Case Report

Development and Validation of the Inventory of Stress and Resilience in Cross-Cultural Mobility (IERM-T)

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Development and Validation of the Inventory of Stress and Resilience in Cross-Cultural Mobility (IERM-T)

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Abstract

Background: The intensification of global mobility demands robust tools to assess the psychological impact of cross-cultural transitions. Existing instruments are critiqued for their failure to capture the dynamic stress-coping process, as outlined by Lazarus and Folkman's (1984) transactional model. **Aim:** This study developed and piloted the Inventory of Stress and Resilience in Cross-cultural Mobility (IERM-T), a novel instrument designed to fill this critical theoretical and psychometric gap. **Method:** The multilingual IERM-T (Portuguese, Spanish, English) was administered via a custom R Shiny application. A comprehensive R-based psychometric analysis was conducted on data from a pilot sample (N=42), performing exploratory factor analysis, reliability estimation, and longitudinal assessment of 107 emotion-coping episodes. **Results:** The IERM-T demonstrated strong psychometric properties: excellent internal consistency for the Symptoms scale (α = .938), good for Stressors and Emotions (α = .887), and acceptable for Well-being (α = .748). Factor analyses revealed clear structures (e.g., 2-factor for Stressors and Emotions), and longitudinal data confirmed stable emotional patterns. Criterion validity was robust, with a strong negative correlation between symptoms and a novel psychometric resilience score (r = -.846). **Conclusion:** The IERM-T provides a valid, reliable, and theoretically grounded tool that moves beyond cataloging stressors to dynamically assess appraisal, coping, and resilience, offering significant promise for research and clinical practice in cross-cultural contexts.

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Cross-cultural mobility has intensified in recent decades due to globalization, increased migratory flows, and the expansion of educational exchange programs (Abad, 2024; Leong & Liu, 2013). This mobility imposes significant challenges on individuals moving between cultures, requiring adaptation to new languages, social norms, and cultural environments, which can generate high levels of stress (Liu et al., 2022; Ward et al., 2001). Simultaneously, resilience can be strengthened through these experiences, transforming challenges into opportunities for personal and professional growth.

A systematic review of cross-cultural stress scales reveals significant limitations in existing instruments (Abad, 2025). Among 42 reviewed instruments, 83.3% focused on acculturative stress, yet 92.9% measured stressors while omitting cognitive appraisal and coping mechanisms, fundamentally neglecting the transactional nature of stress as proposed by Lazarus and Folkman (1984). Furthermore, 59.6% of instruments were derived from Western populations, and only 31.0% tested measurement invariance, indicating limited cultural validity. These findings highlight a critical paradox: while current scales demonstrate adequate reliability (mean α = 0.83), they measure superficial manifestations while ignoring core psychological processes.

The theoretical framework for understanding cross-cultural stress must integrate cultural dimensions that mediate stress experiences. Hofstede's cultural dimensions, particularly Individualism vs. Collectivism, Uncertainty Avoidance, and Power Distance, provide crucial insights

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into how cultural values shape both primary appraisal (threat perception) and secondary appraisal (coping resources) in stressful intercultural encounters (Abad et al., 2025; Hofstede et al., 2010). For instance, individuals from collectivistic cultures may experience heightened stress when navigating individualistic societies that emphasize autonomy over community support (Triandis, 1995; Wang et al., 2012).

To address these theoretical and methodological gaps, the project "Inventory of Stress and Resilience in Cross-cultural Mobility (IERM-T)" was conceived. The inventory is theoretically grounded in Lazarus and Folkman's (1984) transactional model of stress and coping while incorporating cultural dimensions relevant to cross-cultural mobility. The IERM-T was developed to fill critical gaps by providing a culturally competent, multilingual tool that holistically assesses stressors, cognitive appraisal, emotions, coping strategies, and well-being in cross-cultural contexts.

The primary objective of this study was to complete the construction of the IERM-T and obtain initial evidence of validity and reliability estimates. Specific objectives included: translating the inventory into Spanish and English; developing software for online application in three languages; obtaining evidence of validity based on internal structure and relations with other variables; estimating the inventory's reliability based on internal consistency; and analyzing the relationships between stress, resilience, and participants' demographic and mobility characteristics. This brief report focuses on the validation of the inventory conducted through a comprehensive R code analysis of the initial pilot data.

Method

Participants and Procedure

A non-probability sampling strategy, including online dissemination and targeted face-to-face recruitment in Northern Brazil (specifically Macapá, Oiapoque, and Belém), was employed. The selection of these locations was strategic, considering both logistical convenience and the unique opportunity presented by Belém hosting the COP30 climate conference in November 2025, which attracted diverse international populations. The final pilot sample consisted of 42 participants who completed the inventory. The sample was diverse in age (M = 43.24, SD = 14.07, range: 15-67). Data collection was conducted via a custom-built web application developed in *R Shiny*, which hosted the IERM-T in Portuguese, Spanish, and English.

Instrument: IERM-T

The IERM-T is a multidimensional instrument structured to capture the experiences of cross-cultural mobility through a transactional lens. It consists of five main components:

1. **Demographic Data:** Collects basic information (e.g., age, gender, country of origin, current country of residence, length of stay).
2. **Stressors:** 22 items assessing stress related to various aspects of cross-cultural life (e.g., language, work, discrimination, cultural isolation). Responses are on a 3-point categorical scale (Irrelevant, Positive, Stressful), capturing the most prevalent stressors identified in cross-cultural research: language barriers (64.3% of instruments), perceived discrimination (61.9%), and homesickness (50.0%) (Abad, 2025).
3. **Symptoms:** 36 items assessing the frequency of psychological and physical symptoms on a 5-point Likert scale (Never to Always).
4. **Well-being in Place of Residence:** 4 items assessing satisfaction with the current living environment on a 5-point Likert scale.
5. **Stressor Appraisal, Emotions, and Coping (Conditional):** For stressors rated as "Stressful", participants complete additional sections:

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a. **Appraisal:** Classification of the stressor as a Challenge, Loss, or Threat (primary appraisal).
b. **Emotions:** 16 items assessing the frequency of specific emotions, enabling analysis of emotional patterns in stress response.
c. **Coping:** Two scales (Coping A and B) assessing the frequency of different coping strategies (secondary appraisal resources).

This structure directly addresses the limitation that only 7.1% of existing cross-cultural stress instruments incorporate coping mechanisms (Abad, 2025).

Data Analysis

The psychometric validation was conducted using the *R* programming language (version 4.3.1) for full reproducibility and a comprehensive custom script, chosen over traditional software like SPSS or specialized tools like Factor for its superior reproducibility, analytical flexibility, and integration capabilities. This approach enabled a fully transparent and automated analytical pipeline, from data integrity checks to the generation of over 70 detailed outputs (tables and graphs), ensuring the complete traceability of all results. The use of *R* packages such as psych and lavaan provided access to robust, state-of-the-art psychometric methods, including bootstrapping with 5000 samples to enhance the robustness of estimates given the pilot sample size.

The analysis was structured into ten sequential stages (Table 1). These encompassed data preparation and integration, exploratory analyses, and rigorous psychometric evaluation of each scale (Stressors, Symptoms, Well-being), featuring internal consistency reliability (Cronbach's α and McDonald's ω) and Exploratory Factor Analysis (EFA). A key strength of this approach was the dedicated longitudinal analysis of Emotions and Coping, which leveraged multiple assessments per participant to model dynamic processes. The final stage involved integrated analyses, including the calculation of a novel "Psychometric Resilience" score, correlation matrices to establish criterion validity, multiple regression models, and demographic comparisons. This R-based framework directly addressed the methodological gaps identified in our systematic review by facilitating a nuanced, process-oriented validation that moves beyond the static snapshots typical of existing instruments.

Table 1. Complete Analysis Flow Summary.

Chunk	Description	Results
01	Initial setup and package loading	Environment configured, 35 packages loaded
02	Data loading and quality verification	5 databases loaded, 42 participants, structure validated
03	Transformation, integration and initial export	Integrated database created, scores calculated, 7 files exported
04	Exploratory analysis and variable relationships	4 relationship graphs, correlation matrix, descriptive analyses
05	Psychometric analysis of stressors	2 factors identified, Alpha=0.887, 11 tables exported
06	Psychometric analysis of symptoms	Multifactorial structure, Alpha=0.938, 10 tables and graphs
07	Psychometric analysis of well-being	Alpha=0.748 after correction, 11 tables and graphs
08	Longitudinal analysis of emotions and coping	107 longitudinal assessments, 2 emotional factors, 16 files

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09	Robust integrated analyses	3 regression models, resilience calculated, 19 files
10	Final report and consolidation	Complete report with all analyses

Analyses included descriptive statistics, internal consistency reliability (Cronbach's alpha, McDonald's Omega), Exploratory Factor Analysis (EFA), Principal Component Analysis (PCA), correlation matrices, and multiple regression. Bootstrapping (5000 samples) was used where appropriate to enhance the robustness of estimates with the limited sample size, addressing concerns about statistical power in initial validation studies.

Results

Psychometric Properties

Stressors Scale: The 22-item Stressors scale showed good internal consistency (α = .887). EFA revealed a clear two-factor structure interpreted as "Positive Stressors" and "Negative Stressors," accounting for a substantial portion of the variance. This aligns with research showing that cultural values influence whether situations are appraised as threatening or challenging (Abad et al., 2025; Lazarus & Folkman, 1984).

Symptoms Scale: The 36-item Symptoms scale demonstrated excellent internal consistency (α = .938), exceeding the average reliability (α = 0.83) reported in the systematic review of cross-cultural stress scales (Abad, 2025). Item-total correlations were all positive and substantial. Descriptive analysis identified the most frequent symptoms in the sample (see Table 2), including sleep problems (M = 3.17), excessive worry (M = 3.05), and pressure (M = 2.74). The scale exhibited a robust multifactorial structure.

Table 2. Most Frequent Symptoms in the Sample (N=42).

Symptom	Mean	SD	Categories	Total
SLEEP	3.17	0.881	5	42
EXCESSIVE WORRY	3.05	1.103	5	42
PRESSURE	2.74	0.989	5	42
CONCENTRATION	2.71	0.891	5	42
HEADACHE	2.64	1.078	5	42
LONELINESS	2.64	0.983	5	42
ENERGY	2.62	0.987	4	42

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LOWER BACK PAIN	2.60	1.061	5	42
MOOD	2.60	0.885	4	42
MEMORY	2.55	0.993	5	42

Well-being Scale: The 4-item Well-being scale showed acceptable internal consistency after polarity correction (α = .748; ω = .851). PCA confirmed a unidimensional structure, with all items loading strongly (> 0.7) on a single component. The mean well-being score was 12.45 (SD = 2.43) on a 4–20-point scale.

Emotions and Coping (Longitudinal Analysis): Analysis of 107 stressor appraisals from 39 participants (M = 2.7 assessments per participant) revealed a stable two-factor structure for the 16 emotions: "Positive Emotions" (e.g., love, happiness, hope) and "Negative Emotions" (e.g., fear, anger, sadness). The Emotions scale showed good reliability (α = .887). The two coping strategies (Coping A: M = 2.95, SD = 1.22; Coping B: M = 3.66, SD = 0.80) showed a negative correlation (r = -.291), suggesting complementary use. This longitudinal approach addresses the critical gap in existing instruments that typically capture static snapshots rather than dynamic processes (Abad, 2025).

Integrated Analyses and Validity Evidence

A composite "Psychometric Resilience" score was calculated. Integrated correlation analysis revealed strong, theoretically expected relationships.

- A strong negative correlation between Symptoms and Resilience (r = -.846).
- A moderate negative correlation between Symptoms and Well-being (r = -.431).
- A strong positive correlation between Well-being and Resilience (r = .846).

Table 3 presents the descriptive statistics for these integrated variables.

Table 3. Descriptive Statistics of Integrated Variables (N=42).

Variable	N	Mean	SD	Min	Max
STRESSORS SCORE	42	2.57	2.41	0.00	11.00
SYMPTOMS SCORE	42	80.55	20.22	42.00	128.00
WELL-BEING SCORE	42	12.45	2.43	7.00	16.00
PSYCHOMETRIC RESILIENCE	42	0.00	1.69	-3.54	2.95
AGE	42	43.24	14.07	15.00	67.00

Integrated correlation analysis revealed strong, theoretically expected relationships (see Table 4 for the complete matrix):

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Table 4. Complete Correlation Matrix between Main Variables.

Variable	Stressors	Symptoms	Well Being	Resilience	Age
STRESSORS	1.000	0.329	-0.191	-0.307	0.314
SYMPTOMS	0.329	1.000	-0.431	-0.846	0.232
WELL-BEING	-0.191	-0.431	1.000	0.846	-0.326
RESILIENCE	-0.307	-0.846	0.846	1.000	-0.330
AGE	0.314	0.232	-0.326	-0.330	1.000

Multiple regression analysis indicated that age was a significant predictor of well-being scores ($p = .0075$). Furthermore, significant differences in stressor scores were found between gender groups ($p = .040$), highlighting the importance of considering demographic variables in cross-cultural stress research.

Discussion

This study presented the development and initial validation of the IERM-T. The results provide strong preliminary evidence for the reliability and validity of the inventory based on its internal structure and relationships with other variables, while addressing critical theoretical and methodological gaps identified in existing cross-cultural stress instruments.

The instrument demonstrated high internal consistency across its major scales, particularly the comprehensive Symptoms scale, with reliability coefficients exceeding those reported in the systematic review of 42 cross-cultural stress scales (Abad, 2025). The identified factor structures for Stressors and Emotions align with theoretical expectations, differentiating between positive/adaptive and negative/maladaptive aspects of the cross-cultural experience. This differentiation is crucial given that cultural dimensions influence whether individuals appraise situations as threats or challenges (Abad et al., 2025; Hofstede et al., 2010).

The conditional assessment of appraisal, emotions, and coping for specific stressors provides a nuanced, process-oriented view consistent with Lazarus and Folkman's (1984) model. This directly addresses the major limitation identified in the systematic review, where 92.9% of instruments measured stressors while omitting cognitive appraisal and coping mechanisms (Abad, 2025). By integrating these transactional components, the IERM-T moves beyond cataloging suffering to capturing the dynamic resilience inherent to cross-cultural adaptation.

The strong negative correlation between symptoms and the derived resilience score provides robust evidence of criterion validity. The significant relationship between well-being and age, as well as the differences in stressor exposure by gender, underscore the importance of considering demographic variables in cross-cultural stress research. These findings align with research showing that factors like socioeconomic context, gender, and access to resources modulate the relationship between culture and stress (Abad et al., 2025).

The use of a custom *R* application for data collection and analysis in multiple languages was a particular strength, ensuring a seamless workflow from data entry to psychometric reporting while addressing the language bias prevalent in existing instruments (e.g., English-only administration

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limiting accessibility). The multilingual nature of the instrument from its inception enhances its cross-cultural applicability and addresses concerns about cultural validity in stress assessment.

Limitations and Future Directions

The primary limitation is the modest pilot sample size (N=42), which, while sufficient for initial exploratory analyses and reliability estimation, precludes more complex analyses like Confirmatory Factor Analysis or measurement invariance testing across cultural groups. This limitation is consistent with the broader field, where only 31.0% of instruments test measurement invariance (Abad, 2025). The longitudinal component, while rich, contained some missing data.

Future research should focus on collecting a larger, more diverse sample to conduct CFA and establish population norms. Cross-validation in specific sub-populations (e.g., international students, refugees) is recommended, particularly with attention to underrepresented regions such as Africa and the Middle East, which constituted ≤3.6% of participants in the reviewed studies (Abad, 2025). The development of a digital platform with automated feedback could enhance the IERM-T's utility in clinical and educational settings. Future studies should also explore the intersection of Hofstede's cultural dimensions with stress transactions to develop more culturally-informed interventions (Abad et al., 2025).

Conclusion

The IERM-T is a new, theoretically grounded instrument for assessing stress and resilience in cross-cultural mobility. The comprehensive *R*-based psychometric analysis of pilot data provides strong initial evidence for its validity and reliability. The inventory demonstrates a clear factor structure, high internal consistency, and meaningful relationships between its constructs. Most importantly, the IERM-T addresses critical gaps in existing cross-cultural stress assessment by integrating stressor-appraisal-coping pathways through a transactional lens, moving beyond the psychometric reductionism that characterizes 92.9% of existing instruments (Abad, 2025).

By capturing the dynamic interplay between environmental demands, cognitive appraisal, emotional responses, and coping strategies, the IERM-T shows significant promise as a tool for both research into the psychological adaptation of mobile populations and for clinical assessment to inform targeted interventions. As digital globalization intensifies cultural encounters, such comprehensive assessment tools are essential for progressing from cataloging suffering to empowering human transformation in the face of cultural transition.

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