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Perceived seismic risk and occupant preparedness as a component of a seismic vulnerability assessment methodology

Riesgo sísmico percibido y preparación de los ocupantes como componente de una metodología para la evaluación de la vulnerabilidad sísmica

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ABSTRACT

Seismic vulnerability assessment usually focuses on the physical features of buildings, yet the vulnerability of a household also depends on what its occupants perceive, know and do. This study described the initial behaviour of a perceived seismic risk and preparedness scale, with ten items and two dimensions, as an input for the occupant component of the seismic vulnerability assessment methodology of project FZ-HAB-0031 on the Factoriza UAS platform. With a cross-sectional design, 8 cases out of a target of 100 were analysed while data collection remained open. Descriptive statistics, Cronbach's alpha and inter-item correlations were estimated. Internal consistency was very low for Perceived seismic risk of the dwelling (α = .203) and low for Earthquake preparedness (α = .464). In the first dimension, affective components and judgements about the dwelling did not vary together; in the second, knowing what to do, a family meeting point and an emergency kit formed a coherent core, and having a meeting point was associated with recognising furniture that could fall (r = -.745 with the recoded item). Occupants reported knowing how to act during an earthquake, whereas a meeting point and an emergency kit scored below the scale midpoint. The technical component of the methodology is not part of the analysed package. The findings guide the revision of the instrument and its link with the technical assessment of buildings.

Keywords: seismic vulnerability; risk perception; earthquake preparedness; internal consistency

RESUMEN

La evaluación de la vulnerabilidad sísmica suele centrarse en las características físicas de las edificaciones, pero la vulnerabilidad de un hogar depende también de lo que sus ocupantes perciben, saben y hacen. Este estudio describió el comportamiento inicial de una escala de riesgo sísmico percibido y preparación, de diez reactivos y dos dimensiones, como insumo para el componente de ocupantes de la metodología de evaluación de la vulnerabilidad sísmica del proyecto FZ-HAB-0031 de Factoriza UAS. Con diseño transversal, se analizaron 8 casos de una meta de 100, con el levantamiento abierto. Se estimaron descriptivos, alfa de Cronbach y correlaciones entre reactivos. La consistencia interna fue muy baja en Riesgo sísmico percibido en la vivienda (α = .203) y baja en Preparación ante sismos (α = .464). En la primera dimensión, los componentes afectivos y los juicios sobre la vivienda no variaron juntos; en la segunda, el conocimiento de qué hacer, el punto de reunión y la mochila de emergencia formaron un núcleo coherente, y el punto de reunión se asoció con el reconocimiento de muebles que podrían caer (r = -.745 con el reactivo recodificado). Los ocupantes declararon saber cómo actuar durante un sismo, pero el punto de reunión y la mochila de emergencia obtuvieron medias por debajo del punto medio de la escala. El componente técnico de la metodología no forma parte del paquete analizado. Los resultados orientan la revisión del instrumento y su vinculación con la evaluación técnica de las edificaciones.

Palabras clave: vulnerabilidad sísmica; percepción del riesgo; preparación ante sismos; consistencia interna

INTRODUCTION

Earthquakes are among the natural hazards with the greatest capacity to damage the building stock, and Mexico has a long history of losses associated with them. The magnitude 7.1 earthquake of 19 September 2017 damaged more than 12,000 structures of all occupancy types in Mexico City, according to the authorities cited by Tena-Colunga et al. (2021), who also documented a reconstruction process that was still ongoing years later.

The same event showed that the population's reactions during the shaking and in the hours that followed, dominated by fear and surprise, are part of the response to the disaster: in a survey of 2,400 city residents, Santos-Reyes and Gouzeva (2020) recommended training the public in what to do during and after earthquakes.

Seismic vulnerability assessment of buildings is the basis for risk reduction strategies. For large building stocks, rapid visual screening methods are used. These methods classify the vulnerability of each building based on local seismicity, soil type, construction system and structural features, and they differ in application time and in whether they are oriented toward pre- or post-earthquake assessment (Bektaş and Kegyes-Brassai, 2022).

These methods have shown limitations in accuracy, and recent research is exploring ways to improve them using machine learning trained on post-earthquake inspection data (Bektaş and Kegyes-Brassai, 2025). In self-built housing, checklist-based field assessment is combined with structural modeling and retrofitting proposals (Medrano-Sánchez and Fabian, 2025).

However, the vulnerability of a dwelling does not depend solely on its physical characteristics. It also depends on what its occupants know and do: on whether they recognize the signs of fragility in their home, whether they know how to act during an earthquake, and whether they have taken household preparedness measures.

The literature on risk perception and earthquake preparedness shows that these dimensions do not always align: as Cisternas et al. (2024) note, people with prior experience and high risk perception are not necessarily better prepared. Similarly, among households in high-hazard areas, the vast majority perceive the local risk, whereas only a minority consider themselves sufficiently prepared (Şahin et al., 2026). A methodology for assessing seismic vulnerability that aims to guide household risk reduction therefore needs to incorporate the occupants' perspective alongside the technical assessment of buildings.

Project FZ-HAB-0031 of the Factoriza UAS platform set out to develop a methodology for assessing seismic vulnerability. The project's results package contains the occupant-oriented component: a perceived seismic risk and preparedness scale comprising ten items organized into two dimensions, Perceived Seismic Risk in the Home and Earthquake Preparedness, administered to the occupants of the buildings assessed by the project.

Consequently, this article is limited to the occupant component on perception and preparedness and does not present results on the structural vulnerability of the buildings.

The overall objective was to describe the initial performance of the perceived seismic risk and preparedness scale in the preliminary data cut from its pilot survey, as an input to the occupant component of the seismic vulnerability assessment methodology.

The specific objectives were, first, to describe occupants' perception of the seismic risk of their dwelling and their self-reported level of preparedness; second, to estimate the internal consistency of each dimension and identify items with discrepant behavior; and third, to examine the correlations among the items within each dimension. The project package records no hypotheses, so the study is descriptive and exploratory in scope.

DEVELOPMENT

SEISMIC VULNERABILITY AND ASSESSMENT METHODS FOR BUILDINGS

The seismic vulnerability of a building expresses its susceptibility to damage from ground motion of a given intensity. It can be assessed at different levels of detail, ranging from the structural analysis of a single building to the screening of thousands of buildings.

The review by Bektaş and Kegyes-Brassai (2022) compared conventional rapid visual screening methods, seismic risk indices and vulnerability assessments. It noted that some methods require between fifteen and thirty minutes per building, whereas others take around one hour, and that some are intended for pre-earthquake screening and others for post-earthquake assessment.

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The authors proposed machine learning and fuzzy logic as avenues for improvement; in a subsequent study using inspection data from the 2015 Gorkha earthquake in Nepal, a machine-learning-based screening method achieved 73% accuracy in classifying damage states, far higher than that of conventional methods (Bektaş and Kegyes-Brassai, 2025).

Self-built housing poses particular challenges because its construction process often lacks professional supervision and its characteristics are not always visible from the outside.

In a settlement in Lima, Medrano-Sánchez and Fabian (2025) combined field diagnosis using the INDECI checklist to classify seismic vulnerability, structural modeling in accordance with the Peruvian standard E.030, and the design and testing of a steel-section retrofit. Because of the small number of models and specimens, they presented their results descriptively. These studies show that an assessment methodology must be tailored to the building type, the available information, and the purpose of the assessment.

The Mexican experience illustrates the importance of assessing vulnerability before an earthquake occurs. Following the 2017 earthquake, Tena-Colunga et al. (2021) quantified the resilience of Mexico City's built environment on the basis of damage statistics and reconstruction progress; they recommended structural health monitoring programs for representative buildings to detect and correct deficiencies before the next strong earthquake.

Technical assessment, however, informs us about the building but not about how its occupants perceive risk or about their capacity to act.

SEISMIC RISK PERCEPTION

Risk perception is a multidimensional construct. In the area affected by the Wenchuan earthquake, Huang et al. (2022) constructed a risk perception index for secondary hazards from four indicators (possibility, awareness, apprehension and impact). Using 957 valid responses, they found that perception varied with age, educational attainment, marital status and previous disaster experience.

In Concepción, Chile, using a representative sample of 585 people, Cisternas et al. (2024) found that risk perception was directly and positively associated with the intention to prepare for earthquakes and tsunamis, and that risk awareness and risk perception should be treated as distinct concepts.

These distinctions are relevant to the Perceived Seismic Risk of the Dwelling dimension, which brings together aspects of different kinds: concern about damage to the dwelling in an earthquake (R1), the interpretation of cracks as a sign of fragility (R2), confidence that the dwelling would withstand a strong earthquake (R3, reverse-scored), fear of remaining indoors during an earthquake (R4), and doubt about whether a professional was involved in the construction (R5).

Concern and fear express affective components of perception, whereas R2, R3, and R5 refer to judgments about housing conditions. The assumption that all of them covary must be tested empirically.

HOUSEHOLD EARTHQUAKE PREPAREDNESS

Household earthquake preparedness encompasses knowledge, plans, and resources. In a study of 1,193 households in high-hazard districts of Türkiye, Şahin et al. (2026) found that 93.1 % perceived the local seismic risk, but only 19.3 % considered themselves sufficiently prepared, and that financial and time constraints were common barriers; training was associated with greater perceived preparedness, and home ownership with greater knowledge of the dwelling's seismic resistance.

Among university students in the same country, greater earthquake awareness was associated with having an emergency backpack, securing belongings, and participating in training sessions and drills (Gürsoy et al., 2026); among geriatric patients in Istanbul, only 5.4% had received training and 32.1% knew where their emergency backpack was (Solakoglu et al., 2025).

Psychosocial factors also play a role. Among older adults in Japan, loneliness was directly and negatively associated with preparedness, although it slightly increased risk perception, which in turn was positively associated with preparedness (Fukurai and Grant Ludwig, 2025).

Among households in areas affected by the Wenchuan and Lushan earthquakes, trust in the government was associated with greater perceived efficacy of preparedness (Zhang et al., 2022). Recent instruments are available for measuring preparedness: Davarani et al. (2026) developed a

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household earthquake preparedness questionnaire in Iran through a sequential mixed-methods design that progressed from interviews and a systematic review to exploratory and confirmatory factor analysis; the resulting version comprised 36 items in seven factors, including knowledge, self-efficacy and behavioral intention.

The Earthquake Preparedness dimension of the scale used in this study captures knowing what to do inside the home during an earthquake (R6), the existence of a family meeting point (R7), the presence of furniture that could fall (R8, reverse-scored), knowing how to shut off the gas supply (R9), and the availability of an emergency backpack (R10). It therefore combines knowledge, plans, and resources with an item that refers to a hazardous condition within the home rather than to a preparedness behavior.

MEASUREMENT CONSIDERATIONS AT THE INITIAL STAGE

The internal consistency of a dimension is usually estimated with Cronbach's alpha (Cronbach, 1951), which assumes equivalent loadings across items; McDonald's omega (McDonald, 1999/2013) does not make this assumption, and simulation studies have compared the performance of both coefficients under different data conditions (Malkewitz et al., 2023).

Internal structure is examined through exploratory factor analysis, which first requires verifying that the data are adequate and that the sample size is sufficient (Ferrando et al., 2022; Goretzko et al., 2021).

Scales with items worded in both directions may show wording effects, because some respondents respond inconsistently to the positively and negatively worded items of the same dimension (Steinmann et al., 2022); identifying these responses may reduce such effects (García-Batista et al., 2021).

Moreover, in small samples, a few careless response patterns can distort correlations (Ward and Meade, 2023). Given the cross-sectional design, the relationships between items should be understood as associations.

METHODOLOGY

DESIGN

A quantitative, non-experimental, cross-sectional study with a descriptive and exploratory scope was conducted as part of the occupant component of the project methodology. The data come from survey LEV-0036, «Piloto · Riesgo sísmicopercibido» (Pilot · Perceived Seismic Risk), of project FZ-HAB-0031 on the Factoriza UAS platform, and from the frozen dataset DST-0034, with a cut-off date of 9 October 2026. The survey is an independent sample and the only survey in the project.

POPULATION, SAMPLE, AND DATA CUTOFF

The population was defined as individuals aged 18 years or older who occupy the buildings assessed by the project, in the area where those buildings are located. According to the Factoriza log, 17 individuals opened the questionnaire and 8 completed it; no cases were excluded on quality-control grounds, so 8 cases were analyzed (Table 2).

The data cut analyzed here is preliminary: it comprises 8 cases out of a target of 100, and data collection was still open, in the fieldwork phase, as of the cut-off date. With 8 cases for 10 items, the inter-item correlation matrix is not invertible, so it is not possible to conduct an exploratory factor analysis, which also requires a much larger sample (Ferrando et al., 2022; Goretzko et al., 2021).

INSTRUMENT

The Perceived Seismic Risk and Preparedness Scale was administered; it comprises ten items with a five-point response format, ranging from Strongly disagree (1) to Strongly agree (5). The items are organized into two dimensions of five items each: Perceived Seismic Risk in the Home (R1 to R5) and Earthquake Preparedness (R6 to R10).

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Two items, R3 and R8, are reverse-worded and have already been recoded in the data matrix. After recoding, a higher score indicates greater perceived risk in the first dimension and greater preparedness in the second. Table 1 presents the code, dimension, wording and direction of each item.

Table 1. Instrumentstructure.

Code	Dimension	Item	Reverse
R1	Perceived seismic risk to the home	I am worried that my home will be damaged in an earthquake	No
R2	Perceived seismic risk to the dwelling	The cracks in my home make me think that it is fragile	No
R3	Perceived seismic risk to the dwelling	I believe my home would withstand a strong earthquake	Yes
R4	Perceived seismic risk in the home	In a strong earthquake, I would be afraid to stay inside my home	No
R5	Perceived seismic risk of the dwelling	I doubt that my home was built with the advice of a professional	No
R6	Earthquake preparedness	I know what to do inside my home during an earthquake	No
R7	Earthquake preparedness	My family has a meeting point in case of an earthquake	No
R8	Earthquake preparedness	In my home, there is furniture that could fall during an earthquake	Yes
R9	Earthquake preparedness	I know how to shut off the gas supply to my home in an emergency	No
R10	Earthquake preparedness	I have an emergency backpack on hand	No

Note. Perceived Seismic Risk and Preparedness Scale. 5-point response scale (Strongly disagree, Disagree, Neither agree nor disagree, Agree, Strongly agree). Reverse-scored items have already been recoded in the delivered data matrix. Source: Factoriza UAS, project FZ-HAB-0031, survey LEV-0036, dataset DST-0034.

PROCEDURE

Responses were collected through the survey questionnaire administered in Factoriza UAS, which records explicit online informed consent before the first item and does not collect identifying data. Factoriza froze dataset DST-0034 with a cryptographic hash, generated the data matrix with reverse-scored items recoded, and produced the descriptive, internal-consistency, and within-dimension correlation analyses (runs RUN-00196 to RUN-00200).

DATA ANALYSIS

Factoriza UAS calculated the mean, standard deviation, skewness, kurtosis and percentages of responses at the extreme values for each item; the internal consistency of each dimension using Cronbach's alpha (Cronbach, 1951), with the corrected item-total correlation and alpha if item deleted; and the Pearson correlations between the items of each dimension, with 95% confidence intervals obtained through Fisher's z transformation.

The project belongs to the technical track of the article-writing workshop, whose data collections are not routed through the complementary psychometric analysis program; for this reason, and because these statistics cannot be estimated with 8 cases for 10 items, neither McDonald's omega nor exploratory factor analysis was computed. The reference values for the psychometric indices are treated as guidelines rather than as decision rules (Ferrando et al., 2022). No item was removed.

ETHICAL CONSIDERATIONS

Participation was voluntary and anonymous. Factoriza UAS records explicit informed consent online and does not collect names, email addresses or any other identifying data.

STATEMENT ON THE USE OF ARTIFICIAL INTELLIGENCE

During the preparation of this manuscript, the Factoriza UAS platform was used for data management and for descriptive, internal consistency and inter-item correlation analyses. The Claude Opus language model (Anthropic) was used for assisted literature searching, writing a draft and assembling the document from the results. The authors reviewed, edited and approved

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the entire text, verified every reference and take full responsibility for the content of the article.

RESULTS

SAMPLE COMPOSITION

Table 2 summarizes the case flow. Of the 17 individuals who opened the questionnaire, 8 completed it and were analyzed, with no exclusions for quality control. All 8 analyzed cases answered the ten items.

Table 2. Sample composition.

Indicator	Value
Individuals who opened the questionnaire	17
Completed questionnaires	8
Cases excluded by quality control	0
Cases analyzed	8
Items	10

Note. Survey "Pilot · Perceived Seismic Risk" (LEV-0036); population: persons aged 18 years or older who occupy the buildings assessed by the project; area: zone of the buildings assessed by the project. Dataset DST-0034, fingerprint cc66909686a891b3. Source: Factoriza UAS. Preliminary cut-off: n = 8 of a target of 100, with the survey still open.

PERCEIVED SEISMIC RISK AND SELF-REPORTED PREPAREDNESS

Table 3 and Figure 1 present the descriptive statistics. In the dimension Perceived seismic risk in the dwelling, concern that the dwelling would be damaged in an earthquake had the highest mean (R1: *M* = 3.25, *SD* = 1.91), with the greatest dispersion in the instrument and a kurtosis of -2.48, indicating responses concentrated at the extremes rather than around the mean. Fear of remaining inside the dwelling during a strong earthquake (R4: *M* = 3.13, *SD* = 1.46) and doubt about professional advice during construction (R5: *M* = 3.00, *SD* = 1.07) fell at the midpoint of the scale. Interpreting cracks as a sign of fragility had the lowest mean in the dimension (R2: *M* = 2.50, *SD* = 1.41).

Confidence that the dwelling would withstand a strong earthquake (recoded) barely varied among occupants (R3: *M* = 2.88, *SD* = 0.35), with a skewness of -2.83 and a kurtosis of 8.00.

In the Earthquake Preparedness dimension, knowing what to do inside the home during an earthquake had the highest mean (R6: *M* = 3.50, *SD* = 1.20), followed by knowing how to shut off the gas supply (R9: *M* = 3.38, *SD* = 1.51). The lowest means were for having a family meeting point (R7: *M* = 2.13, *SD* = 1.55) and the availability of an emergency backpack (R10: *M* = 2.25, *SD* = 1.04). The absence of furniture that could fall, once recoded, also scored below the midpoint (R8: *M* = 2.50, *SD* = 0.93).

Overall, the sample is characterized by occupants with an intermediate perception of risk that is polarized with respect to worry. These occupants report knowing how to act during an earthquake, but a family meeting point and an emergency backpack are infrequent measures among them, with means below the midpoint of the scale; they also tend to acknowledge the presence of furniture that could fall.

Table 3. Descriptive statistics of the items.

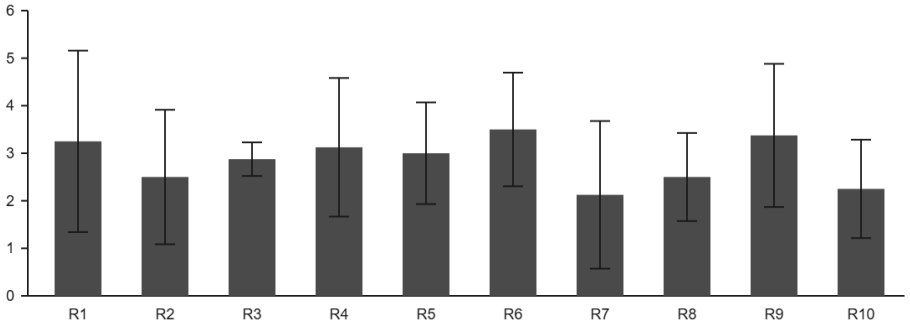
Item	M	SD	Skewness	Kurtosis	Floor	Ceiling
R1	3.25	1.91	-0.14	-2.48	25%	50%
R2	2.50	1.41	0.81	-0.23	25%	13%
R3	2.88	0.35	-2.83	8.00	13%	88%
R4	3.13	1.46	0.09	-1.19	13%	25%
R5	3.00	1.07	0.94	0.35	38%	13%
R6	3.50	1.20	0.00	-1.46	25%	25%
R7	2.13	1.55	1.25	0.24	50%	13%
R8	2.50	0.93	-0.00	0.00	13%	13%

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Item	M	SD	Skewness	Kurtosis	Floor	Ceiling
R9	3.38	1.51	-0.52	-1.34	13%	25%
R10	2.25	1.04	0.39	-0.45	25%	13%

Note.N = 8. Floor and ceiling indicate the percentage of responses at the minimum and maximum values. The item-total correlation column from the Factoriza descriptive table is omitted because its values do not match those in Table 4, as they are not calculated on the total of each dimension. Factoriza UAS run RUN-00196. Preliminary cut-off: n = 8 of a target of 100, with data collection still open.

Figure 1. Mean scores by item with one-standard-deviation error bars.



INTERNAL CONSISTENCY

Table 4 presents the item analysis by dimension. Perceived seismic risk in the home showed very low internal consistency (α = .203). Only the interpretation of cracks as a sign of fragility (R2: .787) and, to a lesser extent, fear of remaining indoors (R4: .239) were positively related to the rest of the dimension, whereas concern about damage (R1: -.104), recoded confidence in the structural resistance of the home (R3: -.256), and doubt about professional advice (R5: -.163) correlated negatively with it. Deleting R2 would produce a negative alpha (-.893), which indicates that the four remaining items covary, on average, in the opposite direction; in contrast, deleting R1 would raise alpha to .466.

Earthquake preparedness showed low internal consistency (α = .464). Having a family meeting point was the item most consistent with the dimension (R7: .810), followed by having an emergency backpack (R10: .575) and knowing what to do during an earthquake (R6: .562); knowing how to shut off the gas showed a weaker relationship (R9: .298). The recoded item on the absence of furniture that could fall correlated negatively with the dimension (R8: -.735); deleting this item would raise alpha to .791.

Table 4. Item analysis by dimension.

Dimension	Item	Corrected item-total r	α if item deleted
Perceived risk	R1	-.104	.466
Perceived risk	R2	.787	-.893
Perceived risk	R3	-.256	.279
Perceived risk	R4	.239	-.014
Perceived risk	R5	-.163	.358
Preparation	R6	.562	.181
Preparation	R7	.810	-.216
Preparation	R8	-.735	.791
Preparation	R9	.298	.370
Preparation	R10	.575	.213

Note.N = 8. Scale from 1 to 5; reverse-scored items R3 and R8 are shown recoded. Run RUN-00196 of Factoriza UAS. Preliminary data cut: n = 8 of a target of 100, with data collection still open.

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INTER-ITEM CORRELATIONS

Tables 5 and 6 present the correlations between the items within each dimension. In the Perceived seismic risk in the home dimension, no correlation had a confidence interval that excluded zero. The largest in absolute value was the negative correlation between concern about damage and doubt about professional advice (R1 and R5: r = -.630, 95% CI [-.924, .134], p = .094), followed by the negative correlation between recoded confidence in the strength of the home and fear of staying inside (R3 and R4: r = -.520, 95% CI [-.896, .292], p = .187) and the positive correlation between cracks and fear (R2 and R4: r = .450, 95% CI [-.372, .877], p = .263).

Table 5. Correlations between the items of Perceived Seismic Risk in the Home.

Variable pair	r	IC 95%	p
R1 and R2	.318	[-.499, .835]	.443
R1 and R3	-.370	[-.853, .452]	.366
R1 and R4	.039	[-.685, .724]	.928
R1 and R5	-.630	[-.924, .134]	.094
R2 and R3	.143	[-.625, .770]	.736
R2 and R4	.450	[-.372, .877]	.263
R2 and R5	.283	[-.526, .824]	.496
R3 and R4	-.520	[-.896, .292]	.187
R3 and R5	.378	[-.445, .855]	.356
R4 and R5	.092	[-.655, .748]	.829

Note.N = 8. Perceived risk = Perceived seismic risk in the home; Preparedness = Earthquake preparedness. The corrected item–total correlation excludes the item itself from the total of its dimension. A negative alpha when an item is deleted indicates that the remaining items covary, on average, in a negative direction. Cronbach's α for each full dimension (5 items each): Perceived risk = .203 (run RUN-00197); Preparedness = .464 (RUN-00199). Source: Factoriza UAS, Tables 4 and 6 of the package, combined without modifying values. Preliminary data cut: n = 8 out of a target of 100, with data collection ongoing.

In Earthquake Preparedness, two correlations had intervals that excluded zero. Knowing what to do during an earthquake was associated with having a family meeting point (R6 and R7: r = .731, 95% CI [.055, .948], p = .039). The meeting point, in turn, was negatively associated with the absence of furniture that could fall (R7 and R8: r = -.745, 95% CI [-.951, -.086], p = .034); that is, those who reported having a meeting point also tended to acknowledge the presence of furniture that could fall.

The relationships between knowing what to do and having an emergency backpack (R6 and R10: r = .693, 95% CI [-.023, .939], p = .057) and between having a meeting point and knowing how to shut off the gas (R7 and R9: r = .649, 95% CI [-.102, .929], p = .082) were positive and of similar magnitude, but their intervals included zero.

Table 6. Correlations Between Earthquake Preparedness Items.

Variable pair	r	IC 95%	p
R6 and R7	.731	[.055, .948]	.039
R6 and R8	-.516	[-.895, .296]	.190
R6 and R9	.119	[-.639, .760]	.779
R6 and R10	.693	[-.023, .939]	.057
R7 and R8	-.745	[-.951, -.086]	.034
R7 and R9	.649	[-.102, .929]	.082
R7 and R10	.600	[-.181, .917]	.116
R8 and R9	-.564	[-.908, .234]	.146
R8 and R10	-.447	[-.876, .376]	.267
R9 and R10	.206	[-.583, .795]	.624

Note.N = 8. Pearson correlation. Confidence intervals were obtained using Fisher's z transformation. Cross-sectional design: the reported relationships are associations, not causal relationships. Run RUN-00198 of Factoriza UAS. Preliminary cutoff: n = 8 out of a target of 100, with data collection still open.

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DISCUSSION OF RESULTS

The aim of this study was to describe the initial performance of the perceived seismic risk and preparedness scale as an input for the occupant component of a seismic vulnerability assessment methodology.

With only 8 cases, all results are provisional: the literature on internal consistency coefficients has been developed with much larger samples (Malkewitz et al., 2023), the confidence intervals of the correlations are very wide, and the internal structure could not be examined. Even so, this data cut provides useful information for revising the instrument.

The dimension Perceived seismic risk in the dwelling did not behave as a scale. The most plausible explanation lies in its content: the dimension mixes affective components, such as worry and fear, with judgments about the dwelling, such as the interpretation of cracks, confidence in its strength, and doubts about its construction.

The literature treats risk perception as a construct with several components, such as likelihood, awareness, apprehension and impact (Huang et al., 2022), and distinguishes risk awareness from risk perception (Cisternas et al., 2024). The negative correlation between concern about damage and doubt about professional advice, although inconclusive, illustrates that the two items do not measure the same thing. Furthermore, confidence in the structural resistance of the dwelling showed almost no variation among occupants, which limits any correlation involving it.

In Earthquake Preparedness, the coherent core consisted of knowledge of what to do, the meeting point, and the emergency kit, in line with the association among seismic awareness, the availability of an emergency kit, and participation in training observed in other settings (Gürsoy et al., 2026).

The behavior of R8 has a plausible content-based explanation. The item was reverse-scored on the assumption that the presence of furniture that could fall is the opposite of preparedness, but those who are better prepared may be precisely those who recognize this hazard in their home. The negative correlation between the meeting point and the absence of furniture that could fall is consistent with this interpretation.

If this is confirmed in the final data cut, R8 should be treated as an indicator of non-structural hazard recognition or reworded as a behavior, such as having anchored furniture to the wall.

The descriptive profile is consistent with a pattern documented in other countries: self-reported preparedness is concentrated in knowing what to do, whereas measures that require planning or resources, such as a meeting point or an emergency kit, are less common.

In Türkiye, most households in high-hazard areas perceived the risk, but only a minority considered themselves sufficiently prepared, citing financial and time barriers (Şahin et al., 2026); among geriatric patients in Istanbul, only a minority knew where their emergency kit was (Solakoglu et al., 2025).

In Mexico City, after the 2017 earthquake, it was recommended that the population be trained in what to do during and after tremors (Santos-Reyes and Gouzeva, 2020). These similarities are descriptive: with 8 cases, proportions cannot be estimated or compared with those of other populations.

For the methodology used to assess seismic vulnerability, these results suggest two implications. The first is that the occupant component should distinguish, at a minimum, risk perception, recognition of hazards in the dwelling, and preparedness, rather than combining them into two heterogeneous dimensions; recent household preparedness instruments, developed using mixed-methods designs and factor analyses, show that preparedness can be organized into several factors (Davarani et al., 2026).

The second is that the occupant component becomes meaningful when it is linked to the technical assessment of each building: uncertainty about professional advice during construction or the interpretation of cracks can be checked against the technical diagnosis, as is done with checklists in self-built housing (Medrano-Sánchez and Fabian, 2025). This comparison is not possible with the current data, because the package does not include the results of the technical assessment.

CONCLUSIONS

The study achieved its objective to the extent allowed by a preliminary sample of 8 cases. The perceived seismic risk and preparedness scale showed very low internal consistency for Perceived Seismic Risk in the Home (α = .203) and low consistency for Earthquake Preparedness (α = .464).

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In the first dimension, only the interpretation of cracks and the fear of remaining indoors were positively related to the rest of the items; in the second, knowing what to do, the meeting point and the emergency backpack formed a coherent core, whereas the item on furniture that could fall behaved in the opposite direction to that expected.

Occupants reported knowing how to act during an earthquake, whereas the assembly point and the emergency kit had mean scores below the midpoint of the scale. The results do not yet provide evidence of validity, but they guide the revision of the methodology's occupant component.

The limitations are substantial. The sample of 8 cases, compared with a target of 100 and with fewer cases than items, makes all statistics unstable and precludes estimation of omega and of the internal structure; data collection was still ongoing, and of the 17 people who opened the questionnaire, only 8 completed it. No information is available on the locality, the type of buildings, or the characteristics of the occupants.

The package does not include the technical component of the methodology, so this article provides no results on the structural vulnerability of the buildings, nor can it compare the occupants' perceptions with the technical assessment. The cross-sectional design precludes establishing relationships of dependence.

Several decisions for the authors follow from these results. The first is to review the composition of Perceived seismic risk in the dwelling and to consider splitting it into an affective component (worry and fear) and a component of judgment about the dwelling. The second is to review R8, on furniture that could fall, and to decide whether it measures hazard recognition or preparedness behavior. The third is to document the origin of the items and the content review. The fourth is to describe the technical component of the methodology and how its results will be linked to those of the occupant component. None of these decisions was made in the present analysis, which retains the ten original items.

For future work, we propose completing the survey to the planned target, then estimating omega and conducting the exploratory factor analysis, followed by a confirmatory factor analysis in an independent sample. Linking each occupant to the assessed building would make it possible to examine the correspondence between structural vulnerability and risk perception, and to target risk communication and preparedness toward households where the two do not match. A methodology that integrates the technical assessment and the occupants' perspective would bring a more comprehensive view of housing vulnerability to seismic risk reduction.

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