaluated by Cronbach's α coefficient for homogeneity estimation (42) both in pilot and main studies. In the pilot study 70 questionnaires were distributed (response rate =74%). Given that the tool was anonymous, we could only recognize 18 respondents from which 15 complete questionnaires returned after two weeks. The Reliability was evaluated through Intraclass Correlation Coefficient analysis. The confidence level ($P<0.05$) was considered in all statistical analysis.

Since data gathering performed at the presence of research assistants, non-responded items were not great (<10% in one scale and <5% in the others). We replaced missing data with the mode in categorical responses and with the mean average in the numeric values. No significant floor and ceiling effects were found adopting 15% threshold for the frequency of the highest and lowest scores (43) in any of scales. Exploratory Factor Analysis (EFA) method was used to determine the construct validity for each scale. We considered Eigenvalues (>1.00), factor loading (FL>.30) on the first unrotated factor with at least 3 items for supporting the construct validity (44). Varimax rotation was performed. Scree plots determined the number of factors in the scales.

Participants

The minimum sample size required for factor analysis is 300 (44). Tehran urban districts were classified to three levels of earthquake vulnerability (Low, Medium, High) (45) and four levels of urban development and social welfare (very low, low, medium and high) (46). Stratified random sampling method used to choose districts in each crossed level. The proportion of households in the chosen districts calculated (Table 2).

Table 2: The sampling area and population proportion in Tehran

Chosen districts in crossed levels	Urban development	Necessary proportion of district residents	Total filled questionnaires
Low vulnerability area	11	76	80
	20		
Medium Vulnerability area	1	158	160
	7		
	10		
	15		
High vulnerability area	2	126	129
	5		
	8		
Total		360	369

Eligible people for this study were at least 18 yr old, able to read, write and speak in Persian, had no visible physical / mental disabilities, lived in one of Tehran urban districts and verbally accepted the consent form of participation. Finally, 369 participants were included (Table 3).

Table 3: Participants' characteristics (Pilot: N=53; Study: N=369)

Variable		Statistics	
		Pilot	Study
Age (26-64) *pilot*, (20-71) *Study*	Mean (SD)	41.48(8.71)	34 (9.99)
Gender	Female, n (%)	33 (63.5)	137 (37.1)
	Male, n (%)	19 (36.5)	232 (62.9)
Income	Low, n (%)	30 (57.7)	178 (48.2)
	Medium, n (%)	10 (19.2)	176 (47.7)
	High, n (%)	12 (23.1)	15 (4.1)
Education	Under graduate, n (%)	16 (30.8)	266 (72.1)
	Post graduate, n (%)	26 (69.2)	103 (27.9)
Job	Long-term employed, n (%)	26 (51)	57 (15.45)
	Short-term employed, n (%)	20 (39.2)	117 (31.71)
	Self-employed, n (%)	-	139 (37.67)
	Unemployed, n (%)	5 (9.8)	42 (11.38)
	Retired/pensioner, n (%)	-	14 (3.79)
Ownership	House owner, n (%)	37 (71.2)	256 (69.4)
	Tenant, n (%)	15 (28.8)	114 (30.6)

Ethics approval

This paper is reporting a part of a study approved (IR.USWR.REC.1395.107) on 21 Sep 2016 by the

Ethics Committee in University of Social Welfare and Rehabilitation, Tehran, Iran. All the respondents in this research verbally accepted to participate with no obligations. Data gathered anonymously without any recognizable personal data. The participants were free to leave whenever they wanted. Finally, all participants received an educational booklet provided by Iranian Red Crescent Organization regarding household earthquake preparedness.

Results

The instrument
EPIP composed of 8 different scales. Ten households confirmed the qualitative face validity of the instrument. Considering content validity ratio, 10 items evaluated as unessential (i.e.: mean <1.5, CVR<0.49) and two items added based on experts' opinion. In the first round of CVI calculation, 16 fair items counted. All the remained items scored as excellent by three other raters in the second round. The content validity confirmed by S-CVI = .98 (> .75 :S-CVI/UA). 10 items were unacceptable in both CVR and CVI analysis and eliminated. The internal consistency of inhibiting attitudes and collective efficacy scales were low but in acceptable range (>0.6), trust showed the highest (α=.95) and the total scale was (α=.94). The instrument showed appropriate time reliability in test-retest analysis (ICC= .92). All samplings were adequate for factor analysis as the results of Bartlet's test of sphericity and sampling adequacy evaluation by Kaiser-Meyer-Olkin (KMO >.60). Factors in each scale extracted using principle component methods of analysis (Table 4).

Table 4: Results of sampling adequacy test and internal consistency of all scales

Scales/subscales	Kaiser-Meyer-Olkin	Bartlett's Test of Sphericity		(Cronbach's α)
		Approx. x^2	df	
Inhibiting Attitudes	.62	213.82*	6	.62
Positive outcome expectancy	.76	384.47*	6	.76
Community participation	.79	481.24*	10	.79
Collective efficacy	.69	416.32*	15	.66
Empowerment	.89	2737.68*	55	.88
General Trust	.85	929.17*	10	.87
Trust to authorities of Emergencies	.96	4814.83*	105	.95
Trust (GT+TEA)	.95	5927.47*	190	.95
Intention to Prepare	.95	6655.15*	190	.73
Internal Consistency of total scale				.94

* x^2 was significant at *P* value <.001

The rotated matrixes showed more than one factor in Intention to prepare, Empowerment, Trust and collective efficacy scales (E. value>1.00). Trust combined from general trust (GT) and trust to emergency authorities (TEA). The TEA (Factor Loading: .54-.83) explained 46.43% of scale variances; but together with general trust (FL: .51-.86) could describe 65.6% of Trust variances. The first component (FL: .60-.87) in Empowerment scale referred to *the community functioning* that defined 42.23% of variances whereas with the other 4-item component suggesting *the individual perceptions* (FL: .60-.71) explained 66.64% of the Empowerment variances. The first 3-item component of collective efficacy (FL: .77-.84) referred to *community behavior efficacy* and the second (FL: .67-.83) described *community principles*. They could explain 61.4% of the scale variances.

The 11- item component (FL: .60-.84) of Intention to prepare represented "*intention to cooperative preparedness behaviors*" and the 9-item component (FL: .66-.81) referred to "*intentions for the personal preparedness*". Together, they could explain 58.65% of scale variances.

Changes applied

Experts decided to eliminate 10 items: collective efficacy 4, 5, 6 & 8, TEA 12, Negative outcome expectancy 2 & 3, Empowerment 7, Intention to prepare 18 & 19. Two sentences "*Earthquakes are the fate dominated by God and no one can change it*" and "*Earthquakes are the divine punishment for human sinful behaviors*" developed in accordance to literature, expert opinions and cultural adaptation. The results of EFA confirmed this change. The final 69-item questionnaire provides some demographic information like previous experience, household size and composition, length of residence, living near parents/friends, too.

Discussion

Main Findings

In this study, EPIP was translated to facilitate its application. Several measures evaluated the psychometric properties. Data completeness was good; Response distribution analysis showed no significant floor or ceiling effects in any of the scales. EPIP scores tapped a wide range of effects. The internal consistency of the translated scale was adequate for research (42). Test-retest reliability checked and confirmed. Some alterations were recommended. 10 items eliminated and 2 items added to represent the fatalistic beliefs consistent with previous studies (15, 16, 33 47). These items with negative outcome expectancy formed a new construct "*Inhibiting Attitudes*" due to their underpinning meaning confirmed by the designer. This was appropriate as the original construct derives from proximal interpretation of events and not to culturally implicit beliefs. Hence, the changes were appropriate from the perspective of developing a valid instrument to inform theorizing and assessing the

preparedness in Iranian population. The data authenticated the reliability and validity of the Persian EPIP in measuring factors that influence the public intention to prepare against earthquakes. We could not conduct criterion validity since no similar Persian tool was found.

The Persian EPIP could provide detailed information for recognizing more individual and social aspects of public intention to prepare and their relations in novel ways. This increases the utility confidence that supports conducting functional interventions based on the data that it can provide. This work informs the development of a process to provide a cost-effective foundation for earthquake preparedness in a country that highly faces this hazard (e.g., it provides a framework for community development and identifies where developmental resources should be targeted).

Strength and Limitations

The existing Persian tools have typically been self-developed for specific objectives and populations which mostly didn't report the required psychometric evaluations. Therefore, they are appropriate for the specific research goal/s established by the researcher. This precludes their generalizability and limits the opportunities for theory development, testing and developing national preparedness programs and such. The work cited here facilitates achieving these latter goals.

The necessity of a valid instrument like EPIP was inevitable. During the past decade, governmental and local attempts to enhance public preparation against earthquake were not successful enough. People still were not prepared for suddenly-occurring and potentially catastrophic earthquake (and other) hazards (10, 15, 16, 26). One reason has been the lack of a dedicated preparedness measurement tool, capable of providing the quality of data required to render the evidence for policymaking and to guide the formal preparedness strategies. The use of ad hoc measures in the past may have resulted in some missing information regarding the factors influencing on preparedness. Prior problems may thus be due to the insufficiency of existing instruments in social as-

pects. By using a rigorous approach to the development of a valid questionnaire, this research can provide an applicable measure to inform future preparedness strategy development and practice. EPIP has been used in different studies for vulnerable nations to disasters especially earthquake (21, 28,29, 31, 33, 34). During the past decade, a holistic paradigm applied in designing the dimensions of making decision about a public behavior to prevent a serious risk, tend to develop this instrument. Meanwhile, the rich theoretical basis in considering socio-cognitive determinants of preparedness makes it a comprehensive and unrivaled questionnaire in this field. This confirms our choice in translating EPIP as an applicable tool for Persian speaking countries; besides, the present version privileged by the outstanding psychometric measurements.

We had some problems regarding time because filling each questionnaire took 15-20 minutes. Research assistants were trained to have an open conversation to take the participants verbal consents, demographic information, and then ask them to fill the forms in one session. Data gathering implemented during winter when inappropriate climate was a serious problem that extended the phase much longer than it was planned.

As if we added two items to assess fatalistic attitudes, it was not possible to evaluate this cultural fact as a construct in the present study due to the EFA results. Researchers in future try to explore and develop the inhibiting attitudes concept based on cultural concerns so that all of its aspects will hopefully be determined.

Conclusion

Psychometric evaluation of the translated instrument confirms its content coverage and item property due to the consensus of experts. Therefore, Persian EPIP described as a valid instrument and capable of providing comprehensive assessment of intention for preparedness against earthquake and the influencing factors in Persian speaking populations.

Ethical considerations

Ethical issues (plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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Conflict of interest

None declared.

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