



Indoor habitability and telework in Mazatlán: A preliminary review of a scale

Habitabilidad interior y teletrabajo en Mazatlán: revisión preliminar de una escala

Dámaris Alexandra Luna Sarabia¹  

Víctor Manuel Martínez García¹  

Yennifer Díaz Romero¹  

Pedro Antonio Valdez Lizárraga¹  

José de Jesús Reyes Machain¹  

Melissa Edith Salazar Echeagaray¹  

¹ Universidad Autónoma de Sinaloa, Vicerrectoría. Mazatlán, México.

Submitted: 01-07-2026 | Revised: 04-09-2026 | Accepted: 06-10-2026 | Published: 07-10-2026

Corresponding Author: Víctor Manuel Martínez García 

ABSTRACT

Working from home turned domestic space into a workplace, and its indoor habitability is related to the health and satisfaction of teleworkers. This instrumental, cross-sectional and exploratory study carried out a preliminary review of a fifteen-item scale with three dimensions, indoor comfort of the dwelling, adequacy of the dwelling for work and satisfaction with working from home, administered in the pilot survey of project FZ-HAB-0011 of the Factoriza UAS platform to people who work from home in Mazatlán, Sinaloa, Mexico. A preliminary cut of 17 cases, out of a target of 100, was analyzed with descriptive statistics, Cronbach's alpha, McDonald's omega, an exploratory factor analysis reported only as documentation, and Spearman correlations between dimensions. Comfort showed moderate internal consistency ($\alpha = .628$; $\omega = .694$), supported by temperature and ventilation, whereas adequacy ($\alpha = -.079$) and satisfaction ($\alpha = -.433$) did not behave as dimensions. Internet connection obtained the highest mean ($M = 4.35$), and end-of-day exhaustion, in its recoded version, the lowest ($M = 2.65$). The exploratory analysis grouped the three reverse-worded items in a single factor. The results do not estimate the properties of the scale, but they guide its revision before the final data cut.

Keywords: telework; working from home; indoor habitability; psychometric evidence.

RESUMEN

El trabajo desde la vivienda convirtió el espacio doméstico en lugar de trabajo, y su habitabilidad interior se relaciona con la salud y la satisfacción de quienes teletrabajan. Este estudio instrumental, transversal y exploratorio realizó una revisión preliminar de la Escala de habitabilidad interior y teletrabajo, con quince reactivos en tres dimensiones, Confort interior de la vivienda, Adecuación de la vivienda al trabajo y Satisfacción con trabajar desde casa, aplicada en el levantamiento piloto del proyecto FZ-HAB-0011 de Factoriza UAS a personas que trabajan desde su vivienda en Mazatlán, Sinaloa. Se analizó un corte preliminar de 17 casos, de una meta de 100, con estadísticos descriptivos, alfa de Cronbach, omega de McDonald, un análisis factorial exploratorio presentado solo como documentación y correlaciones de Spearman entre dimensiones. Confort mostró una consistencia interna moderada ($\alpha = .628$; $\omega = .694$), sostenida por la temperatura y la ventilación, mientras que Adecuación ($\alpha = -.079$) y Satisfacción ($\alpha = -.433$) no se comportaron como dimensiones. La conexión a internet obtuvo la media más alta ($M = 4.35$), y el agotamiento al final de la jornada, la más baja en su versión recodificada ($M = 2.65$). El análisis exploratorio agrupó los tres reactivos inversos en un mismo factor. Los resultados no estiman las propiedades de la escala, pero orientan su revisión antes del corte final.

Palabras clave: teletrabajo; trabajo desde casa; habitabilidad interior; evidencias psicométricas.

INTRODUCTION

Working from home ceased to be an exceptional situation. After the COVID-19 pandemic, a considerable proportion of workers perform their working day wholly or partly at home, and the dwelling, conceived for rest and family life, also became a place of work. A national survey of Spanish households conducted during the 2020 lockdown, with 1,800 questionnaires, found that teleworking spaces were insufficient in more than a quarter of the dwellings and that the perceived adequacy of those spaces was related to the tenure regime, the type and surface area of the dwelling, its indoor environmental quality, the availability of an exclusive space for working, and the quality of digital resources (Cuerdo-Vilches et al., 2021).

The consequences of telework for health are ambivalent. In two surveys of 25,058 and 18,859 office workers from Dutch public organizations required to work from home, home workspace, the presence of children, and organizational support were related to perceived productivity, and many of these relationships were mediated by indicators of physical, mental, and social health; inadequate furniture, sedentary behavior, and social isolation were among the explanations for health problems (Appel-Meulenbroek et al., 2023). In one national sample of employed individuals in Sweden, predominantly working from home was associated with worse general health, more sleep problems, and lower job satisfaction than working at the office (Rosander, 2026).

In Mexico, research on telework and housing is still scarce. A recent study with 202 teleworking individuals from the Mexican manufacturing sector developed one four-factor home work ergonomics questionnaire and noted that research linking the home work environment with musculoskeletal discomfort is limited in the country (Rodríguez-Orona et al., 2026). In the literature reviewed for this study, no brief instruments in Spanish were identified that would allow for a joint assessment of the interior comfort of the home, its suitability for work, and satisfaction with working from home in a city with a warm climate such as Mazatlán, where the temperature and ventilation of the home are decisive conditions for remaining in it during the workday.

The FZ-HAB-0011 project of the Factoriza UAS platform designed the Interior Habitability and Telework Scale, with 15 items organized into 3 dimensions—Interior Comfort of the Home, Suitability of the Home for Work, and Satisfaction with Working from Home—and initiated a pilot survey with people who work from home in Mazatlán. This article presents the results of the first preliminary round of that survey. The general objective is to conduct a preliminary review of the scale's functioning. The specific objectives are to describe the responses to the items, estimate the internal consistency of each dimension, explore the internal structure and the relationships among the dimensions, and identify the adjustments that the instrument requires before the final round.

Housing as a place of work

Interior habitability refers to the suitability of dwelling spaces for the activities carried out in them. When the dwelling becomes a workplace, work-specific requirements are added to comfort conditions: a fixed place, separation from family areas, a sufficient internet connection, and adequate furniture (Cuerdo-Vilches et al., 2021). In one study with 16 people who switched to working from home full-time, photographs of workstations showed less favorable postures than in the office and irregular adherence to ergonomic recommendations, although most participants who perceived changes in their productivity considered them positive (Black and St-Onge, 2022). One cluster-randomized trial in Japanese companies, with an educational program to improve home workstation organization, did not detect significant differences in workstation organization behaviors or somatic symptoms (Kanamori et al., 2026), suggesting that space conditions do not depend solely on the information of the person occupying it.

The reasons for working from home are diverse. In a national survey in the United States, the most valued reason for working from home was balancing work with caregiving responsibilities, followed by reduced commuting time and cost, lower exposure to illness, and preference for the home environment, with heterogeneous preference profiles among individuals (Bir et al., 2026). This diversity of motives anticipates that satisfaction with telework may have distinct components.

Indoor comfort: temperature, ventilation, light and noise

Indoor comfort depends on physical conditions that a person perceives directly. In the Hamburg city cohort, protection against annoying nighttime light, the entry of natural light, the sense of safety, and the quality of views from the windows were associated with lower levels of self-reported depression, and noise annoyance with higher levels (Ascone et al., 2024). A qualitative analysis of descriptions by London residents during lockdown examined how the acoustic environment of

the home was related to activities such as work and rest, and identified the characteristics of an ideal indoor soundscape for each (Torresin et al., 2022). Noise annoyance has also been associated with greater depression and anxiety in a meta-analysis of 13 studies (Gong et al., 2022).

In warm climates, indoor temperature is a critical condition. A systematic review with meta-analysis found that heat waves and extremely high temperatures were associated with a higher risk of mental and behavioral disorders (Li et al., 2023). For someone working at home in Mazatlán, temperature and air circulation are central conditions for maintaining the workday in the dwelling without continuously resorting to air conditioning, with the cost that this entails.

Satisfaction, isolation, and boundaries between work and home

Satisfaction with telework encompasses aspects that do not always align. A critical interpretive synthesis of 69 studies on telework in service occupations found that, in healthcare and social work professions, telework eroded the boundaries that contained the emotional burden of work, and that in call centers control was reconstituted through digital surveillance, with a collapse of the boundaries between work and home (Lee et al., 2026). Using data from five national surveys in the United States and 588,322 workers, Emanuel et al. (2026) estimated that the increase in remote work was accompanied by more time alone and worse mental well-being, especially among those living alone.

These findings suggest that the preference for working from home, perceived performance, time organization, and exhaustion at the end of the workday may vary independently. One person may prefer working from home because of the flexibility it offers for organizing their time and, at the same time, end the workday exhausted due to the lack of separation between work and domestic life. This possibility has implications for measurement, because a satisfaction dimension that combines these aspects may not behave as a coherent set.

Evidence of validity in the initial 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 assume them; simulation studies have compared the performance of both coefficients under different data conditions (Malkewitz et al., 2023). Internal structure is explored with exploratory factor analysis, which requires verifying the adequacy of the data and a sufficient sample size (Ferrando et al., 2022; Goretzko et al., 2021). Scales with items in both directions may show wording effects, because some individuals respond inconsistently to positively and negatively worded items of the same dimension, which can produce factors associated with wording direction (Steinmann et al., 2022), and identifying these responses may reduce such effects (García-Batista et al., 2021). The project scale includes a reverse-coded item in each dimension.

METHODS

Design

An instrumental, quantitative, non-experimental, cross-sectional study was carried out with a descriptive and exploratory scope. The data correspond to the survey LEV-0016, "Mazatlán Pilot · Interior habitability and teleworking", from the FZ-HAB-0011 project of the Factoriza UAS platform, and to the frozen dataset DST-0018, with a cut-off date of June 11, 2026. The survey constitutes an independent sample and is the only one of the project.

Population, sample, and data cutoff

The population was defined as people aged 18 years or older who work from home in Mazatlán, Sinaloa, and the survey was conducted with individuals contacted by the project lead. According to the Factoriza log, 33 people opened the questionnaire and 17 completed it; no cases were excluded due to quality control, so 17 cases were analyzed (Table 2).

The analyzed cut is preliminary: it includes 17 cases out of a target of 100, and the survey remained open, in field status, as of the cut-off date. With 17 cases for 15 items, the ratio is 1.1 cases per item.

Instrument

The Indoor Habitability and Telework Scale was applied, the name under which it appears in Factoriza's item dictionary. It consists of fifteen items with a 5-point response format, from Strongly disagree (1) to Strongly agree (5), organized into three dimensions of 5 items each. Interior comfort of the home (R1 to R5) assesses temperature, air circulation, distracting noise, natural light, and general comfort. Suitability of the home for work (R6 to R10) assesses the existence of a fixed place to work, its separation from family areas, internet connection, interruptions due to household activities, and the comfort of the furniture. Satisfaction with working from home (R11 to R15) assesses satisfaction, performance, preference for working at home over the office, exhaustion at the end of the workday, and time organization. Three items are worded in the reverse direction, R3, R9, and R14, and are recoded in the data matrix, so that a higher score indicates greater comfort, better suitability, and higher satisfaction. Table 1 presents the code, text, and direction of each item.

Table 1. Structure of the instrument.

Code	Reagent	Inverse
R1	The temperature inside my home is pleasant	No
R2	The air circulates inside my home	No
R3	There is noise inside my home that distracts me	Yes
R4	Natural light reaches the spaces I use	No
R5	I feel comfortable inside my home	No
R6	I have a fixed place to work within my home	No
R7	My workspace at home is separated from family areas	No
R8	The internet connection in my home allows me to work	No
R9	While I work at home, I am interrupted by household activities	Yes
R10	The furniture I use for work at home is comfortable	No
R11	I feel satisfied working from home	No
R12	I perform well in my work when I work from home	No
R13	I prefer working from home to working in an office	No
R14	When I finish my workday at home, I feel exhausted	Yes
R15	Working from home allows me to organize my time	No

Note. R1 to R5 = Interior comfort of the dwelling; R6 to R10 = Suitability of the dwelling for work; R11 to R15 = Satisfaction with working from home. The dimension column is omitted to preserve the legibility of the table. 5-point response scale (Strongly disagree, Disagree, Neither agree nor disagree, Agree, Strongly agree). Reverse-coded items are already recoded in the delivered matrix. Source: Factoriza UAS, project FZ-HAB-0011, survey LEV-0016, dataset DST-0018.

Procedure

Responses were collected through the survey questionnaire managed in Factoriza UAS, which records explicit online informed consent before the first item and does not collect identifying information. Factoriza froze the DST-0018 dataset with a cryptographic fingerprint, generated the matrix with the reverse-coded items recoded, and produced descriptive, internal consistency, and within-each-dimension correlation analyses (runs RUN-00088 to RUN-00094). Complementary analyses were performed using the data file and item dictionary exported by the platform.

Data processing

The 17 cases analyzed answered the 15 items, so there were no missing values and it was not necessary to impute responses, and no records with identical responses were found. Reverse-coded items were analyzed in the recoded version provided by the platform, and the supplementary program did not reverse any item again. The values in the tables were copied as produced by Factoriza UAS and the analysis program, without recalculating or rounding them again; when tables from the package were combined into a single table, dimension names were abbreviated or a column was omitted, and the table note states this. The correlations between the items of each dimension, calculated by Factoriza (Tables 5, 7 and 9 of the package), are cited in the text and are not reproduced in a table due to their length.

Data analysis

In a first stage, Factoriza UAS calculated the mean, standard deviation, skewness, kurtosis, and response percentages at the extreme values of each item; the internal consistency of each dimension using Cronbach's alpha (Cronbach, 1951), with corrected item-total correlation and alpha if the item was deleted, and Pearson correlations between the items of each dimension, with 95% confidence intervals by Fisher transformation. In a second stage, the program analisis_psicometrico.py, version 1.0, was run in Python 3.13.16 (Python Software Foundation, 2026), with NumPy 2.5.3 (Harris et al., 2020), SciPy 1.18.1 (Virtanen et al., 2020), and pandas 3.0.5. The program applies fixed and declared procedures, without manual intervention in the calculations.

For each dimension, the program estimated McDonald's total omega (McDonald, 1999/2013) using a single-factor model without reverse-scoring items. Internal structure was examined by exploratory factor analysis of the Pearson correlation matrix for the 15 items based on the 17 complete cases, using the Kaiser–Meyer–Olkin measure of sampling adequacy (Kaiser, 1974) and Bartlett's test of sphericity (1950). The number of factors was determined by parallel analysis (Horn, 1965) with 100 simulations and seed 2026. Extraction used the minimum residual method and oblimin rotation, which allows factors to correlate. Finally, associations among the mean scores of the three dimensions were estimated using Spearman's coefficient and its 95 % confidence interval, with Fisher's transformation and the Bonett and Wright standard error (2000). Reference values for psychometric indices are treated as guidelines rather than decision rules (Ferrando et al., 2022). No item was eliminated, and confirmatory factor analysis was not performed.

Ethical considerations

Participation was voluntary and anonymous. Factoriza UAS records express informed consent online and does not collect names, email addresses, or 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 descriptive and internal consistency analyses; a Python analysis program with fixed and validated procedures was used for omega, exploratory factor analysis, and correlations between dimensions; and the Claude Opus language model (Anthropic) was used to run this program, conduct the assisted literature search, draft a draft, and assemble the document from the results. The authors reviewed, corrected, and approved the entire text, verified each reference, and assume full responsibility for the content of the article.

RESULTS

Sample composition

Table 2 summarizes the case flow. Of the 33 people who opened the questionnaire, 17 completed it and were analyzed, with no exclusions due to quality control. The 17 analyzed cases answered the 15 items.

Table 2. Sample composition.

Indicator	Value
People who opened the questionnaire	33
Completed questionnaires	17
Cases excluded by quality control	0
Cases analyzed	17
Items	15

Note. Survey "Pilot Mazatlán · Indoor habitability and telework" (LEV-0016); population: people aged 18 years or older who work from their homes in Mazatlán; territory: Mazatlán, Sinaloa, with people contacted by the project lead. Dataset DST-0018, fingerprint d238325ad7f64bd9. Source: Factoriza UAS. Preliminary cutoff: n = 17 out of a target of 100, with the survey open.

Comfort, adequacy and satisfaction

Table 3 and Figure 1 present the descriptive statistics. In Interior comfort of the home, general comfort (R5: M = 4.18, SD = 0.88) and natural light (R4: M = 4.00, SD = 0.94) obtained the highest means, followed by temperature (R1: M = 3.94, SD = 0.97) and air circulation (R2: M = 3.76, SD = 1.30). Distracting noise, in the recoded version of the reverse item, obtained the lowest mean of the dimension (R3: M = 2.76, SD = 1.35), which indicates that indoor noise is a frequent distraction.

In Housing Adequacy for Work, internet connection (R8: M = 4.35, DE = 0.70), with 47% of responses at the maximum value, and work furniture (R10: M = 4.29, DE = 0.77) obtained the highest means of the instrument. The fixed place to work (R6: M = 3.59, DE = 1.18) and its separation from family areas (R7: M = 3.53, DE = 1.33) obtained intermediate values, and interruptions due to household activities, in the recoded version of the reverse item, the lowest mean of the dimension (R9: M = 2.71, DE = 1.05).

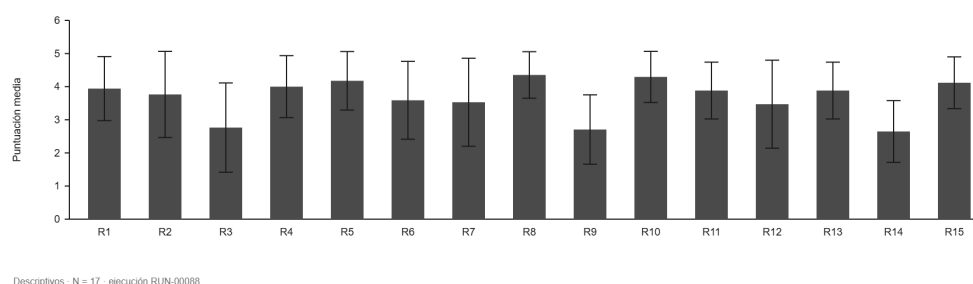
In Satisfaction with working from home, time organization (R15: M = 4.12, SD = 0.78) obtained the highest mean, followed by satisfaction (R11: M = 3.88, SD = 0.86) and preference for working at home versus the office (R13: M = 3.88, SD = 0.86), while performance (R12: M = 3.47, SD = 1.33) had an intermediate value and exhaustion at the end of the workday, in the recoded version of the reverse-coded item, the lowest mean of the instrument (R14: M = 2.65, SD = 0.93). Overall, respondents favorably rated the connection, furniture, light, and comfort of their homes, and reported high satisfaction with time organization, but also domestic interruptions, distracting noise, and exhaustion at the end of the workday.

Table 3. Descriptive statistics of the items.

Item	M	SD	Skewness	Kurtosis	Floor	Ceiling
R1	3.94	0.97	-0.81	0.13	12%	29%
R2	3.76	1.30	-0.86	-0.41	6%	35%
R3	2.76	1.35	0.31	-1.16	18%	12%
R4	4.00	0.94	-0.52	-0.56	6%	35%
R5	4.18	0.88	-1.00	0.76	6%	41%
R6	3.59	1.18	-0.63	-0.12	6%	24%
R7	3.53	1.33	-0.25	-1.15	6%	35%
R8	4.35	0.70	-0.63	-0.58	12%	47%
R9	2.71	1.05	0.30	0.25	12%	6%
R10	4.29	0.77	-0.59	-0.98	18%	47%
R11	3.88	0.86	-0.43	-0.08	6%	24%
R12	3.47	1.33	-0.65	-0.55	12%	24%
R13	3.88	0.86	0.24	-1.63	41%	29%
R14	2.65	0.93	-0.22	-0.54	12%	18%
R15	4.12	0.78	-0.22	-1.24	24%	35%

Note. N = 17. R1 to R5 = Interior comfort of the home; R6 to R10 = Suitability of the home for work; R11 to R15 = Satisfaction with working from home. Floor and ceiling indicate the percentage of responses at the minimum and maximum values. Reverse items R3, R9, and R14 are shown recoded. The item-total correlation column is omitted from the Factoriza descriptive table, whose values do not match those in Table 4 because they are not calculated over the total for each dimension. Factoriza UAS execution RUN-00088. Preliminary cutoff: n = 17 of a target of 100, with data collection open.

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



Note. N = 17. Scale from 1 to 5; reverse items R3, R9, and R14 are shown recoded. RUN-00088 execution by Factoriza UAS. Preliminary cut: n = 17 out of a target of 100, with data collection open.

Internal consistency

Table 4 brings together the item analysis by dimension calculated by Factoriza, and Table 5 presents the coefficients of the complementary program, whose alpha values coincide with those of Factoriza. Interior comfort of the dwelling obtained moderate internal consistency ($\alpha = .628$; $\omega = .694$). Air circulation was the most consistent item (R2: .745), followed by temperature (R1: .531), while distracting noise, the reverse item, had the weakest relationship (R3: .145), and its elimination would raise alpha to .715.

The other two dimensions obtained negative alphas. In Housing adequacy for work, the alpha was $-.079$ and the corrected item-total correlations ranged from $-.195$ (R9) to $.213$ (R10), with negative values for the separation of the workspace and for interruptions. In Satisfaction with working from home, the alpha was $-.433$ and the corrected item-total correlations ranged from $-.471$ (R14) to $.221$ (R15), with negative values for satisfaction, performance, and burnout. Because of these negative correlations, the program did not report omega for either of the two dimensions. A negative alpha indicates that the mean covariance between the items is negative, that is, that in this sample the items do not vary together.

Table 4. Item analysis by dimension.

Item	Corrected item-total r	α if the item is removed
R1	.531	.509
R2	.745	.331
R3	.145	.715
R4	.325	.600
R5	.283	.617
R6	.094	-.294
R7	-.151	.162
R8	.012	-.105
R9	-.195	.161
R10	.213	-.337
R11	-.033	-.521
R12	-.233	-.089
R13	.010	-.606
R14	-.471	.192
R15	.221	-.984

Note. N = 17. R1 to R5 = Interior comfort of the dwelling; R6 to R10 = Suitability of the dwelling for work; R11 to R15 = Satisfaction with working from home. The corrected item-total correlation excludes the item itself from the total for its dimension. Cronbach's α for the complete dimension, with 5 items each: Comfort = .628 (RUN-00089 execution); Suitability = $-.079$ (RUN-00091); Satisfaction = $-.433$ (RUN-00093). A negative alpha indicates that the average covariance among the items in the dimension is negative. Source: Factoriza UAS, Tables 4, 6, and 8 from the package, compiled without modifying values. Preliminary cutoff: n = 17 out of a target of 100, with data collection open.

Table 5. Internal consistency by dimension.

Dimension	Items	n	α	ω
Comfort	5	17	.628	.694
Adequacy	5	17	-.079	N/A
Satisfaction	5	17	-.433	N/A

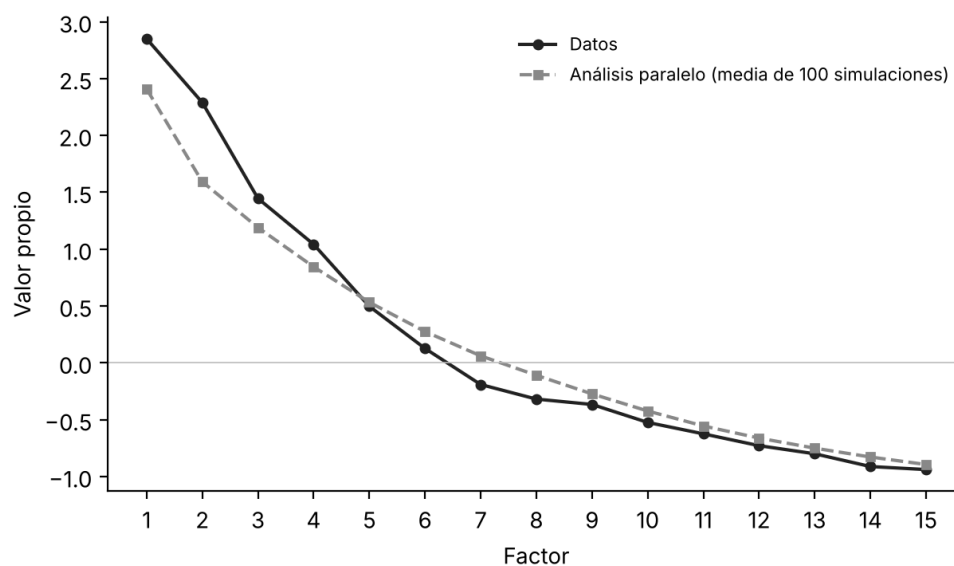
Note. α = Cronbach's alpha; ω = McDonald's total omega, obtained from a single-factor minimum residual model without reverse-scoring items. Complete cases by dimension. Comfort = interior comfort of the home; Adequacy = suitability of the home for work; Satisfaction = satisfaction with working from home. The program does not report ω for Adequacy or Satisfaction because some items correlate negatively with the rest of their dimension: R7 and R9 in Adequacy, and R11, R12, and R14 in Satisfaction; this observation is carried over from the corresponding column to this note. Source: own elaboration using analisis_psicometrico.py 1.0 (Python 3.13.16), dataset DST-0018_FZ_HAB_0011. Preliminary cut: n = 17 of a target of 100, with data collection still open.

The correlations among the items of each dimension calculated by Factoriza help interpret these results. In Comfort, temperature was related to air circulation (R1 and R2: $r = .784$, 95% CI [.487, .919], $p < .001$), and air circulation was related to natural light (R2 and R4: $r = .514$, 95% CI [.044, .797], $p = .035$); no other correlation in the dimension had an interval that excluded 0 (Table 5 of the package, RUN-00090). In Adequacy, no correlation had an interval that excluded 0; the highest was that between fixed place and furniture (R6 and R10: $r = .417$, 95% CI [-.079, .748], $p = .096$) (Table 7 of the package, RUN-00092). In the Satisfaction dimension, satisfaction was related to preference for working at home (R11 and R13: $r = .575$, 95% CI [.130, .827], $p = .016$), and the absence of exhaustion was negatively related to time organization (R14 and R15: $r = -.541$, 95% CI [-.811, -.081], $p = .025$); performance was negatively related to satisfaction and preference, with intervals that included 0 (R11 and R12, and R12 and R13: $r = -.332$) (Table 9 of the package, RUN-00094).

Internal structure

The correlation matrix showed an overall measure of sampling adequacy of .304, well below the .60 reference value used by the program, and Bartlett's test of sphericity rejected the hypothesis of an identity matrix, $\chi^2(105) = 169.47$, $p < .001$. The measure of sampling adequacy for each item was below .50 in 13 of the 15 items; only natural light (R4: .616) and furniture (R10: .635) exceeded it. With 17 cases for 15 items, these results and the factor solution are presented as documentation of the cutoff and not as evidence of the instrument's structure. The parallel analysis suggested 4 factors (Figure 2), which together explained 64.34 % of the variance, with percentages between 13.88 % and 18.61 % per factor (Table 7).

Figure 2. Scree plot with parallel analysis.



Note. Eigenvalues of the reduced data matrix versus the mean of 100 simulated matrices of the same size (seed 2026). Source: own elaboration with analisis_psicometrico.py 1.0 (Python 3.13.16), dataset DST-0018_FZ_HAB_0011. Preliminary cutoff: $n = 17$ out of a target of 100, with data collection still open.

Table 6 presents the full pattern matrix. None of the 4 factors reproduced any of the theoretical dimensions. The first factor grouped temperature (R1: .960), air circulation (R2: .819), furniture (R10: .648), fixed location (R6: .490), and internet connection (R8: .465). The second factor grouped time organization (R15: .933), natural light (R4: .731), separation of the workspace (R7: .503), and performance (R12: .480). The third factor grouped the 3 reverse-coded items of the instrument: domestic interruptions (R9: .874), distracting noise (R3: .871), and exhaustion at the end of the workday (R14: .613). The fourth factor grouped preference for working at home (R13: .877) and satisfaction (R11: .539), and, with a negative sign, performance (R12: -.547). Correlations between factors were low, ranging from -.060 to .121.

Table 6. Factor loadings from the exploratory factor analysis.

Item	Factor				h ²	MSA
	1	2	3	4		
R1	.960	-.083	-.021	-.093	.934	.262
R2	.819	.190	.175	.171	.789	.255
R3	.074	-.250	.871	.311	.899	.236
R4	.264	.731	.123	.239	.724	.616
R5	.361	.232	.089	-.008	.201	.412
R6	.490	.016	.001	-.328	.355	.321
R7	.089	.503	-.086	.435	.522	.453
R8	.465	-.439	-.215	.174	.427	.156
R9	-.056	.256	.874	-.253	.876	.291
R10	.648	-.095	-.243	-.164	.496	.635
R11	-.033	-.057	-.329	.539	.417	.204
R12	.280	.480	-.011	-.547	.566	.344
R13	-.021	.251	.014	.877	.884	.409
R14	-.011	-.375	.613	-.241	.641	.236
R15	-.129	.933	-.130	.049	.922	.303

Note. Pattern matrix. Minimum residual extraction and oblimin rotation ($\gamma = 0$) on the Pearson correlation matrix; 17 complete cases. h² = communality; MSA = measure of sampling adequacy per item. All loadings are shown. R1 to R5 = Interior comfort of the dwelling; R6 to R10 = Suitability of the dwelling for work; R11 to R15 = Satisfaction with working from home. The dimension and observation columns of the program are omitted to preserve readability; the observations were: R1, low MSA; R2, low MSA; R3, cross-loading and low MSA; R5, low MSA; R6, cross-loading and low MSA; R7, cross-loading and low MSA; R8, cross-loading and low MSA; R9, low MSA; R11, cross-loading and low MSA; R12, cross-loading, opposite sign, and low MSA; R13, low MSA; R14, cross-loading and low MSA; R15, low MSA. Source: prepared by the authors using analisis_psicometrico.py 1.0 (Python 3.13.16), dataset DST-0018_FZ_HAB_0011. Preliminary cutoff: n = 17 out of a target of 100, with data collection open.

Table 7. Variance explained by the factors.

Factor	Sum of squared loadings	% of variance	Cumulative %
1	2.79	18.61	18.61
2	2.57	17.13	35.73
3	2.21	14.73	50.46
4	2.08	13.88	64.34

Note. KMO = .304; Bartlett's test of sphericity: $\chi^2(105) = 169.47$, $p < .001$. Number of factors by parallel analysis: 4. Source: own elaboration with analisis_psicometrico.py 1.0 (Python 3.13.16), dataset DST-0018_FZ_HAB_0011. Preliminary cutoff: n = 17 of a target of 100, with data collection open.

Table 8 presents the Spearman correlations between the mean scores of the 3 dimensions. Comfort and Adequacy were positively related, $p = .631$, 95% CI [.168, .866], $p = .007$. The relationships of Satisfaction with Comfort, $p = .079$, 95% CI [-.418, .540], $p = .763$, and with Adequacy, $p = .208$, 95% CI [-.308, .629], $p = .424$, were weak and had intervals that included 0. Given that the mean Adequacy score combines items that do not vary together, the correlation of .631 should be interpreted with caution: the joint loading of temperature, air circulation, furniture, and fixed location on the first factor suggests that this association comes from some items and not from the dimension as a whole.

Discussion of Results

The purpose of this study was to conduct a preliminary review of the functioning of an indoor habitability and telework scale applied to people who work from home in Mazatlán. With 17 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 cut does not reach (Ferrando et al., 2022; Goretzko et al., 2021). The cut nevertheless allows clear identification of which parts of the scale require revision.

Table 8. Correlations between dimensions.

Dimension pair	n	ρ	IC 95 %	p
Comfort and Adequacy	17	.631	[.168, .866]	.007
Comfort and Satisfaction	17	.079	[-.418, .540]	.763
Adequacy and Satisfaction	17	.208	[-.308, .629]	.424

Note. Spearman's ρ between the mean scores of each dimension (cases with all items of both dimensions). Intervals calculated using the Fisher transformation with the Bonett and Wright standard error. Comfort = Interior comfort of the home; Adequacy = Adequacy of the home for work; Satisfaction = Satisfaction with working from home. Cross-sectional design: associations, not effects. Source: own elaboration with analisis_psicometrico.py 1.0 (Python 3.13.16), dataset DST-0018_FZ_HAB_0011. Preliminary cutoff: $n = 17$ of a target of 100, with data collection open.

Interior comfort of the dwelling was the only dimension with moderate internal consistency, supported mainly by the relationship between temperature and air circulation. This relationship is consistent with the conditions of a city with a warm climate, where ventilation is the main means of moderating indoor temperature without air conditioning, and with the importance of indoor environmental quality for the perceived suitability of teleworking spaces (Cuerdo-Vilches et al., 2021). Distracting noise, by contrast, was separate from the dimension. Indoor noise in a dwelling occupied by other people during the working day does not depend on the building envelope but on cohabitation, and the literature treats it as a source of annoyance with its own consequences (Gong et al., 2022; Torresin et al., 2022).

The adequacy of the home for work did not behave as a dimension. Its items describe distinct resources, such as a fixed place, spatial separation, connectivity, furniture, and the absence of interruptions, which need not coincide in the same home: a person may have good connectivity and comfortable furniture at a table shared with the family. The literature treats these resources as differentiated conditions of workspace adequacy (Cuerdo-Vilches et al., 2021; Rodríguez-Orona et al., 2026), and one negative alpha, in this case, indicates that the dimension brings together heterogeneous attributes rather than a defect in the items.

Satisfaction with working from home also did not function as a dimension, and its internal relationships are informative. Satisfaction and preference for working from home varied together, but perceived performance was negatively related to both, and time organization was associated with greater exhaustion at the end of the workday. This pattern is consistent with the ambivalence described in the literature: telework offers flexibility and is valued for its reconciliation with caregiving and savings in commuting (Bir et al., 2026), but it is also associated with the erosion of boundaries between work and home (Lee et al., 2026), with greater isolation and poorer mental well-being (Emanuel et al., 2026), and with more sleep problems (Rosander, 2026). Preferring to work from home and feeling exhausted upon finishing it are not extremes of the same disposition but distinct aspects of the experience.

The third factor of the exploratory analysis merits particular interpretation. It grouped the three reverse-coded items of the instrument (domestic interruptions, distracting noise, and exhaustion), a single item from each dimension. Two interpretations are possible. The first is content-related: the three items describe the interference of domestic life with work and its consequence at the end of the workday, a set consistent with the erosion of boundaries described in the literature (Lee et al., 2026). The second is methodological: items worded in the opposite direction may cluster by their wording rather than by their content (Steinmann et al., 2022). With 17 cases, it is not possible to distinguish between them, but the finding informs the revision of the instrument.

Implications for the revision of the instrument

The results suggest several adjustments. In Comfort, thermal comfort, which brings together temperature and ventilation, should be separated from acoustic and lighting comfort, with several items each. In Adequacy, workspace resources should be treated as a profile of conditions, assessed item by item, or grouped into more homogeneous subdimensions, such as space, which would include the fixed location and separation, and equipment, which would include connectivity and furniture. Domestic interruptions, indoor noise, and exhaustion could form their own dimension of work-home interference, worded in the direct direction to rule out method bias. In Satisfaction, a distinction should be made between preference and satisfaction with the modality, perceived performance, and depletion at the end of the workday.

The wording of some items also merits attention. Three items are worded in the masculine, "I feel comfortable," "I feel satisfied," and "I feel exhausted," which should be replaced with gender-neutral wording. It would also be advisable to record the teleworking modality, the number of

days per week working from home, the size of the dwelling, the number of people in the household, and the availability of air conditioning, in order to relate the experience to housing and household conditions. These proposals do not derive from the coefficients of the cutoff, which do not have the necessary precision to justify changes in specific items, but rather from the joint reading of the content of the scale, the reviewed literature, and the patterns that the cutoff reveals.

CONCLUSIONS

The study met its objective to the extent permitted by a preliminary sample of 17 cases: it does not provide estimates of the psychometric properties of the scale, but it identifies the adjustments it requires. Interior comfort of the home showed moderate internal consistency ($\alpha = .628$; $\omega = .694$), supported by the relationship between temperature and ventilation, whereas Home adequacy for work ($\alpha = -.079$) and Satisfaction with working from home ($\alpha = -.433$) did not behave as dimensions. Respondents rated the connection, furniture, and comfort of their home favorably, but reported household interruptions, distracting noise, and exhaustion at the end of the workday. The exploratory analysis, presented only as documentation, did not reproduce the theoretical dimensions and grouped the three reverse-scored items into a single factor.

The study has strengths. The analyzed dataset is frozen with a cryptographic fingerprint, the analyses were executed using fixed and declared procedures, and the complete program output is compiled in a reproducibility appendix, so that any reader can repeat the calculations with the same data. The early review of the instrument, before closing the survey, allows its structure to be corrected when this is still possible without losing the fieldwork.

The limitations are substantial. The sample of 17 cases, compared with the target of 100 and with data collection still open, is insufficient to estimate internal consistency accurately and does not allow an interpretable factor analysis, as shown by the sampling adequacy of .304. The surveyed individuals were contacted by the project lead, so the results cannot be generalized to those who work from home in Mazatlán, and their characteristics are not recorded in the project files. The study did not record the telework modality, the size of the dwelling, or household composition. The cross-sectional design does not allow establishing the direction of relationships, and no confirmatory factor analysis was performed.

These results give rise to decisions for the authors. The first is to reorganize the adequacy and satisfaction dimensions into more homogeneous subdimensions or to treat them as attribute profiles. The second is to decide whether domestic interruptions, indoor noise, and exhaustion constitute a distinct dimension of interference between work and home. The third is to record the telework modality and the characteristics of the housing and household. None of these decisions was made in the present analysis, which retains the 15 items.

As future lines of research, it is proposed to complete the survey up to the planned target, with people from different occupations, telework arrangements, and housing types; to repeat the internal consistency analysis and perform exploratory factor analysis with the final data cut; to confirm the structure in one independent sample through confirmatory factor analysis; and to complement the assessments with temperature and ventilation measurements in a subsample of dwellings. A scale with sufficient evidence of validity would make it possible to document the conditions under which work is carried out from home in Mazatlán and to guide recommendations for the design and adaptation of domestic spaces.

REFERENCES

1. Appel-Meulenbroek, R., Voulon, T., Bergefurt, L., Arkesteijn, M., Hoekstra, B., y Jongens-Van der Schaaf, P. (2023). Perceived health and productivity when working from home during the COVID-19 pandemic. *Work*, 76(2), 417–435. <https://doi.org/10.3233/WOR-220575>
2. Ascone, L., Mascherek, A., Weber, S., Fischer, D., Augustin, J., Cheng, B., Thomalla, G., Augustin, M., Zyriax, B.-C., Gallinat, J., y Kühn, S. (2024). Subjective evaluation of home environment and levels of self-reported depression in middle to old age: Results from the HCHS study. *Journal of Clinical Psychology*, 80(5), 1115–1129. <https://doi.org/10.1002/jclp.23656>
3. 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>
4. Bir, C., Jung, J., y Widmar, N. O. (2026). Understanding why people value working from home or hybrid workplace flexibility a study of preferences during the COVID-19 pandemic. *PLOS ONE*, 21(5), Artículo e0348206. <https://doi.org/10.1371/journal.pone.0348206>
5. Black, N. L., y St-Onge, S. (2022). Measuring pandemic home-work conditions to determine ergonomic recommendation relevance. *Work*, 71(2), 299–308. <https://doi.org/10.3233/WOR-210726>
6. Bonett, D. G., y Wright, T. A. (2000). Sample size requirements for estimating Pearson, Kendall and Spearman correlations. *Psychometrika*, 65(1), 23–28. <https://doi.org/10.1007/BF02294183>
7. Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika*, 16(3), 297–334. <https://doi.org/10.1007/BF02310555>
8. 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>
9. Emanuel, N., Harrington, E., y Pallais, A. (2026). Home alone: Remote work, isolation, and mental health. *Science*, 392(6802), Artículo eaec7671. <https://doi.org/10.1126/science.aec7671>
10. Ferrando, P. J., Lorenzo-Seva, U., Hernández-Dorado, A., y Muñoz, J. (2022). Decalogue for the factor analysis of test items. *Psicothema*, 34(1), 7–17. <https://doi.org/10.7334/psicothema2021.456>
11. 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>
12. Gong, X., Fenech, B., Blackmore, C., Chen, Y., Rodgers, G., Gulliver, J., y Hansell, A. L. (2022). Association between noise annoyance and mental health outcomes: A systematic review and meta-analysis. *International Journal of Environmental Research and Public Health*, 19(5), Artículo 2696. <https://doi.org/10.3390/ijerph19052696>
13. 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>
14. 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>
15. 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>
16. Kaiser, H. F. (1974). An index of factorial simplicity. *Psychometrika*, 39(1), 31–36. <https://doi.org/10.1007/BF02291575>
17. Kanamori, S., Wada, A., Kim, J., Umishio, W., Yoshimoto, T., Tsukinoki, R., Yoshioka, N., Yoshioka, K., Goshio, M., Nakata, Y., y Kai, Y. (2026). Effects of a telework environment intervention on work setup behaviors and somatic symptoms among Japanese teleworkers: A secondary analysis of the TELEWORK cluster randomized controlled trial. *Journal of Occupational Health*, 68(1), Artículo uiag042. <https://doi.org/10.1093/joccuh/uiag042>
18. Lee, J., Almomani, Y., Davis, A., Miller, M., Li, P., Cockayne, D., Premji, S., y MacEachen, E. (2026). Home-based telework and worker health and well-being across service occupations: A critical interpretive synthesis. *SSM - Population Health*, 35, Artículo 101951. <https://doi.org/10.1016/j.ssmph.2026.101951>
19. Li, D., Zhang, Y., Li, X., Zhang, K., Lu, Y., y Brown, R. D. (2023). Climatic and meteorological exposure and mental and behavioral health: A systematic review and meta-analysis. *Science of the Total Environment*, 892, Artículo 164435. <https://doi.org/10.1016/j.scitotenv.2023.164435>
20. Malkewitz, C. P., Schwall, P., Meesters, C., y Hardt, J. (2023). Estimating reliability: A comparison of Cronbach's α , McDonald's ω and the greatest lower bound. *Social Sciences & Humanities Open*, 7(1), Artículo 100368. <https://doi.org/10.1016/j.ssaho.2022.100368>
21. McDonald, R. P. (2013). *Test theory: A unified treatment*. Psychology Press. <https://doi.org/10.4324/9781410601087> (Obra original publicada en 1999)
22. Python Software Foundation. (2026). Python (Versión 3.13.16) [Software]. <https://www.python.org/>
23. Rodríguez-Orona, M. A., Maldonado-Macías, A. A., Balderrama-Armendariz, C. O., Gutiérrez-Hernández, M. G., Realyvásquez-Vargas, A., y Hernández Arellano, J. L. (2026). Design and preliminary psychometric validation of an ergonomics-oriented questionnaire applied to Mexican teleworkers in working from home conditions using exploratory and confirmatory factor analyses. *Ergonomics*. Publicación anticipada en línea. <https://doi.org/10.1080/00140139.2026.2740201>

24. Rosander, M. (2026). Working from home: Hybrid and predominantly home-based work in relation to work environment, job satisfaction, and health. *International Journal of Environmental Research and Public Health*, 23(4), Artículo 524. <https://doi.org/10.3390/ijerph23040524>
25. 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>
26. Torresin, S., Ratcliffe, E., Aletta, F., Albatici, R., Babich, F., Oberman, T., y Kang, J. (2022). The actual and ideal indoor soundscape for work, relaxation, physical and sexual activity at home: A case study during the COVID-19 lockdown in London. *Frontiers in Psychology*, 13, Artículo 1038303. <https://doi.org/10.3389/fpsyg.2022.1038303>
27. 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>

FUNDING

The authors did not receive funding for the development of this research.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

AUTHORSHIP CONTRIBUTIONS

Conceptualization: Dámaris Alexandra Luna Sarabia

Data curation: Pedro Antonio Valdez Lizárraga

Formal analysis: Víctor Manuel Martínez García

Research: Dámaris Alexandra Luna Sarabia

Methodology: Yennifer Díaz Romero

Project administration: Pedro Antonio Valdez Lizárraga

Software: Pedro Antonio Valdez Lizárraga

Supervision: Víctor Manuel Martínez García

Validation: Víctor Manuel Martínez García

Visualization: Yennifer Díaz Romero

Writing – original draft: Dámaris Alexandra Luna Sarabia

Writing – review and editing: Yennifer Díaz Romero