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Productive habitability: The home-workshop of brickmakers and fishers in southern Sinaloa. A preliminary review of a scale

Habitabilidad productiva: vivienda-taller de ladrilleros y pescadores del sur de Sinaloa. Revisión preliminar de una escala

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ABSTRACT

In the households of brickmakers and fishers, the dwelling also works as a workshop, and the overlap of domestic and productive space exposes the family to working conditions. This instrumental, cross-sectional and exploratory study carried out a preliminary review of a fifteen-item scale of productive habitability in the home-workshop, with three dimensions, compatibility of housing and work, safe working conditions and satisfaction with living and working at home, administered in the pilot survey of project FZ-HAB-0017 of the Factoriza UAS platform in brickmaking and fishing communities of southern Sinaloa, Mexico. A preliminary cut of 9 cases, out of a target of 100, was analyzed with descriptive statistics, Cronbach's alpha and Pearson inter-item correlations; omega, exploratory factor analysis and correlations between dimensions could not be estimated because the correlation matrix is singular. Satisfaction (α = .602) and safe conditions (α = .590) showed moderate internal consistency and compatibility a low one (α = .200); in each dimension, the reverse-worded item was the only one with a negative item-total correlation. Feeling safe while working obtained the highest mean (M = 4.44), and the risk to children and the wish to separate the workshop were frequently endorsed. Five of the nine cases gave the same answer to every item, which calls for reviewing the administration procedure and quality control before the final data cut.

Keywords: home-based work; brickmakers; small-scale fishers; productive habitability; response quality

RESUMEN

En los hogares de ladrilleros y pescadores, la vivienda funciona también como taller, y la superposición del espacio doméstico y productivo expone a la familia a las condiciones del trabajo. Este estudio instrumental, transversal y exploratorio realizó una revisión preliminar de la Escala de habitabilidad productiva en la vivienda-taller, con quince reactivos en tres dimensiones, Compatibilidad de vivienda y trabajo, Condiciones seguras para trabajar y Satisfacción con vivir y trabajar en casa, aplicada en el levantamiento piloto del proyecto FZ-HAB-0017 de Factoriza UAS en comunidades de ladrilleros y pescadores del sur de Sinaloa. Se analizó un corte preliminar de 9 casos, de una meta de 100, con estadísticos descriptivos, alfa de Cronbach y correlaciones de Pearson entre reactivos; el omega, el análisis factorial exploratorio y las correlaciones entre dimensiones no fueron estimables porque la matriz de correlaciones es singular. Satisfacción (α = .602) y Condiciones (α = .590) mostraron una consistencia moderada y Compatibilidad, una baja (α = .200); en cada dimensión, el reactivo inverso fue el único con correlación ítem-total negativa. La sensación de seguridad al trabajar obtuvo la media más alta (M = 4.44), y el riesgo para los niños y el deseo de separar el taller fueron señalados con frecuencia. Cinco de los nueve casos dieron la misma respuesta a todos los reactivos, lo que exige revisar el procedimiento de aplicación y el control de calidad antes del corte final.

Palabras clave: trabajo en la vivienda; ladrilleros; pescadores; habitabilidad productiva; calidad de las respuestas

INTRODUCTION

In many communities in northwestern Mexico, the home is also the workplace. In brickmakers' households, the kiln, the drying yard and the materials share the plot with the rest areas; in fishers' households, the home is used to store equipment, repair fishing gear and prepare the catch.

This overlap between domestic and productive space is a condition of habitability that housing studies address less often than the physical conditions of the dwelling.

The literature on working from home, which has developed mainly since the COVID-19 pandemic, has shown that the suitability of the space for work depends on the available floor area, the existence of a dedicated space, and indoor environmental quality (Cuerdo-Vilches et al., 2021). However, this literature has focused on office work rather than on the manual trades carried out in the home.

Artisanal brickmaking in Mexico is an informal activity that is usually organized around family labor, with kilns located close to homes (Saldaña-Villanueva et al., 2026).

There is abundant evidence on its health consequences. A systematic review and meta-analysis of 104 studies found that, compared with unexposed individuals, those working at brick kilns consistently had poorer lung function, more respiratory symptoms and more musculoskeletal complaints, although the studies were of low quality (Nicolaou et al., 2024).

In Mexico, exposure to arsenic, lead and polycyclic aromatic hydrocarbons has been documented among brick kiln workers in San Luis Potosí, Guanajuato and Querétaro (Pérez-Vázquez et al., 2025), as have ocular and neurotoxic symptoms among people who work or live in the brick-making area of El Refugio, in León, Guanajuato (Pedroza Carrillo et al., 2025).

Small-scale fishing poses its own risks. In a survey of 50 artisanal fishers in Bangladesh, 68% reported musculoskeletal discomfort in the previous five years (Zakaria et al., 2022). In a cross-sectional study of 650 people from 132 fishing families in the Indian Sundarbans, musculoskeletal disorders accounted for 20% of recorded morbidity (Roy et al., 2024).

In both occupations, the home is not only the place where people rest from hazardous work but may also form part of the workplace, with consequences for those who live there and do not take part in that work, particularly children.

The literature reviewed for this study did not reveal any brief Spanish-language instruments for assessing, from the perspective of their occupants, the habitability of dwellings that also function as workshops.

Project FZ-HAB-0017 of the Factoriza UAS platform designed the Productive Habitability in the Home-Workshop Scale, which comprises fifteen items organized into three dimensions (Compatibility of Housing and Work, Safe Working Conditions, and Satisfaction with Living and Working at Home). The project also began a pilot survey in brick-making and fishing communities in southern Sinaloa.

This article presents the results of the first preliminary data cut of that survey. The general objective is to conduct a preliminary review of how the scale performs. The specific objectives are to describe the responses to the items, estimate the internal consistency of each dimension, examine the relationships among the items within each dimension, review response quality, and identify the adjustments that the instrument and the administration procedure require before the final data cut.

DEVELOPMENT

THE HOME-WORKSHOP AS A WAY OF DWELLING

Habitability refers to the suitability of a dwelling's spaces for the activities that take place in it. When a dwelling also houses a productive activity, the demands of work are added to those of rest, cohabitation and care: space to carry it out without encroaching on family areas, places to store tools and materials, and conditions that allow work to be done without endangering those who do not take part in it.

Research on working from home has noted that the lack of a dedicated space and the small floor area of the dwelling limit the perceived adequacy of the workspace (Cuerdo-Vilches et al., 2021). In the home-workshop, these limitations coexist with work that produces dust, smoke, waste and hazardous objects, none of which stay in the area where the work is done.

The family-based organization of work is both an advantage and a risk. It allows productive

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activity to be combined with caring for children and other household members, and it avoids commuting; however, it also brings the whole family closer to working conditions. The review by Saldaña-Villanueva et al. (2026) of artisanal brick kilns in Mexico highlights the informality of the activity, the proximity of the kilns to homes, and family participation in the work as features that shape community exposure.

In a brick-making community in Baja California, a mixed-methods study involving all of the community's adult women documented social and structural barriers to accessing sexual and reproductive health services (Bejarano Zambrano et al., 2026). This finding illustrates that the vulnerability of these communities is not limited to environmental exposure.

SAFETY CONDITIONS AND EXPOSURE IN THE HOME-BASED PRODUCTION SETTING

Workspace safety conditions include ventilation, lighting, floor stability, and protection against accidents. In brick kilns, exposure to pollutants has been associated with clinical abnormalities in various organs.

In a study of 110 people across three precarious work settings in Mexico, brick kiln workers showed the highest frequency of clinical abnormalities, and length of employment in this type of work was negatively associated with pulmonary function parameters (Saldaña-Villanueva et al., 2023).

A systematic review with meta-analysis of thirteen studies in South Asia found that musculoskeletal disorders among brick kiln workers were concentrated in the lower back, shoulders, wrists and knees, and that posture, repetition and work duration were among the associated factors (Paira and Das, 2025).

Exposure extends to children in the household. In three communities in San Luis Potosí engaged in informal recycling, artisanal brickmaking and quarry stone carving, a study of 50 girls and boys found distinct urinary metal profiles depending on each community's activity, with higher arsenic concentrations in the brickmaking area, as well as exploratory associations between these metals and hematological parameters (Méndez-Rodríguez et al., 2025).

Studies on other forms of informal home-based production point in the same direction. In Brazilian households engaged in soldering costume jewelry, dust accumulated in the home contained potentially toxic elements whose levels correlated with concentrations in children's blood (Barrozo et al., 2022), and the women who performed this work showed changes in gene expression associated with arsenic exposure and with self-reported symptoms (Salles et al., 2025).

These findings give substance to two items on the project scale: the dust that the work leaves inside the home and the risk of accidents for children in the workspace.

SATISFACTION, LIVELIHOOD AND ROOTEDNESS

People's appraisal of their home-workshop does not depend solely on its material conditions. The home is the means by which the family earns its living, and losing it, or separating it from work, may mean losing that livelihood.

For this reason, satisfaction with the dwelling as a workplace, pride in it, and valuing it as a place for the family may coexist with the desire to separate the workshop from the dwelling, an aspiration that reflects awareness of the drawbacks of their overlap. A satisfaction dimension that combines these elements may not behave as a homogeneous set, and this possibility should be borne in mind when interpreting its coefficients.

RESPONSE QUALITY AND VALIDITY EVIDENCE IN THE EARLY STAGE OF A SCALE

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

Internal structure is explored with exploratory factor analysis, which requires checking data adequacy and a sufficient sample size (Ferrando et al., 2022; Goretzko et al., 2021). Neither coefficient is interpretable if the responses do not reflect the content of the items.

Scales that combine positively and negatively worded items make it possible to detect one type of problematic responding. Some respondents answer the positive and negative items of

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the same dimension inconsistently, for example, because they give the same answer to all items without attending to their wording. This inconsistency can produce factors associated with item wording direction and distort internal consistency estimates (Steinmann et al., 2022).

Factor mixture models make it possible to identify these individuals and to estimate the instrument's structure without their influence (García-Batista et al., 2021). The project's scale includes one reverse-worded item in each dimension, so this problem can be examined from the first wave of data collection.

METHODOLOGY

DESIGN

An instrumental, quantitative, non-experimental, cross-sectional study with a descriptive and exploratory scope was conducted. The data come from survey LEV-0022, "Piloto sur de Sinaloa · Vivienda-taller" (Southern Sinaloa Pilot · Home Workshop), of project FZ-HAB-0017 on the Factoriza UAS platform, and from the frozen dataset DST-0022, with a data cutoff date of 9 October 2026. The survey is an independent sample and the only one in the project.

POPULATION, SAMPLE, AND DATA CUTOFF

The population was defined as people aged 18 years or older from brickmaker and fisher households in southern Sinaloa who work at home. Data were collected in brickmaker and fisher communities selected by the project lead. According to the Factoriza log, 24 people opened the questionnaire and 9 completed it; no cases were excluded for quality control, so 9 cases were analyzed (Table 2).

The data cut analyzed here is preliminary: it comprises 9 cases out of a target of 100, and data collection was still open and in the field at the cut-off date. With 9 cases for 15 items, the ratio is 0.6 cases per item. The dataset does not indicate whether each person belongs to a brickmaking or a fishing household, so the two groups cannot be distinguished in the analysis.].

INSTRUMENT

The instrument administered was the Productive Habitability in the Dwelling-Workshop Scale, the name under which it appears in the Factoriza item dictionary. It consists of fifteen items with a five-point response format, ranging from Strongly disagree (1) to Strongly agree (5), organized into three dimensions of five items each. Compatibility of housing and work (R1 to R5) assesses the availability of space to work without disturbing the family, the dust that work leaves inside the dwelling, the possibility of storing tools in a place separate from the bedrooms, the family's rest during work, and the possibility of attending to the family while working.

Safe working conditions (R6 to R10) assesses workplace ventilation, the risk of accidents for children, lighting, the sense of safety while working, and the firmness of the floor. Satisfaction with living and working at home (R11 to R15) assesses satisfaction with the dwelling as a workplace, its role in the household's livelihood, the desire to separate the workshop from the dwelling, pride in the home-workshop, and its value as a place for the family.

Three items are reverse-worded (R2, R7 and R13) and have been recoded in the data matrix, so that a higher score indicates greater compatibility, safer conditions and greater satisfaction. In the recoded version, a low mean on these items indicates that dust, risk to children and the desire to separate the workshop from the home were frequently reported. Table 1 presents the code, wording and direction of each item.

Table 1. Structure of the instrument.

Code	Item	Reverse
R1	In my home there is space to work without disturbing my family	No
R2	The work I do at home leaves dust inside the dwelling	Yes
R3	I can store my tools in a place separate from the bedrooms	No
R4	My family can rest while I work from home	No

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Code	Item	Reverse
R5	Working from home allows me to take care of my family	No
R6	The place where I work in my home is well ventilated	No
R7	In my workspace there is a risk of accidents for children	Yes
R8	The space where I work has enough light to see clearly	No
R9	I feel safe working in my home	No
R10	The floor of my work area is firm	No
R11	I am satisfied with my home as a workplace	No
R12	My home allows me to earn a living	No
R13	I would like to separate my workshop from my home	Yes
R14	I feel proud of my home-workshop	No
R15	My home-workshop is a good place for my family	No

Note. R1 to R5 = Compatibility of housing and work; R6 to R10 = Safe working conditions; R11 to R15 = Satisfaction with living and working at home. The dimension column is omitted to preserve table readability. 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-0017, survey LEV-0022, dataset DST-0022.

PROCEDURE

Responses were collected through the survey questionnaire administered on Factoriza UAS, which records explicit online informed consent before the first item and does not collect identifying data. Factoriza froze the DST-0022 dataset 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-00114 to RUN-00120). The supplementary analysis program was run using the data file and the item dictionary exported by the platform.

DATA HANDLING

All 9 cases analyzed responded to all fifteen items, so there were no missing values and no responses needed to be imputed. The reverse-scored items were analyzed in the recoded version provided by the platform, and none was reversed again. The values in the tables were copied exactly as produced by Factoriza UAS, without being recalculated or re-rounded; where tables from the package were combined into a single table or a column was omitted, the table note states this.

Inspection of the data matrix revealed response patterns that compromise the interpretation of the coefficients. Cases 3, 4, 7, and 9 have identical responses across all fifteen items: 4 on the positively worded items and 2 on the recoded reverse-worded items. Case 1 scores 5 on the positively worded items and 1 on the recoded reverse-worded items, and case 2 repeats the value 4 on most items.

On the original response scale, these patterns correspond to giving the same answer to all items, including the reverse-worded ones. The columns for R1, R6, and R14 are also identical, as are those for R4 and R15 and those for R8 and R12, although in some cases they belong to different dimensions. No case or item was removed in this analysis; the decision to apply an exclusion criterion for uniform responding is left to the authors.

DATA ANALYSIS

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

In addition, the project's supplementary analysis program, analisis_psicometrico.py, version 1.0, was run in Python 3.13.16 (Python Software Foundation, 2026), with NumPy (Harris et al., 2020), SciPy (Virtanen et al., 2020), and pandas. This program estimates McDonald's omega total

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(McDonald, 1999/2013) and examines internal structure through exploratory factor analysis. The factor analysis includes the Kaiser-Meyer-Olkin measure of sampling adequacy (Kaiser, 1974), Bartlett's (1950) test of sphericity, and parallel analysis to determine the number of factors (Horn, 1965). The program also computes Spearman correlations between dimension scores.

The program stopped while computing the sampling adequacy index, before producing any results, because the correlation matrix of the fifteen items is singular: with 9 cases for 15 items it cannot be inverted, and the identical columns described in the previous section add exact linear dependencies among the items.

Consequently, no omega coefficient, exploratory factor analysis or correlations between dimensions are available. The program was not modified, and the execution log is provided in the reproducibility appendix. Given the size of the cohort, the Factoriza coefficients are reported to document how the instrument functions, not as estimates of its properties. The reference values of the psychometric indices are treated as guidelines, not as decision rules (Ferrando et al., 2022). No items were removed, and no confirmatory factor analysis was performed.

ETHICAL CONSIDERATIONS

Participation was voluntary and anonymous. Factoriza UAS records express informed consent online and does not collect names, email addresses, or any other identifying data. Because the scale asks about risk to children in the workplace, the information gathered may inform protective actions in the participating communities.

STATEMENT ON THE USE OF ARTIFICIAL INTELLIGENCE

The following were used in preparing this manuscript: the Factoriza UAS platform, for data management and for descriptive, internal consistency, and inter-item correlation analyses; a Python analysis program with fixed and validated procedures, whose execution stopped because the correlation matrix was singular; and the Claude Opus language model (Anthropic), for running that program, for assisted literature searching, for drafting, and for assembling the document from the results. The authors reviewed, corrected, and approved 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 24 people who opened the questionnaire, 9 completed it and were analyzed, with no exclusions for quality control. The 9 analyzed cases answered all fifteen items. The proportion of people who abandoned the questionnaire before completing it was high, and the Factoriza log does not indicate at which item they dropped out.

Table 2. Sample composition.

Indicator	Value
People who opened the questionnaire	24
Completed questionnaires	9
Cases excluded by quality control	0
Cases analyzed	9
Items	15

Note. Survey "Southern Sinaloa Pilot · Home Workshop" (LEV-0022); population: persons aged 18 years or older from brickmaker and fisher households in southern Sinaloa who work in their homes; territory: southern Sinaloa, in brickmaker and fisher communities selected by the project lead. Dataset DST-0022, fingerprint e5c76ac62c9575a5. Source: Factoriza UAS. Preliminary cut-off: n = 9 of a target of 100, with the survey still open.

COMPATIBILITY, SAFETY CONDITIONS, AND SATISFACTION

Table 3 and Figure 1 present the descriptive statistics. Means for the twelve direct items

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ranged from 3.89 to 4.44 (standard deviations between 0.33 and 0.93), whereas the recoded means of the three reverse-worded items ranged from 1.78 to 2.67. In Home–Work Compatibility, the possibility of storing tools in a place separate from the bedrooms (R3: *M* = 4.00, *SD* = 0.87) and the family's rest while work is being done (R4: *M* = 4.00, *SD* = 0.50) had the highest means, followed by space to work without disturbing the family (R1: *M* = 3.89, *SD* = 0.78) and the possibility of attending to the family (R5: *M* = 3.89, *SD* = 0.93). Dust left inside the dwelling by the work (a reverse-worded item, recoded) had the lowest mean in the dimension and the greatest dispersion in the instrument (R2: *M* = 2.67, *SD* = 1.32).

In Safe Conditions for Working, the feeling of safety when working in the home had the highest mean in the instrument (R9: *M* = 4.44, *SD* = 0.53), followed by light for seeing clearly (R8: *M* = 4.11, *SD* = 0.33), floor firmness (R10: *M* = 4.00, *SD* = 0.87) and ventilation (R6: *M* = 3.89, *SD* = 0.78). The risk of accidents for children, in the recoded version of the reverse-scored item, had a mean of 1.89 (R7: *SD* = 0.60); that is, most respondents agreed that their workspace entails this risk. Respondents felt safe working in their homes and, at the same time, acknowledged the risk that this same space poses to children.

In the Satisfaction with Living and Working at Home dimension, the possibility of earning a living at home had the highest mean (R12: *M* = 4.11, *SD* = 0.33), followed by satisfaction with the home as a workplace (R11: *M* = 4.00, *SD* = 0.87), its rating as a good place for the family (R15: *M* = 4.00, *SD* = 0.50), and pride in the home-workshop (R14: *M* = 3.89, *SD* = 0.78). The desire to separate the workshop from the home, in the recoded version of the reverse-scored item, had the lowest mean on the instrument (R13: *M* = 1.78, *SD* = 0.44).

Overall, the responses describe a favorable appraisal of the home-workshop as a livelihood and as a place for the family, alongside an acknowledgment of the dust, the risk to children, and the desire to separate the workshop. This pattern should be read in light of the review of response quality presented later, because the three reverse-worded items drew agreement from the same respondents who agreed with all of the direct items.

The distributions were highly concentrated. Light (R8) and livelihood (R12) had the lowest standard deviations in the instrument, 0.33, with eight of the nine responses at the same value. The skewness and kurtosis of these items, 3.00 and 9.00, reflect a single response departing from the rest. With nine cases, these shape indices are highly sensitive to an isolated response and are reported for descriptive purposes only.

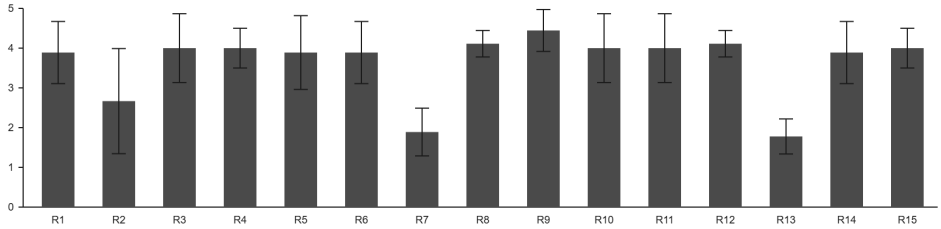
Table 3. Descriptive statistics of the items.

Item	M	SD	Skewness	Kurtosis	Floor	Ceiling
R1	3.89	0.78	-1.80	5.65	11%	11%
R2	2.67	1.32	0.79	-0.66	11%	11%
R3	4.00	0.87	-1.48	4.00	11%	22%
R4	4.00	0.50	0.00	4.00	11%	11%
R5	3.89	0.93	-0.94	1.35	11%	22%
R6	3.89	0.78	-1.80	5.65	11%	11%
R7	1.89	0.60	-0.02	1.13	22%	11%
R8	4.11	0.33	3.00	9.00	89%	11%
R9	4.44	0.53	0.27	-2.57	56%	44%
R10	4.00	0.87	-1.48	4.00	11%	22%
R11	4.00	0.87	-1.48	4.00	11%	22%
R12	4.11	0.33	3.00	9.00	89%	11%
R13	1.78	0.44	-1.62	0.73	22%	78%
R14	3.89	0.78	-1.80	5.65	11%	11%
R15	4.00	0.50	0.00	4.00	11%	11%

Note.N = 9. R1 to R5 = Compatibility of housing and work; R6 to R10 = Safe working conditions; R11 to R15 = Satisfaction with living and working at home. Floor and ceiling indicate the percentage of responses at the minimum and maximum values. Reverse-scored items R2, R7, and R13 are shown recoded. The item-total correlation column from the Factoriza descriptive table is omitted; its values do not match those in Table 4 because they are not computed on the total of each dimension. Factoriza UAS run RUN-00114. Preliminary cut-off: n = 9 of a target of 100, with data collection still open.

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Figure 1. Mean scores per item with error bars representing one standard deviation.



INTERNAL CONSISTENCY

Table 4 presents the item analysis by dimension calculated with Factoriza. Satisfaction with living and working at home had the highest alpha (α = .602), supported by the rating of the dwelling as a good place for the family (R15: .844) and satisfaction with the dwelling as a workplace (R11: .721), followed by livelihood (R12: .505). Pride showed a weak relationship (R14: .187), and the desire to separate the workshop was negatively related to the remaining items (R13: -.146), so removing it would raise alpha to .721.

Safe working conditions yielded an alpha of .590. Floor firmness (R10: .825) and ventilation (R6: .773) were the most consistent items, followed by the sense of safety (R9: .483) and lighting (R8: .359). The risk of accidents for children, by contrast, was negatively related to the remaining items (R7: -.348), and its removal would raise alpha to .818. Housing–work compatibility had the lowest alpha (α = .200).

Caring for the family (R5: .674), space for working (R1: .629), and a place for tools (R3: .520) were positively related to the remaining items; family rest was unrelated (R4: .000); and dust was negatively related (R2: -.499), so removing it would raise alpha to .841. In all three dimensions, the reverse-scored item was the only one with a negative item-total correlation and the one that most reduced internal consistency.

Table 4. Item analysis by dimension.

Item	Corrected item-total r	α if item deleted
R1	.629	-.400
R2	-.499	.841
R3	.520	-.333
R4	.000	.225
R5	.674	-.634
R6	.773	.208
R7	-.348	.818
R8	.359	.559
R9	.483	.479
R10	.825	.123
R11	.721	.256
R12	.505	.531
R13	-.146	.721
R14	.187	.667
R15	.844	.321

Note.N = 9. Scale from 1 to 5; reverse-scored items R2, R7, and R13 are shown recoded. Factoriza UAS run RUN-00114. Preliminary cutoff: n = 9 out of a target of 100, with data collection still open.

CORRELATIONS BETWEEN ITEMS

Table 5 shows all correlations among the items within each dimension. In Compatibility, space to work was related to the place for tools (R1 and R3: r = .923, 95% CI [.670, .984], p < .001) and to the possibility of caring for the family (R1 and R5: r = .842, 95% CI [.405, .966], p = .004). The

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recoded dust item (R2) had negative coefficients with the other four items, ranging from -.567 (R2 and R4) to -.327 (R2 and R3), all with intervals that included zero. The place for tools was not related to family rest (R3 and R4: *r* = .000).

In Conditions, ventilation was related to floor firmness (R6 and R10: *r* = .923, 95% CI [.670, .984], *p* < .001), and no other correlation had an interval that excluded zero; the highest was between the sense of safety and floor firmness (R9 and R10: *r* = .548, 95% CI [-.183, .889], *p* = .127). The recoded item on risk to children (R7) had negative coefficients with the other four items, ranging from -.555 (R7 and R8) to -.219 (R7 and R9), all with intervals that included zero.

In the Satisfaction dimension, satisfaction with the dwelling as a workplace was related to its rating as a good place for the family (R11 and R15: *r* = .866, 95% CI [.475, .971], *p* = .003), and livelihood was also related to that rating (R12 and R15: *r* = .750, 95% CI [.171, .944], *p* = .020). The item on the desire to separate the workshop (R13), recoded so that a high value indicates a lower desire to separate it, had negative coefficients with livelihood (R12 and R13: *r* = -.661, 95% CI [-.921, .005], *p* = .052) and with pride (R13 and R14: *r* = -.443), a positive one with satisfaction (R11 and R13: *r* = .327), and a null one with the rating of the dwelling as a place for the family (R13 and R15: *r* = .000); the intervals for these coefficients included zero.

Table 5. Correlations between items within each dimension.

Dimension	Variable pair	r	IC 95%	p
Compatibility	R1 and R2	-.524	[-.881, .215]	.148
Compatibility	R1 and R3	.923	[.670, .984]	< .001
Compatibility	R1 and R4	.320	[-.437, .812]	.402
Compatibility	R1 and R5	.842	[.405, .966]	.004
Compatibility	R2 and R3	-.327	[-.814, .430]	.390
Compatibility	R2 and R4	-.567	[-.894, .156]	.111
Compatibility	R2 and R5	-.339	[-.819, .419]	.372
Compatibility	R3 and R4	.000	[-.664, .664]	1.000
Compatibility	R3 and R5	.622	[-.071, .910]	.074
Compatibility	R4 and R5	.539	[-.195, .886]	.134
Conditions	R6 and R7	-.296	[-.802, .458]	.440
Conditions	R6 and R8	.533	[-.203, .884]	.140
Conditions	R6 and R9	.438	[-.319, .854]	.238
Conditions	R6 and R10	.923	[.670, .984]	< .001
Conditions	R7 and R8	-.555	[-.891, .173]	.121
Conditions	R7 and R9	-.219	[-.771, .521]	.571
Conditions	R7 and R10	-.240	[-.780, .504]	.534
Conditions	R8 and R9	.395	[-.365, .839]	.292
Conditions	R8 and R10	.433	[-.324, .852]	.244
Conditions	R9 and R10	.548	[-.183, .889]	.127
Satisfaction	R11 and R12	.433	[-.324, .852]	.244
Satisfaction	R11 and R13	.327	[-.430, .814]	.390
Satisfaction	R11 and R14	.185	[-.546, .756]	.634
Satisfaction	R11 and R15	.866	[.475, .971]	.003
Satisfaction	R12 and R13	-.661	[-.921, .005]	.052
Satisfaction	R12 and R14	.533	[-.203, .884]	.140
Satisfaction	R12 and R15	.750	[.171, .944]	.020
Satisfaction	R13 and R14	-.443	[-.856, .313]	.232
Satisfaction	R13 and R15	.000	[-.664, .664]	1.000
Satisfaction	R14 and R15	.320	[-.437, .812]	.402

Note.N = 9. R1 to R5 = Compatibility of housing and work; R6 to R10 = Safe working conditions; R11 to R15 = Satisfaction with living and working at home. The corrected item-total correlation excludes the item itself from the total of its dimension. Cronbach's α for each full dimension (5 items each): Compatibility = .200 (run RUN-00115); Conditions = .590 (RUN-00117); Satisfaction = .602 (RUN-00119). Source: Factoriza UAS, Tables 4, 6, and 8 of the package, combined without modifying values. Preliminary cut-off: n = 9 out of a target of 100, with data collection still open.

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The correlations of .923 should be interpreted in light of the caveat in the note to Table 5. Because the columns for R1 and R6 are identical, the correlations of R1 with R3 and of R6 with R10 derive from the same responses on the first item of each pair, so their agreement is not an independent finding. Moreover, with nine cases, the confidence intervals are very wide: most of the correlations in the table have intervals ranging from moderately negative to high positive values.

INTERNAL STRUCTURE AND RELATIONSHIP BETWEEN DIMENSIONS

The exploratory factor analysis, McDonald's omega and the correlations between the scores on the three dimensions could not be estimated. With 9 cases for 15 items, and with three groups of items that had identical responses, the correlation matrix was singular, and the supplementary analysis program stopped when computing the measure of sampling adequacy. Consequently, the study provides no evidence on the dimensionality of the instrument or on the relationship between compatibility, safety and satisfaction.

RESPONSE QUALITY

The review of the data matrix, described in the data processing section, makes it possible to interpret the pattern common to all three dimensions. Five of the nine cases gave the same response to all items on the original scale, and a sixth did so for most of them. When a person answers "Agree" to all items, their recoded response is low on the reverse-worded items and high on the directly worded ones.

With five or six of the nine cases in that situation, the reverse-worded items correlate negatively with the rest of their dimension because of the response style, not necessarily because of their content. The low means of R2, R7 and R13 in their recoded version largely reflect the same generalized agreement. This pattern is consistent with the uniform responding or acquiescence described in the literature on mixed-worded scales (García-Batista et al., 2021; Steinmann et al., 2022).

DISCUSSION OF RESULTS

This study aimed to conduct a preliminary review of how a productive habitability scale performs in the workshop-dwellings of brickmakers and fishers in southern Sinaloa. With 9 cases, the coefficients cannot be interpreted as estimates of the instrument's properties: the simulation literature on alpha and omega has been developed with much larger samples (Malkewitz et al., 2023), and factor analysis requires a sample size that this data cut does not reach (Ferrando et al., 2022; Goretzko et al., 2021). The data cut does, however, allow us to identify three problems that should be resolved before data collection continues and to formulate some content hypotheses for the final cut.

The first and most important problem is the quality of the responses. Most respondents answered uniformly, without distinguishing the reverse-worded items, and the platform's quality control did not exclude them. The literature shows that individuals who respond inconsistently to mixed-worded items can produce factors associated with item wording direction and alter the internal consistency of the dimensions (Steinmann et al., 2022), and that identifying them allows the instrument's structure to be estimated more precisely (García-Batista et al., 2021).

In this subsample, the three reverse-worded items were the only ones with negative item-total correlations and the ones that most reduced the alpha of their dimension. This is consistent with what would be expected if the manner of responding, rather than the content, organizes the responses. The mode of administration may be relevant: if the questionnaire was read aloud to the respondents, uniform responding may reflect fatigue, politeness toward the interviewer, or difficulty processing negative sentences aloud. The procedural record would allow these possibilities to be examined.

The second problem is the identical columns. The fact that ventilation, workspace, and pride in the home-workshop received exactly the same responses in all nine cases may be partly explained by the overall uniformity of responses, since five cases gave the same answer to every item. It also means, however, that an error in questionnaire configuration or data entry must be ruled out. Until this point is verified, the highest correlations in the wave, which involve these

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items, cannot be interpreted as substantive relationships.

The singularity of the correlation matrix, which prevented the factor analysis from being conducted, has the same root cause.

The third problem concerns design. The scale was administered in households engaged in two very different trades, brickmaking and fishing, but the dataset does not record which trade each person belongs to. Conditions in homes where bricks are fired, with kilns, combustion and clay dust, are not equivalent to those in homes where fishing equipment is stored and repaired, and the literature documents different risk profiles for each trade (Nicolaou et al., 2024; Roy et al., 2024; Zakaria et al., 2022).

Without a record of the occupation, it is not possible to examine whether the items function in the same way in both groups.

With these caveats, the results suggest content hypotheses that the final wave can examine. Dust inside the dwelling was the item with the greatest dispersion in the instrument and the one that deviated most from the compatibility dimension. The literature on informal home-based production has documented that accumulated household dust is a route through which children are exposed to toxic elements (Barrozo et al., 2022), and in Mexican brick-making communities, metal exposures have been measured in both adults and children (Méndez-Rodríguez et al., 2025; Pérez-Vázquez et al., 2025).

Dust is therefore more an environmental condition of the dwelling than an indicator of compatibility, and on the scale it could be placed alongside the safety conditions.

Recognition of risk to children, if confirmed once the problem of response quality has been resolved, is the most relevant content finding of this round. The coexistence of a strong sense of safety at work with recognition of risk to children suggests that respondents distinguish between their own safety and that of people who live alongside the work without taking part in it. This distinction is consistent with the evidence on child exposure in precarious work communities (Méndez-Rodríguez et al., 2025) and with the proximity of kilns to homes and family involvement in brickmaking (Saldaña-Villanueva et al., 2026).

If the final data cut confirms that risk to children does not cluster with ventilation, lighting, flooring and personal safety, it could be treated as a distinct dimension focused on protecting children and other household members.

In the satisfaction dimension, appraisals of the dwelling as a workplace, as a means of livelihood and as a place for the family varied together. The recoded item on the desire to separate the workshop had negative coefficients with livelihood and with pride, indicating that agreement with separating the workshop tended to accompany higher appraisals of livelihood and pride, although the intervals for these coefficients included zero.

This pattern, which should be interpreted with caution, is consistent with the ambivalence described in the development section: those who earn their livelihood at home may feel proud of their home and, at the same time, wish to separate the workshop from the family spaces. The literature on brickmaking communities describes an activity carried out under conditions of informality and poverty, with family labor and kilns close to homes (Saldaña-Villanueva et al., 2026); the social vulnerability of these communities, moreover, is not limited to environmental exposure (Bejarano Zambrano et al., 2026).

The desire to separate the workshop could therefore be interpreted as an aspiration linked to available resources rather than as dissatisfaction, and its place in the satisfaction dimension warrants review.

IMPLICATIONS FOR REVISING THE INSTRUMENT AND THE PROCEDURE

The results suggest several adjustments. For the procedure, it would be advisable to add to the platform's quality control a criterion for identifying straightlining (uniform responding), to record the mode of administration, and, if the questionnaire is read aloud, to train those administering it to present the response options neutrally.

In the instrument, reverse-worded items could be rewritten as direct items when their content allows, or balanced with a sufficient number of items worded in each direction within every dimension, so that the variance associated with wording can be modeled in the final version. The items on dust and on risk to children could be grouped with other items on smoke, waste and tool storage to form a dimension of household exposure to work.

The wording of some items also deserves attention. Three items are worded in the masculine form ("me siento seguro" [I feel safe], "estoy satisfecho" [I am satisfied] and "me siento

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orgulloso" [I feel proud]); these should be replaced with gender-neutral wording, all the more so in communities where women take part in family work. It would also be advisable to record the household's trade, the activity each person carries out in the dwelling, the presence of girls and boys, and the location of the workspace relative to the bedrooms. These proposals do not derive from the coefficients of the data cut, which lack the precision needed to justify changes to specific items, but from a joint reading of the scale's content, the literature reviewed and the patterns that the data cut reveals.

CONCLUSIONS

The study met its objective to the extent allowed by a preliminary sample of 9 cases: it does not provide estimates of the psychometric properties of the scale, but it identifies the adjustments required by the instrument and the administration procedure. Satisfaction with living and working at home (α = .602) and Safe working conditions (α = .590) showed moderate internal consistency, and Compatibility of housing and work showed low consistency (α = .200); in all three dimensions, the reverse-scored item was the only one with a negative item-total correlation.

Respondents rated the home-workshop favorably as a means of livelihood and as a place for the family, felt safe working in it, and acknowledged the dust, the risk to children, and the desire to separate the workshop, although this last pattern cannot yet be disentangled from the uniform way most of them responded.

The main finding of this data cut is methodological: five of the nine cases gave the same response to all items, and three pairs or groups of items received identical responses. These patterns account for the singularity of the correlation matrix, which prevented estimation of omega, the exploratory factor analysis, and the inter-dimension correlations. They also require a review of the administration procedure and quality control before data collection continues. The dataset has been frozen with a cryptographic hash, and the program execution log is compiled in a reproducibility appendix, so the review can be carried out on the same data.

The limitations are substantial. The sample of 9 cases, against a target of 100 and with data collection still ongoing, is insufficient to estimate internal consistency precisely and does not allow factor analysis. The respondents belong to communities selected by the project leader, so the results do not generalize to the households of brickmakers and fishers in southern Sinaloa, and the dataset does not distinguish between the two occupations. The quality of the responses has not been verified. The cross-sectional design means that the direction of the relationships cannot be established, and no confirmatory factor analysis was performed.

These results point to several decisions for the authors. The first is to verify the recoding criterion, the cases with uniform responses and the identical columns in Factoriza, and to decide whether to apply an exclusion criterion for uniform responses. The second is to review where dust, the risk to children and the desire to separate the workshop are placed within the dimensions of the scale.

The third is to add the household's trade and the presence of girls and boys to the questionnaire, and to replace the masculine-gendered wording. None of these decisions was made in the present analysis, which retains the fifteen items and the nine cases.

For future work, we propose completing data collection up to the planned target, with a sufficient number of households from each trade; repeating the internal consistency analysis and running the exploratory factor analysis on the final dataset, with and without the uniform-response cases; confirming the structure in an independent sample through confirmatory factor analysis; and complementing the ratings with observations of conditions in the home-workshop. A scale with sufficient validity evidence would make it possible to document, from the perspective of its inhabitants, the conditions of the dwelling that functions as a workshop, and to guide actions to protect children in the brick-making and fishing communities of the region.

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REFERENCES

Barrozo, F., Almeida, G. A. de, Luz, M. S., y Olympio, K. P. K. (2022). A low-cost method shows potentially toxic element levels in dust correlated with elevated blood levels of these chemicals in children exposed to an informal home-based production environment. *International Journal of Environmental Research and Public Health*, *19*(23), Artículo 16236. https://doi.org/10.3390/ijerph192316236
Bartlett, M. S. (1950). Tests of significance in factor analysis. *British Journal of Statistical Psychology*, *3*(2), 77–85. https://doi.org/10.1111/j.2044-8317.1950.tb00285.x
Bejarano Zambrano, C. L., Gilbert, H., González Palacios, C. A., Mukherjee, J., Bejarano Zambrano, M. F., Kasmani, M. N., y Knipper, M. (2026). The Double Dominion Over Women's Bodies as a barrier to exercising sexual and reproductive rights: A mixed-methods study in La Ladrillera, Mexico. *The Lancet Regional Health - Americas*, *59*, Artículo 101493. https://doi.org/10.1016/j.lana.2026.101493
Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika*, *16*(3), 297–334. https://doi.org/10.1007/BF02310555
Cuerdo-Vilches, T., Navas-Martín, M. Á., y Oteiza, I. (2021). Working from home: Is our housing ready? *International Journal of Environmental Research and Public Health*, *18*(14), Artículo 7329. https://doi.org/10.3390/ijerph18147329
Ferrando, P. J., Lorenzo-Seva, U., Hernández-Dorado, A., y Muñiz, J. (2022). Decalogue for the factor analysis of test items. *Psicothema*, *34*(1), 7–17. https://doi.org/10.7334/psicothema2021.456
García-Batista, Z. E., Guerra-Peña, K., Garrido, L. E., Cantisano-Guzmán, L. M., Moretti, L., Cano-Vindel, A., Arias, V. B., y Medrano, L. A. (2021). Using constrained factor mixture analysis to validate mixed-worded psychological scales: The case of the Rosenberg Self-Esteem Scale in the Dominican Republic. *Frontiers in Psychology*, *12*, Artículo 636693. https://doi.org/10.3389/fpsyg.2021.636693
Goretzko, D., Pham, T. T. H., y Bühner, M. (2021). Exploratory factor analysis: Current use, methodological developments and recommendations for good practice. *Current Psychology*, *40*(7), 3510–3521. https://doi.org/10.1007/s12144-019-00300-2
Harris, C. R., Millman, K. J., van der Walt, S. J., Gommers, R., Virtanen, P., Cournapeau, D., Wieser, E., Taylor, J., Berg, S., Smith, N. J., Kern, R., Picus, M., Hoyer, S., van Kerkwijk, M. H., Brett, M., Haldane, A., Fernández del Río, J., Wiebe, M., Peterson, P., . . . Oliphant, T. E. (2020). Array programming with NumPy. *Nature*, *585*(7825), 357–362. https://doi.org/10.1038/s41586-020-2649-2
Horn, J. L. (1965). A rationale and test for the number of factors in factor analysis. *Psychometrika*, *30*(2), 179–185. https://doi.org/10.1007/BF02289447
Kaiser, H. F. (1974). An index of factorial simplicity. *Psychometrika*, *39*(1), 31–36. https://doi.org/10.1007/BF02291575
Malkewitz, C. P., Schwall, P., Meesters, C., y Hardt, J. (2023). Estimating reliability: A comparison of Cronbach's α, McDonald's ωt and the greatest lower bound. *Social Sciences & Humanities Open*, *7*(1), Artículo 100368. https://doi.org/10.1016/j.ssaho.2022.100368
McDonald, R. P. (2013). *Test theory: A unified treatment*. Psychology Press. https://doi.org/10.4324/9781410601087 (Obra original publicada en 1999)
Méndez-Rodríguez, K. B., Pérez-Vázquez, F. J., Van Brussel, E., González-Palomo, A. K., Reyes-Zavala, A., y Saldaña-Villanueva, K. (2025). Hematological effects of chronic heavy metal exposure in children from marginalized occupational communities in Mexico. *Toxicology Letters*, *414*, Artículo 111776. https://doi.org/10.1016/j.toxlet.2025.111776
Nicolaou, L., Sylvies, F., Veloso, I., Lord, K., Chandyo, R. K., Sharma, A. K., Shrestha, L. P., Parker, D. L., Thygerson, S. M., DeCarlo, P. F., Ramachandran, G., y Checkley, W. (2024). Brick kiln pollution and its impact on health: A systematic review and meta-analysis. *Environmental Research*, *257*, Artículo 119220. https://doi.org/10.1016/j.envres.2024.119220
Paira, M., y Das, B. (2025). Prevalence and risk factors of musculoskeletal disorders among South Asian brick kiln workers: A systematic review and meta-analysis. *Indian Journal of Occupational and Environmental Medicine*, *29*(1), 4–14. https://doi.org/10.4103/ijoem.ijoem_158_24
Pedroza Carrillo, P. K., Salazar-Gómez, A., Jimenez Alcala, A. M., Nilo Olmos, D. del R., Perez Perez, B., Rocha Villa, V. G., Martínez-Rodríguez, A. L., Thébault, S. C., y Hernández-Zimbrón, L. F. (2025). Human exposure to pollutant emissions from brick kilns and their association with ocular health and neurotoxic symptoms: A pilot study in the Refugio Brickmaking Area, León, Mexico. *Frontiers in Psychiatry*, *16*, Artículo 1554101. https://doi.org/10.3389/fpsyt.2025.1554101
Pérez-Vázquez, F. J., Reyes-Zavala, A., Marín-Jáuregui, L. S., Méndez-Rodríguez, K. B., Van-Brussel, E., y Fernández-Macías, J. C. (2025). Assessment of environmental pollutant exposure and cardiovascular risk in Mexican brick-making communities. *Environmental Geochemistry and Health*, *48*(1), Artículo 25. https://doi.org/10.1007/s10653-025-02910-1
Python Software Foundation. (2026). *Python* (Versión 3.13.16) [Software]. https://www.python.org/
Roy, A., De, A., Aftabuddin, M., Bera, A. K., Bayen, S., Ghosh, A., y Das, B. K. (2024). Analysis of health ailments and associated risk factors in small-scale fisherfolk community of Indian Sundarbans: A cross-sectional study. *Indian Journal of Community Medicine*, *49*(2), 360–366. https://doi.org/10.4103/ijcm.ijcm_906_22
Saldaña-Villanueva, K., González-Palomo, A. K., Méndez-Rodríguez, K. B., y Pérez-Vázquez, F. J. (2026). Artisanal brick kilns in Mexico: Socio-environmental impacts, health effects, and regulatory challenges. *Environmental Geochemistry and Health*, *48*(11). https://doi.org/10.1007/s10653-026-03371-w
Saldaña-Villanueva, K., Méndez-Rodríguez, K. B., Zamora-Mendoza, B. N., Gómez-Gómez, A., Díaz-Barriga, F., y

Pérez-Vázquez, F. J. (2023). Health effects of informal precarious workers in occupational environments with high exposure to pollutants. *Environmental Science and Pollution Research*, *30*(31), 76818–76828. https://doi.org/10.1007/s11356-023-27769-6
Salles, F. J., Atilola, G., Frydas, I., Schultz, D. R., Papaioannou, N., Rogero, M. M., Sarigiannis, D., Vineis, P., y Olympio, K. P. K. (2025). Effects of minimal arsenic, lead, and cadmium exposure on biological pathways in Brazilian informal workers welding fashion jewelry. *Journal of Trace Elements in Medicine and Biology*, *89*, Artículo 127660. https://doi.org/10.1016/j.jtemb.2025.127660
Steinmann, I., Strietholt, R., y Braeken, J. (2022). A constrained factor mixture analysis model for consistent and inconsistent respondents to mixed-worded scales. *Psychological Methods*, *27*(4), 667–702. https://doi.org/10.1037/met0000392
Virtanen, P., Gommers, R., Oliphant, T. E., Haberland, M., Reddy, T., Cournapeau, D., Burovski, E., Peterson, P., Weckesser, W., Bright, J., van der Walt, S. J., Brett, M., Wilson, J., Millman, K. J., Mayorov, N., Nelson, A. R. J., Jones, E., Kern, R., Larson, E., . . . Vázquez-Baeza, Y. (2020). SciPy 1.0: Fundamental algorithms for scientific computing in Python. *Nature Methods*, *17*(3), 261–272. https://doi.org/10.1038/s41592-019-0686-2
Zakaria, M. U. M. A., Paul, D., Das, R., Bhowmik, S., Hoque, M. S., y Mamun, A.-A. (2022). Evaluation of occupational health management status and safety issues of the small-scale fisheries sector in Bangladesh. *International Maritime Health*, *73*(1), 10–19. https://doi.org/10.5603/IMH.2022.0002