



Habitability of coastal public spaces and restorative well-being in Mazatlán: A preliminary review of a scale

Habitabilidad de espacios públicos costeros y bienestar restaurativo en Mazatlán: revisión preliminar de una escala

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ABSTRACT

Coastal public spaces are part of the habitability of seaside cities, and their use is associated with well-being and psychological restoration. This instrumental, cross-sectional and exploratory study carried out a preliminary review of a ten-item scale with two dimensions, coastal space quality and psychological recovery by the sea, administered in the pilot survey of project FZ-HAB-0006 of the Factoriza UAS platform to users of coastal public spaces in Mazatlán, Sinaloa, Mexico. A preliminary cut of 12 cases, out of a target of 100, was analyzed with descriptive statistics, Cronbach's alpha, McDonald's omega, inter-item correlations, an exploratory factor analysis reported only as documentation, and the Spearman correlation between dimensions. Recovery showed an alpha of .849, supported by its direct items, whereas its reverse-worded item departed from the dimension; quality showed an alpha of .109, suggesting that it groups heterogeneous attributes. Shade for resting was the lowest-rated attribute ($M = 2.08$), and forgetting one's worries was the recovery state with the highest mean ($M = 4.17$). The correlation between dimensions was close to zero ($p = -.038$). The results do not estimate the properties of the scale, but they guide its revision before the final data cut.

Keywords: blue space; coastal public space; psychological restoration; psychometric evidence.

RESUMEN

Los espacios públicos costeros forman parte de la habitabilidad de las ciudades con litoral, y su uso se asocia con el bienestar y la recuperación psicológica. Este estudio instrumental, transversal y exploratorio realizó una revisión preliminar de la Escala de condiciones del espacio costero y recuperación psicológica, con diez reactivos en dos dimensiones, Calidad del espacio costero y Recuperación psicológica junto al mar, aplicada en el levantamiento piloto del proyecto FZ-HAB-0006 de Factoriza UAS a personas usuarias de espacios públicos costeros de Mazatlán, Sinaloa. Se analizó un corte preliminar de 12 casos, de una meta de 100, con estadísticos descriptivos, alfa de Cronbach, omega de McDonald, correlaciones entre reactivos, un análisis factorial exploratorio presentado solo como documentación y la correlación de Spearman entre dimensiones. Recuperación obtuvo un alfa de .849, sostenido por sus reactivos directos, mientras que el reactivo inverso se apartó de la dimensión; Calidad obtuvo un alfa de .109, indicio de que reúne atributos heterogéneos. La sombra para descansar fue el atributo peor valorado ($M = 2.08$), y el olvido de las preocupaciones, el estado de recuperación con la media más alta ($M = 4.17$). La relación entre las dimensiones fue prácticamente nula ($p = -.038$). Los resultados no estiman las propiedades de la escala, pero orientan su revisión antes del corte final.

Palabras clave: espacios azules; espacio público costero; recuperación psicológica; evidencias psicométricas.

INTRODUCTION

The coast forms part of the habitability of cities that have a coastline. For those who live in a coastal city, the promenade, the beaches, and the public spaces facing the sea are places for strolling, exercise, meeting, and rest, and their quality determines the possibility of making use of them. A survey in 18 countries, with 16,307 participants, found that the frequency of recreational visits to green spaces, to inland blue spaces, and to coastal spaces during the previous four weeks was positively associated with well-being and negatively associated with psychological distress, and that the association between living near the coast and well-being largely disappeared when recreational visits were taken into account (White et al., 2021). The use of spaces, and not only their proximity, appears to be the main pathway of that relationship.

The literature on blue spaces has grown rapidly. A systematic evidence map gathered 139 studies on the mental health benefits of specific types and characteristics of blue spaces and found that coastal environments were the most studied, with 94 studies, that affect was the most frequently assessed outcome, and that most studies had been conducted in Europe and Asia (Beute et al., 2026). A scoping review of 44 experimental studies found that brief exposure to green and blue spaces was consistently associated with lower stress, better mood, and greater psychological recovery, and noted the scarcity of experiments on blue spaces (Sun et al., 2026).

Mazatlán is a coastal city with a warm climate, an extensive seaside promenade, and urban beaches used daily. However, in the literature reviewed for this study, no brief instruments in Spanish were identified that would allow users of coastal public spaces in a Mexican city to assess both the quality of those spaces and the psychological recovery they experience in them. Most instruments on perceived restoration have been developed for other settings, such as university spaces (Menardo et al., 2024), and evidence on blue spaces comes mainly from European and Asian countries (Beute et al., 2026).

The FZ-HAB-0006 project of the Factoriza UAS platform designed the Scale of Coastal Space Conditions and Psychological Recovery, with 10 items organized into 2 dimensions, Quality of Coastal Space and Psychological Recovery by the Sea, and initiated a pilot survey with users of coastal public spaces 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 responses to the items, estimate the internal consistency of each dimension, explore the internal structure and the relationship between the dimensions, and identify the adjustments that the instrument requires before the final round.

Blue spaces and psychological recovery

Restoration theories explain why natural environments are associated with well-being. Stress reduction theory and attention restoration theory propose, respectively, that these environments promote the recovery of stress responses and directed attention capacity; one systematic review of 124 studies on plants, light, and natural elements in confinement environments considered its findings consistent with both theories (Zandi and Wung, 2025). Water environments have been studied as a particular case. A systematic review with meta-analysis of 50 studies found that a greater amount of blue space in the residential area and greater contact with it were associated with higher levels of restoration, whereas shorter distance to these spaces was not associated with restoration (Georgiou et al., 2021).

The sounds of water are part of the coastal experience. A synthesis with meta-analysis of 18 publications found that natural sounds were associated with lower stress and annoyance and with better health and positive affect outcomes (Buxton et al., 2021). In the same survey in 18 countries, views of blue spaces from the home and recreational visits to green and blue spaces were associated with a lower likelihood of sleeping less than needed, and these associations were partly explained by better mental well-being (Martin et al., 2024).

The quality of coastal public spaces

The benefits of the coast depend on its conditions. A conceptual framework on coastal amenities and well-being indicated that the benefits of coastal environments are conditioned by their environmental quality, accessibility, and ease of use, and that environmental degradation and excessive use can reduce them (Lyddon, 2026). In warm climates, shade is among those conditions. In Bangkok, a survey of 1,200 users of 30 parks identified park quality as the main predictor of satisfaction, found low ratings of shade coverage, and identified protection from heat as the main barrier to access (Chanthanet, 2026). In a park in China, with 557 surveys, temperature parameters

were significantly lower in areas with tree shade than in open spaces (Zhang et al., 2025), and in Austin, Texas, tree shade at bus stops was associated with a smaller decline in passenger numbers during high temperatures (Lanza and Durand, 2021).

Heat is also related to psychological well-being. 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). In a city such as Mazatlán, shade, benches, and the cleanliness of the coastal space are conditions that can facilitate or hinder remaining by the sea. Perceived safety is another condition for the use of public space: the systematic review by te Braak and van Tienoven (2025) on women's perception of safety in urban public space proposed a framework in which personal, social, environmental, and temporal factors interact, such as the difference between day and night.

Attributes of space and recovery states: two measurement objects

The reviewed literature makes it possible to distinguish two types of content in the measurement of coastal experience. The first are assessments of spatial attributes, such as cleanliness, shade, benches, maintenance, and pedestrian accessibility, which depend on different design and management decisions and thus can vary independently of each other (Chanthanet, 2026; Lyndon, 2026). The second are the states that the person experiences, such as rest, calm, relief from worries, and mental clarity, which the restoration literature treats as manifestations of the same recovery process (Menardo et al., 2024; Sun et al., 2026). This distinction guides the interpretation of the results, because internal consistency can be expected in the second set, but not necessarily in the first.

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 among the 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). The 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 a portion of the people respond inconsistently to the positive and negative items of the same dimension (Steinmann et al., 2022), and identifying those responses can reduce such effects (García-Batista et al., 2021). The project scale includes a reverse-scored 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-0011, "Mazatlan coastal pilot · Coastal space and well-being", from the FZ-HAB-0006 project of the Factoriza UAS platform, and to the frozen dataset DST-0015, with a cut-off date of June 10, 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 individuals aged 18 years or older who use coastal public spaces in Mazatlán, Sinaloa, and the survey was conducted in coastal public spaces selected by the project lead. According to the Factoriza record, 21 individuals opened the questionnaire and 12 completed it; no cases were excluded due to quality control, so 12 cases were analyzed (Table 2).

The data cut analyzed is preliminary: it comprises 12 cases out of a target of 100, and data collection remained open, in fieldwork status, as of the date of the cut. With 12 cases for 10 items, the ratio is 1.2 cases per item.

Instrument

The Coastal Space Conditions and Psychological Recovery Scale was applied, the name under which it appears in the Factoriza item dictionary. It consists of ten items with a five-point respon-

se format, from Strongly disagree (1) to Strongly agree(5), organized into two dimensions of five items each. Coastal space quality (R1 to R5) assesses cleanliness, shade for resting, benches near the sea, neglect of the space, and ease of walking access. Psychological recovery by the sea (R6 to R10) assesses the feeling of rest, forgetting worries, recovery of calm, tiredness upon leaving the coast, and the possibility of clearing the mind. Two items are worded in the reverse direction, R4 and R9, and are recoded in the data matrix, so that a higher score indicates better space quality and greater recovery. Table 1 presents the code, text, and direction of each item.

Table 1. Structure of the instrument.

Code	Reagent	Inverse
R1	The coastal area I visit is clean	No
R2	There is shade for resting in the coastal area I visit	No
R3	There are benches to sit on near the sea	No
R4	The coastal area I visit is neglected	Yes
R5	I can easily walk to the coastal area I visit	No
R6	When I am by the sea, I feel rested	No
R7	Visiting the coast helps me forget my worries	No
R8	I regain my calm by the sea	No
R9	When I leave the coast, I feel just as tired as when I arrived	Yes
R10	Being on the coast allows me to clear my mind	No

Note. R1 to R5 = Coastal space quality; R6 to R10 = Psychological restoration by the sea. The dimension column is omitted to preserve table readability. 5-point response scale (Strongly disagree, Disagree, Neither agree nor disagree, Agree, Strongly agree). Reverse-coded items have already been recoded in the delivered matrix. Source: Factoriza UAS, project FZ-HAB-0006, survey LEV-0011, dataset DST-0015.

Procedure

Responses were collected using the survey questionnaire managed in Factoriza UAS, which records explicit online informed consent before the first item and does not collect identifying data. Factoriza froze dataset DST-0015 with a cryptographic fingerprint, generated the matrix with the reverse-coded items recoded, and produced the descriptive, internal consistency, and within-dimension correlation analyses (runs RUN-00073 to RUN-00077). Using the data file and item dictionary exported by the platform, complementary analyses were run.

Data processing

The 12 cases analyzed answered the 10 items, so there were no missing values and no responses needed to be imputed. Reverse-scored items were analyzed in the recoded version provided by the platform, and the supplementary program did not reverse any item again. Table values 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, a header was labeled, or a column was omitted, the table note states this. In the review of the data matrix, it was observed that case 5 responded with the minimum value on the 4 direct recovery items and, at the same time, on the original scale, disagreed that when leaving the coast they felt as tired as when arriving, a combination difficult to reconcile. The case was retained in the analysis.

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 the corrected item-total correlation and alpha if the item was removed, and Pearson correlations among the items of each dimension, with 95 % confidence intervals using the Fisher transformation. In a second stage, the program analisis_psiométrico.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, with no manual intervention in the calculations.

The program estimated McDonald's total omega (McDonald, 1999/2013) for each dimension from a single-factor model, without reverse-scoring items. Internal structure was explored by exploratory factor analysis of the Pearson correlation matrix of the 10 items and the 12 complete cases, using the Kaiser, Meyer and 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, and extraction was performed by minimum residual. Finally, the relationship between the mean scores of the two dimensions was estimated with Spearman's coefficient and its 95 % confidence interval, using Fisher's transformation with the Bonett and Wright standard error (2000). Reference values for psychometric indices are treated as guidelines and not as decision rules (Ferrando et al., 2022). No items were eliminated, 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 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 that program, conduct assisted literature searches, draft the manuscript, and assemble the document based on the results. The authors reviewed, corrected, and approved the entire text, verified every reference, and assume full responsibility for the content of the article.

RESULTS

Sample composition

Table 2 summarizes the case flow. Of the 21 individuals who opened the questionnaire, 12 completed it and were analyzed, with no exclusions due to quality control. The 12 analyzed cases answered all ten items.

Coastal space quality and psychological recovery

Table 3 and Figure 1 present the descriptive statistics. In Coastal Space Quality, shade for resting obtained the lowest mean of the instrument (R2: M = 2.08, DE = 0.79), followed by cleanliness (R1: M = 2.58, DE = 0.79) and absence of neglect, in the recoded version of the reverse item (R4: M = 2.67, DE = 0.65). Benches near the sea (R3: M = 3.25, DE = 1.14) and ease of access on foot (R5: M = 3.25, DE = 1.22) obtained the highest means of the dimension, slightly above the midpoint of the scale.

Table 2. Sample composition.

Indicator	Value
People who opened the questionnaire	21
Completed questionnaires	12
Cases excluded by quality control	0
Cases analyzed	12
Items	10

Note. Survey “Mazatlán Coast Pilot · Coastal Space and Well-being” (LEV-0011); population: persons aged 18 years or older who use coastal public spaces in Mazatlán; territory: Mazatlán, Sinaloa, in coastal public spaces selected by the project lead. Dataset DST-0015, fingerprint 01fa106c8c441da3. Source: Factoriza UAS. Preliminary cut: n = 12 of a target of 100, with the survey open.

In Psychological recovery by the sea, all means were above the midpoint. Forgetting worries (R7: $M = 4.17$, $SD = 1.27$), with 58% of responses at the maximum value, and the possibility of clearing the mind (R10: $M = 4.08$, $SD = 1.16$) obtained the highest means, followed by the recovery of calm (R8: $M = 4.00$, $SD = 1.13$), the sense of rest (R6: $M = 3.92$, $SD = 1.08$) and the absence of fatigue upon leaving, in the recoded version of the reverse-coded item (R9: $M = 3.75$, $SD = 0.62$). The four direct items had negative skewness, between -1.66 (R7) and -1.87 (R6), and positive kurtosis, between 2.54 (R7) and 4.79 (R6), which describes responses concentrated at the high values of the scale.

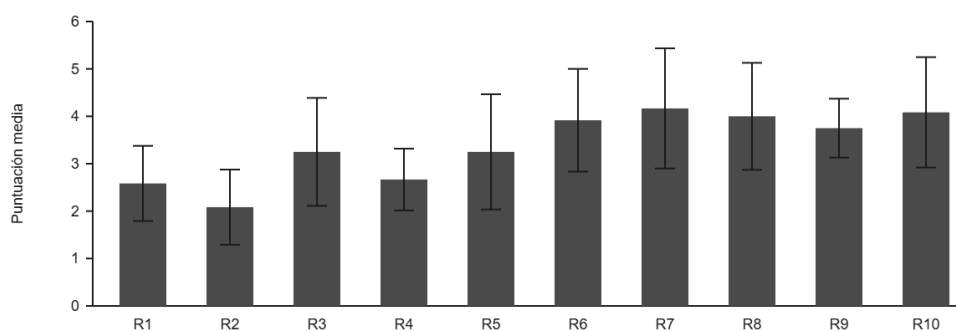
Overall, respondents rated the shade, cleanliness, and maintenance of the coastal spaces they visit unfavorably, benches and pedestrian access moderately, and reported high psychological restoration by the sea.

Table 3. Descriptive statistics of the items.

Item	M	SD	Skewness	Kurtosis	Floor	Ceiling
R1	2.58	0.79	-0.33	0.33	8%	8%
R2	2.08	0.79	1.15	2.72	17%	8%
R3	3.25	1.14	-1.03	-0.70	8%	67%
R4	2.67	0.65	0.44	-0.34	42%	8%
R5	3.25	1.22	-0.57	-0.84	8%	8%
R6	3.92	1.08	-1.87	4.79	8%	25%
R7	4.17	1.27	-1.66	2.54	8%	58%
R8	4.00	1.13	-1.82	4.33	8%	33%
R9	3.75	0.62	0.17	-0.09	33%	8%
R10	4.08	1.16	-1.85	4.13	8%	42%

Note. $N = 12$. R1 to R5 = Quality of the coastal space; R6 to R10 = Psychological recovery by the sea. Floor and ceiling indicate the percentage of responses at the minimum and maximum values. Reverse-coded items R4 and R9 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 run RUN-00073. Preliminary cut: $n = 12$ of a target of 100, with data collection open.

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



Descriptivos · $N = 12$ · ejecución RUN-00073

Note. $N = 12$. Scale from 1 to 5; reverse-coded items R4 and R9 are shown recoded. Run RUN-00073 by Factoriza UAS. Preliminary cutoff: $n = 12$ out of a target of 100, with data collection open.

Internal consistency

Table 4 presents the item analysis by dimension calculated by Factoriza, and Table 5 presents the coefficients from the supplementary program, whose alpha values match those from Factoriza. The two dimensions showed opposite behaviors. Psychological recovery by the sea obtained an alpha of .849. The corrected item-total correlations for the direct items ranged from .744 (R6) to .919 (R10), whereas that for the reverse-scored item, fatigue when leaving the coast, was -.219, and its elimination would raise alpha to .951. Because of this negative correlation, the program did not report the omega for the dimension.

Coastal space quality obtained an alpha of .109. The corrected item-total correlations were negative for cleanliness (R1: -.041), shade (R2: -.094), and the absence of neglect (R4: -.207), and only the benches near the sea reached a correlation of moderate magnitude (R3: .457), so that eliminating this last item would leave an alpha of -.688. Nor did the program report the omega for this dimension. The alpha close to zero indicates that, in this cross-section, the attributes of the coastal space do not vary together.

Table 4. Item analysis by dimension.

Item	Corrected item-total r	α if the item is removed
R1	-.041	.170
R2	-.094	.217
R3	.457	-.688
R4	-.207	.271
R5	.097	.007
R6	.744	.795
R7	.897	.744
R8	.905	.746
R9	-.219	.951
R10	.919	.740

Note. N = 12. R1 to R5 = Coastal space quality; R6 to R10 = Psychological recovery by the sea. The corrected item-total correlation excludes the item itself from the total of its dimension. Cronbach's α for the complete dimension, with 5 items each: Quality = .109 (RUN-00074 execution); Recovery = .849 (RUN-00076). Source: Factoriza UAS, Tables 4 and 6 of the package, compiled without modifying values. Preliminary cut: n = 12 out of a target of 100, with data collection open.

Table 5. Internal consistency by dimension.

Dimension	Items	n	α	ω
Quality	5	12	.109	n/a
Recovery	5	12	.849	n/a

Note. α = Cronbach's alpha; ω = McDonald's total omega based on a single-factor minimum-residual model, without reverse-scoring items. Complete cases per dimension. Quality = quality of the coastal space; Recovery = psychological recovery by the sea. The program does not report ω for either of the two dimensions because some items correlate negatively with the rest of their dimension: R1, R2, and R4 in Quality, and R9 in Recovery; this observation is carried over to the note from the corresponding column. Source: prepared by the authors using analisis_psicometrico.py 1.0 (Python 3.13.16), dataset DST-0015_FZ_HAB_0006. Preliminary cut: n = 12 out of a target of 100, with data collection open.

Table 6 presents all correlations between the items of each dimension. In Quality, correlations ranged from -.345 (R4 and R5) to .542 (R3 and R5), and none had an interval that excluded 0; the highest, between benches and pedestrian access, had an interval of [-.046, .851], $p = .069$. In Restoration, the four direct items were interrelated with correlations from .739 (R6 and R7) to .914 (R7 and R10, 95% CI [.715, .976], $p < .001$), all with intervals that excluded 0, while the correlations of the reverse item, with the others were negative or close to 0, ranging from -.439 (R6 and R9) to -.058 (R7 and R9), with intervals that included 0.

Internal structure

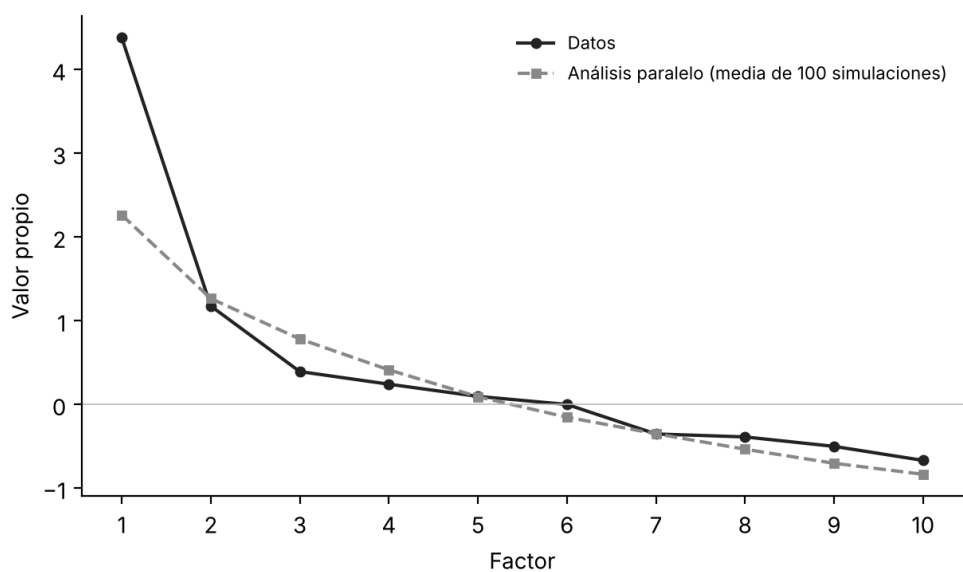
The correlation matrix showed a global sampling adequacy of .517, below the .60 reference used by the program, and Bartlett's test of sphericity rejected the hypothesis of an identity matrix, $\chi^2(45) = 84.12$, $p < .001$. With 12 cases for 10 items, these results and the factor solution are presented as documentation of the cutoff and not as evidence of the instrument's structure. Parallel analysis suggested a factor (Figure 2), which explained 43.81 % of the variance (Table 8).

Table 6. Correlations between the items of each dimension.

Dimension	Pair of variables	r	IC 95%	p
Quality	R1 and R2	.060	[-.532, .613]	.852
Quality	R1 and R3	.025	[-.557, .591]	.938
Quality	R1 and R4	.235	[-.392, .713]	.463
Quality	R1 and R5	-.259	[-.725, .370]	.416
Quality	R2 and R3	-.025	[-.591, .557]	.938
Quality	R2 and R4	-.293	[-.742, .337]	.355
Quality	R2 and R5	-.024	[-.590, .558]	.942
Quality	R3 and R4	-.000	[-.574, .574]	1.000
Quality	R3 and R5	.542	[-.046, .851]	.069
Quality	R4 and R5	-.345	[-.767, .286]	.273
Recovery	R6 and R7	.739	[.287, .922]	.006
Recovery	R6 and R8	.818	[.460, .947]	.001
Recovery	R6 and R9	-.439	[-.809, .181]	.154
Recovery	R6 and R10	.798	[.415, .941]	.002
Recovery	R7 and R8	.827	[.481, .950]	< .001
Recovery	R7 and R9	-.058	[-.611, .534]	.859
Recovery	R7 and R10	.914	[.715, .976]	< .001
Recovery	R8 and R9	-.130	[-.655, .480]	.688
Recovery	R8 and R10	.900	[.673, .972]	< .001
Recovery	R9 and R10	-.220	[-.705, .405]	.492

Note. N = 12. Quality = Quality of the coastal space; Recovery = Psychological recovery by the sea. Pearson correlation. Confidence intervals were obtained using Fisher's z transformation. Cross-sectional design: the reported relationships are associations. RUN-00075 and RUN-00077 runs from Factoriza UAS (Tables 5 and 7 of the package, combined without modifying values). Preliminary cut: n = 12 out of a target of 100, with data collection still open.

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-0015_FZ_HAB_0006. Preliminary cut: n = 12 out of a target of 100, with data collection ongoing.

Table 7 presents the loadings of the single factor. The four direct recovery items had the highest loadings, between .821 (R6) and .990 (R10), the latter with a communality of .980, very close to the limit of an improper solution. Ease of walking access (R5: .651) and benches near the sea (R3: .443) also loaded on the factor, whereas cleanliness (R1: -.362) and shade (R2: -.410) loaded in the opposite direction, and the absence of neglect (R4: .079) and tiredness on leaving (R9: -.224) did not reach a loading of .30. The item-level measure of adequacy was low, below .50, for R1, R2, R4, and R9, with the lowest value for R4 (.207).

Table 7. Factor loadings from the exploratory factor analysis.

Reagent	Factor 1	h ²	MSA
R1	-.362	.131	.321
R2	-.410	.168	.322
R3	.443	.197	.702
R4	.079	.006	.207
R5	.651	.423	.639
R6	.821	.675	.645
R7	.942	.888	.513
R8	.929	.863	.815
R9	-.224	.050	.309
R10	.990	.980	.571

Note. Pattern matrix. Minimum residual extraction and oblimin rotation ($\gamma = 0$) on the Pearson correlation matrix; 12 complete cases. h² = communality; MSA = measure of sampling adequacy per item. All loadings are shown. R1 to R5 = Quality of coastal space; R6 to R10 = Psychological recovery by the sea. The dimension and program observation columns are omitted, and the single-factor heading is labeled "Factor 1" to preserve readability; the observations were: R1, opposite sign and low MSA; R2, opposite sign and low MSA; R4, insufficient loading and low MSA; R9, insufficient loading and opposite sign and low MSA. With a single factor, rotation is not applied. Source: own elaboration with analisis_psicometrico.py 1.0 (Python 3.13.16), dataset DST-0015_FZ_HAB_0006. Preliminary cut: n = 12 of a target of 100, with data collection open.

Table 8. Variance explained by the factors.

Factor	Sum of squared loadings	% of variance	Cumulative %
1	4.38	43.81	43.81

Note. KMO = .517; Bartlett's test of sphericity: $\chi^2(45) = 84.12$, $p < .001$. Number of factors by parallel analysis: 1. Source: own elaboration with analisis_psicometrico.py 1.0 (Python 3.13.16), dataset DST-0015_FZ_HAB_0006. Preliminary cut: n = 12 out of a target of 100, with data collection open.

The Spearman correlation between the mean scores for Quality and Recovery was practically null, $\rho = -.038$, 95% CI [-.599, .548], $p = .907$. The interval, calculated with the Bonett and Wright standard error (2000), is so wide that the result is compatible with relationships of any sign. Since the analysis comprises a single pair of dimensions, the result is presented in the text and not in a table.

Discussion of results

The purpose of this study was to conduct a preliminary review of the functioning of a scale of habitability of coastal public spaces and psychological recovery in Mazatlán. With 12 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 subset does not reach (Ferrando et al., 2022; Goretzko et al., 2021). This subset does, however, allow a clear contrast to be identified between the two dimensions.

In its direct items, psychological recovery by the sea functioned as a coherent dimension. The feelings of rest, forgetting worries, recovering calm, and the possibility of clearing the mind varied together and yielded high mean scores, consistent with evidence linking contact with blue spaces to restoration (Georgiou et al., 2021) and brief exposure to these spaces to lower stress and better mood (Sun et al., 2026). Two caveats are warranted. First, the very high correlations and the communality close to unity for R10 may be due in part to a single case with extreme responses, which is common in such small samples.

Second, the reverse-scored item was not associated with the other items, a pattern compatible with the wording effects described in scales with items in both directions (García-Batista et al., 2021; Steinmann et al., 2022), although it could also reflect that physical fatigue after a visit to the beach, due to walking, sun, or heat, does not run counter to psychological recovery.

Coastal space quality, by contrast, did not behave as a dimension. Its items describe distinct attributes of space, such as cleanliness, shade, benches, maintenance, and pedestrian access, which depend on different design and management decisions and which the literature treats as differentiated components of quality (Chanthanet, 2026; Lyddon, 2026). A coastal space can have benches and good pedestrian access and at the same time lack shade or be dirty. With 12 cases, moreover, several items had reduced variability, which makes correlations unstable. The alpha close to zero should therefore be read as an indication that the dimension brings together heterogeneous attributes and not as an estimate of its reliability.

Shade for resting was the worst-rated attribute. In a city with a warm climate, this result is relevant, because shade is associated with more favorable thermal conditions in open spaces (Zhang et al., 2025), its absence is among the main barriers to the use of tropical parks (Chanthanet, 2026), and extreme heat is associated with a higher risk to mental health (Li et al., 2023). The fact that surveyed individuals reported high recovery despite rating shade and cleanliness poorly is consistent with the practically null relationship between the dimensions: recovery by the sea could depend more on the presence of water and its sounds (Buxton et al., 2021) than on the conditions of the equipment, although with 12 cases this interpretation is only a hypothesis for the final cut.

Implications for the revision of the instrument

The results suggest several adjustments. In Quality, it would be advisable to treat the attributes as a profile of space conditions, assessed item by item, or to group them into more homogeneous subdimensions with several items each—for example, comfort, which would include shade and benches; maintenance, which would include cleanliness and the absence of neglect; and accessibility, which would include pedestrian access and public transport access. It would also be advisable to incorporate perceived safety, a condition for the use of public space that the literature associates with social, environmental, and temporal factors (te Braak & van Tienoven, 2025). In Recovery, it would be advisable to review the wording of the reverse-coded item so that it distinguishes physical tiredness from mental fatigue, or to replace it with a direct item.

The wording of some items also deserves attention. Two items in the recovery dimension are worded in the masculine, “I feel rested” and “I feel equally tired,” which should be replaced with gender-neutral wording. It would also be advisable to record the coastal space visited, the time, duration, and frequency of the visit, because the experience on the boardwalk at midday differs from the experience on the beach at sunset. These proposals do not derive from the coefficients of the cut, which do not have the necessary precision to justify changes in specific items, but from the joint reading of the content of the scale, the literature reviewed, and the patterns that the cut reveals.

CONCLUSIONS

The study fulfilled its objective to the extent permitted by a preliminary set of 12 cases: it does not provide estimates of the scale’s psychometric properties, but it identifies the adjustments required. Psychological recovery by the sea obtained an alpha of .849, supported by its four direct items, whereas the reverse item departed from the dimension; Quality of the coastal space obtained an alpha of .109, indicating that it brings together heterogeneous attributes. The program did not report the omega for either of the two dimensions because of the presence of items with negative correlations. Respondents rated shade and cleanliness of coastal spaces unfavorably and reported high psychological recovery by the sea. The relationship between the dimensions was practically null, and the single-factor solution is presented only as documentation.

The study has strengths. The analyzed dataset is frozen with a cryptographic fingerprint, the analyses were run 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, makes it possible to correct its structure when this can still be done without losing the fieldwork.

The limitations are substantial. The sample of 12 cases, against a target of 100 and with data collection still open, is insufficient to estimate internal consistency accurately and does not allow

an interpretable factor analysis. The respondents answered in coastal spaces selected by the project leader, so the results cannot be generalized to users of the Mazatlán coast. The study did not record the space visited, the time, or the duration of the visit, and one case with extreme responses must be verified. The cross-sectional design does not allow establishing the direction of the relationships or attributing the reported recovery to the visit to the coast, and no confirmatory factor analysis was performed.

These results give rise to decisions for the authors. The first is to reorganize the quality dimension into more homogeneous subdimensions or to treat it as a profile of attributes of the space. The second is to review or replace the reverse-coded recovery item. The third is to record the coastal space visited, the time, and the duration of the visit. None of these decisions was made in the present analysis, which retains the ten items.

As future lines of research, it is proposed to complete the survey up to the planned target, with users of different coastal spaces and times; repeat the internal consistency analysis and perform exploratory factor analysis with the final data set; confirm the structure in an independent sample through confirmatory factor analysis, and complement the assessments with observations of shade, cleanliness, and equipment in each space. One scale with sufficient validity evidence would make it possible to guide the design and maintenance of Mazatlán's coastal public spaces based on the experience of those who use them.

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CONFLICT OF INTEREST

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