

Translation and Validation of the Exercise Adherence Rating Scale (EARS) in the Gujarati Language

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DOI: <https://doi.org/10.52403/ijrr.20260454>

ABSTRACT

Exercise adherence is essential for achieving optimal rehabilitation outcomes; however, adherence to prescribed home exercise programs is often low. Accurate assessment requires reliable and culturally appropriate tools. The Exercise Adherence Rating Scale (EARS) is a validated self-reported measure of exercise adherence, but no Gujarati version is currently available. Therefore, this study aimed to translate, culturally adapt, and evaluate the reliability and validity of the Gujarati version of EARS (G-EARS).

Methods: This methodological study followed Beaton's guidelines for cross-cultural adaptation, including forward translation, synthesis, back translation, and expert committee review. For psychometric evaluation, 42 participants (mean age: 43.47 ± 8.84 years) with Type 2 Diabetes Mellitus (T2DM), back pain, and early osteoarthritis were recruited. Content validity was assessed using Content Validity Ratio (CVR), Item-Level Content Validity Index (I-CVI), and modified kappa statistics. Reliability was evaluated using test-retest reliability (Intraclass Correlation

Coefficient, ICC) and internal consistency (Cronbach's alpha).

Results: All items demonstrated excellent content validity (CVR = 1; I-CVI > 0.79; k = 1). The G-EARS showed excellent test-retest reliability (ICC = 0.87) and high internal consistency (Cronbach's alpha = 0.93), indicating strong reliability.

Conclusion: The Gujarati version of EARS (G-EARS) is a reliable and valid tool for assessing adherence to prescribed home exercise programs and can be effectively used in clinical and research settings among Gujarati-speaking populations.

Keywords: Exercise Adherence Rating Scale, cross-cultural adaptation, Exercise Compliance, Reliability, Content Validity Ratio, Item-Level Content Validity Index

INTRODUCTION

Exercise is an essential component of rehabilitation and is strongly recommended for the prevention and treatment of chronic illnesses. The benefits of exercise can only be achieved through adherence to a prescribed exercise regimen. Long-term adherence is crucial to maintaining these benefits. However, studies have found that

adherence to prescribed exercises is often low, thereby limiting the potential benefits.¹²³⁴⁵ It is essential to assess adherence appropriately, as it is a multidimensional construct influenced by factors such as the subject's condition, attitudes, psychosocial factors, and interactions with healthcare professionals.⁶

Adherence behavior can be evaluated after a subject has been oriented to perform prescribed exercises, but this does not provide reliable insight into adherence. Strategies that assess frequency or duration (e.g., adherence diaries) cannot fully capture adherence.⁷ Previous studies have shown that self-reported adherence diaries were commonly used, but they lacked accuracy and standardization, limiting their validity.⁸ Electronic devices such as accelerometers and pedometers are often used to measure adherence to exercise programs; however, they must be used consistently, and adherence may decline if they are not. Moreover, these devices do not record specific prescribed exercises.⁹¹⁰ Additionally, studies indicate that using electronic devices can increase exercise engagement, making it difficult to establish an accurate baseline measure.¹¹

The Exercise Adherence Rating Scale (EARS) was developed as a self-reported tool to assess adherence to prescribed exercises.¹² It is a reliable and valid instrument for evaluating adherence.¹³ When using such patient-reported outcome measures across different countries and cultures, translation and cultural adaptation are necessary. Furthermore, for questionnaires to be used in clinical and academic settings, their psychometric properties must be established.¹⁴ Originally developed in English, the EARS has been translated into Nepali, Brazilian Portuguese, and Japanese.

To our knowledge, there is no validated tool available to measure adherence to prescribed exercises in the Gujarati population. Therefore, the aim of this study is to translate and validate the Exercise

Adherence Rating Scale (EARS) in the Gujarati language.

MATERIALS & METHODS

The original English version of the Exercise Adherence Rating Scale (EARS) consists of a 16-item questionnaire divided into three sections. **Section A** includes five items related to general exercise habits and physical activity aimed at improving quality of life. This section allows individuals to provide qualitative information about their adherence behavior. **Section B** consists of six items that specifically assess adherence to prescribed exercises, evaluating whether individuals follow their exercise regimen as recommended. **Section C** contains ten questions that explore reasons for adherence or non-adherence, identifying barriers and facilitators to exercise.¹³

Sections B and C use a 5-point Likert scale (0 = completely agree, 4 = completely disagree). Items 1, 4, and 6 in Section B and Items 4, 5, 6, and 7 in Section C are reverse scored. Scores range from 0 to 24 in Section B, 0 to 40 in Section C, with a combined total of 0 to 64. Higher scores indicate better exercise adherence.¹³

Following approval from the original developer, the EARS was translated using Beaton's Guidelines, a widely used framework for cross-cultural adaptation.¹⁵ The process included five key steps. In **Step 1 (Forward Translation)**, two independent bilingual translators fluent in Gujarati and English (T1 and T2) translated the EARS into Gujarati. In **Step 2 (Synthesis of Translations)**, both versions were compared, discrepancies were resolved, and a common synthesized version (T12) was created. In **Step 3 (Back Translation)**, two independent translators (BT1 and BT2), who were blinded to the original English version and had no medical background, translated T12 back into English to ensure validity and highlight any conceptual errors or inconsistencies. In **Step 4 (Expert Committee Review)**, a panel of experts reviewed the original, forward-translated, synthesized, and back-translated versions to

ensure cultural and conceptual equivalence. A pre-final version of the Gujarati EARS (G-EARS) was developed. In **Step 5 (Pre-Final Version Testing)**, a pilot study was conducted on 20 individuals with Type 2 Diabetes Mellitus (T2DM) who were not included in the final reliability and validity testing. Participants completed the G-EARS and provided feedback on difficult or unclear questions. No ambiguities were reported, and based on their feedback, the pre-final version was approved as the final version of G-EARS by the expert committee.

For validation, 42 participants with T2DM were recruited. After obtaining informed consent, participants completed G-EARS, rating their exercise adherence and reasons for adherence/non-adherence based on their exercise performance over the past two weeks. To establish face and content validity, a panel of clinical experts evaluated the G-EARS using a consensus method. Each item was assessed for clarity, simplicity, and ambiguity and rated as 1 (Rejected), 2 (Accepted with modifications), or 3 (Accepted without modifications).¹⁶ Content Validity Ratio (CVR) was calculated based on the number of accepted items relative to the total number of experts, with a CVR > 0.62 considered acceptable.¹⁷ The Item-Level Content Validity Index (I-CVI) was determined by dividing the number of experts who rated an item as 3 by the total number of experts, with I-CVI \geq 0.79 considered acceptable.¹⁷ Modified kappa statistics were used to assess the chance agreement between experts, with kappa values categorized as > 0.74 (Excellent), 0.60–0.74 (Good), and 0.40–0.59 (Fair).¹⁸⁻¹⁹

To assess test-retest reliability, the 42 participants completed G-EARS twice, with a one-week interval between tests. Intraclass Correlation Coefficient (ICC) was calculated to determine reliability, with values categorized as > 0.80 (Excellent), 0.60–0.79 (Substantial), 0.40–0.59 (Moderate), and < 0.40 (Fair). A minimum

acceptable ICC value of > 0.70 was considered sufficient for reliability.²⁰

This study followed a rigorous methodology to ensure that the Gujarati version of the Exercise Adherence Rating Scale (G-EARS) was accurately translated, culturally adapted, and psychometrically validated, making it a reliable tool for assessing exercise adherence in Gujarati-speaking populations.

Statistical Analysis

All statistical analyses were performed using IBM SPSS Statistics version 22. Descriptive statistics were used to summarize participant characteristics and item scores, expressed as mean and standard deviation.

The internal consistency of the Gujarati version of the Exercise Adherence Rating Scale (G-EARS) was assessed using Cronbach's alpha coefficient, with values between 0.70 and 0.95 considered acceptable.

Test-retest reliability was evaluated using the Intraclass Correlation Coefficient (ICC) with a two-way random-effects model and absolute agreement. An ICC value of \geq 0.70 was considered indicative of acceptable reliability.

Content validity was assessed using the Content Validity Ratio (CVR) and Item-Level Content Validity Index (I-CVI). The modified kappa statistic was calculated to determine agreement beyond chance among experts. A CVR value >0.62 and an I-CVI \geq 0.79 were considered acceptable. Kappa values were interpreted as >0.74 (excellent), 0.60–0.74 (good), and 0.40–0.59 (fair).

A significance level of $p < 0.05$ was considered statistically significant for all analyses.

RESULT

A total of 42 participants were included in the study, with a mean age of 43.47 years (SD = 8.84). Among them, 14 were male (33.33%) and 28 were female (66.66%) (Table 1). The distribution of conditions among participants included 18 individuals

(42.85%) with Type 2 Diabetes Mellitus (T2DM), 14 individuals (33.33%) with back pain, and 10 individuals (23.80%) with early osteoarthritis (Table 2).

Table 2: Participant Conditions

Condition	n (%)
T2DM	18 (42.85)
Back Pain	14 (33.33)
Early Osteoarthritis	10 (23.80)

Table 1: Baseline Characteristics (n=42)

Variable	Mean (SD)	n (%)
Age	43.47 (8.84)	
Male		14 (33.33)
Female		28 (66.66)

Table 3 presents the mean scores for the six-item adherence rating scale and the ten-item scale assessing reasons for adherence and non-adherence.

Table 3: Mean Scores of Exercise Adherence and Reasons for Adherence/Non-Adherence

Section B (Exercise Adherence Rating Scale)	Mean (SD)	Section C (Reasons for Adherence/Non-Adherence)	Mean (SD)
1	2.6 (1.1)	1	2.9 (1.2)
2	2.4 (1.4)	2	2.5 (1.3)
3	2.5 (1.5)	3	2.1 (1.2)
4	2.4 (1.3)	4	2.3 (1.1)
5	2.5 (1.4)	5	2.5 (1.4)
6	2.8 (1.5)	6	2.3 (1.4)
		7	2.1 (1.2)
		8	1.4 (4.1)
		9	1.2 (1.1)
		10	2.8 (1.4)

Face Content Validity

The CVR value for all six items of the G-EARS was 1, exceeding the threshold of 0.62, confirming approval for each item. The I-CVI value for each item was greater than 0.79, indicating strong content validity. The chance of agreement (k) was also 1, which is considered excellent (Table 4).

Reliability

The intraclass correlation coefficient (ICC) for test-retest reliability was found to be **0.87**, indicating excellent reliability. Additionally, the internal consistency of the G-EARS, as assessed by Cronbach's alpha, was **0.93**, confirming high reliability.

Table 4: CVR, I-CVI, and Kappa Values for Each Item of G-EARS

Item	Number of Experts "Accepted" (Ne)	CVR	I-CVI	k
1	8	1	1	1
2	8	1	1	1
3	8	1	1	1
4	8	1	1	1
5	8	1	1	1
6	8	1	1	1

DISCUSSION

The present study aimed to translate and culturally adapt the Exercise Adherence Rating Scale (EARS) into Gujarati and to evaluate its psychometric properties in selected clinical populations. The findings of this study demonstrate that the Gujarati version of EARS (G-EARS) is a reliable and valid tool for assessing adherence to prescribed home exercise programs. The internal consistency of G-EARS

(Cronbach's alpha = 0.93) indicates excellent reliability and is comparable to, or slightly higher than, the original English version ($\alpha = 0.81$) and previously validated translations in Japanese ($\alpha = 0.81$), Brazilian Portuguese ($\alpha = 0.88$), and Nepali ($\alpha = 0.94$).^{13,21-23} This suggests that the translated items maintain strong inter-item correlation and measure a unified construct of exercise adherence.

The test–retest reliability of G-EARS (ICC = 0.87) further confirms the temporal stability of the instrument, indicating that it produces consistent results when administered across time in stable conditions. These findings are consistent with previous studies validating EARS in different languages, which have reported good to excellent reliability coefficients.²¹⁻²³

High reliability is essential for ensuring that the tool can be confidently used in both clinical practice and research settings to monitor adherence behavior.

Content validity was rigorously evaluated using the content validity ratio (CVR), item-level content validity index (I-CVI), and modified kappa statistics. All items demonstrated CVR values above the acceptable threshold of 0.62, indicating that they were considered essential by expert panel members.¹⁹ The I-CVI values were within acceptable limits, and the modified kappa coefficients indicated excellent agreement, confirming that the translated items retained their conceptual relevance and cultural appropriateness. These results suggest that the translation and cross-cultural adaptation process was methodologically sound and preserved the integrity of the original scale.

Exercise adherence is a critical determinant of treatment outcomes in physiotherapy and rehabilitation, particularly in chronic conditions such as low back pain, osteoarthritis, and type 2 diabetes mellitus (T2DM).²⁴⁻²⁵ Poor adherence to prescribed home exercise programs is a well-documented challenge and is associated with suboptimal recovery, increased disability, and higher healthcare costs.²⁶ Therefore, the availability of a culturally adapted and validated tool such as G-EARS is highly valuable for accurately assessing adherence in Gujarati-speaking populations. From a clinical perspective, G-EARS can facilitate improved patient–clinician communication by enabling patients to express their adherence behaviors in their native language. This can enhance patient engagement, promote individualized care

planning, and support better monitoring of rehabilitation progress. Furthermore, the use of standardized adherence measures allows clinicians to identify barriers to adherence and implement targeted interventions, such as motivational strategies, behavioral modification techniques, and patient education programs, to improve long-term outcomes.²⁷

Despite these strengths, the study has certain limitations. The validation of G-EARS was conducted in a limited range of clinical populations, specifically individuals with back pain, T2DM, and early osteoarthritis. As a result, the generalizability of the findings to other patient groups, such as neurological or cardiopulmonary populations, remains uncertain. Additionally, responsiveness was assessed over a short duration of one week, which may not adequately capture long-term changes in adherence behavior. The relatively small sample size may also limit the robustness of the findings.

Future research should aim to validate G-EARS in larger and more diverse populations, including patients with different clinical conditions and varying levels of functional impairment. Longitudinal studies are needed to assess responsiveness over extended periods and to establish additional psychometric properties such as construct validity, criterion validity, and minimal clinically important difference (MCID). Incorporating objective measures of adherence alongside self-reported tools may also enhance the accuracy of assessment.

To the best of our knowledge, G-EARS is the first validated Gujarati-language instrument specifically designed to assess adherence to prescribed home exercise programs. Given its strong reliability and validity, it can be effectively utilized in both clinical and research settings. The integration of G-EARS into routine physiotherapy practice has the potential to improve adherence monitoring, guide evidence-based interventions, and ultimately enhance patient outcomes in rehabilitation.

CONCLUSION

The Gujarati version of the Exercise Adherence Rating Scale (G-EARS) was successfully translated and culturally adapted. It is a reliable and valid tool for assessing adherence to prescribed home exercises. The findings of this study support the use of G-EARS in both research and clinical practice, potentially improving exercise-related outcomes in Gujarati-speaking populations.

Declaration by Authors

Acknowledgement: None

Source of Funding: None

Conflict of Interest: The authors declare no conflict of interest.

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How to cite this article: Kaushikkumar Khalapbhai Patel, Shraddha Jasmin Diwan, Sweta Jagdishchandra Upadhyay. Translation and validation of the exercise adherence rating scale (EARS) in the Gujarati Language. *International Journal of Research and Review.* 2026; 13(4): 534-540. DOI: <https://doi.org/10.52403/ijrr.20260454>
