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TRANSLATION AND PSYCHOMETRIC EVALUATION OF THE GUJARATI VERSION OF THE GLOBAL PHYSICAL ACTIVITY QUESTIONNAIRE (GPAQ)

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Abstract

Background: The Global Physical Activity Questionnaire (GPAQ) is an internationally recognized tool for measuring physical activity, but until now, no validated Gujarati version existed.
Objective: This study aimed to translate the GPAQ into Gujarati, culturally adapt it, and assess its validity and reliability among Gujarati-speaking adults.
Methods: Using standard translation and cultural adaptation guidelines, the GPAQ was translated into Gujarati through a multi-step process involving forward and backward translation, expert review, and pilot testing. Face and content validity were evaluated by professionals in the field. The Gujarati GPAQ was then administered to 30 adult participants from Ahmedabad, Gujarat, who completed both the Gujarati and the original English versions. Internal consistency, test–retest reliability, and concurrent validity were statistically assessed.
Results: The translation process produced a clear, culturally appropriate Gujarati GPAQ. Expert reviewers confirmed strong face and content validity. Internal consistency was excellent (Cronbach's alpha 0.991–0.999), and test–retest reliability was also high (ICC 0.991–0.999). Scores from the Gujarati version closely matched those from the English version (correlation coefficients 0.979–0.997, $p < 0.001$). Most participants were classified as highly physically active.
Conclusion: The Gujarati version of the GPAQ is a reliable and valid instrument for assessing physical activity among Gujarati-speaking adults. Its use will help researchers and public health professionals gather accurate physical activity data in this population.

Introduction

Physical activity is typically defined as any bodily movement produced by skeletal muscles that requires energy expenditure and contributes to overall health.[1] Physical inactivity refers to insufficient physical activity or exercise to meet established health recommendations and is the fourth leading risk factor for global mortality, according to the WHO. The absence of adequate physical activity is linked to obesity and subsequent health problems.[2]

Regular physical activity can enhance both physical health and mental health.[5.] It offers a wide display of benefits,

including a reduced risk of certain musculoskeletal disorders, enhanced cardiovascular health & fitness, elevates mood, and improves cognitive functions like focus, concentration, memory, and general brain functioning, leading to increased engagement in daily work and overall psychological satisfaction [3, 4]

Research indicates that evaluating physical activity in epidemiological settings is often complex. Self-reported questionnaires continue to be widely used because they are inexpensive, simple to administer, and place minimal burden on participants. However, they have notable drawbacks when estimating physical activity. Such tools are helpless to both over- and underreporting of true activity levels, energy expenditure, and sedentary time due to recall errors, social desirability biases, and general memory inaccuracies. Additionally, self-report measures cannot reliably capture the absolute intensity or duration of physical activity. To overcome these shortcomings, many large-scale population studies incorporate device-based monitoring methods such as pedometers and accelerometers. Pedometers count steps, while accelerometers measure bodily movement as acceleration signals, enabling more refined estimates of activity intensity, duration, and associated energy expenditure[6, 7.]As per low- and middle-income contexts, pedometers are often preferred because they are inexpensive and provide instant feedback. Nevertheless, their accuracy is limited, with error margins reaching 30% or more for energy expenditure, compared with around 2.5% reported for accelerometers.[8.]

A variety of physical activity questionnaires have been developed worldwide, most originating from high-income countries, with fewer instruments tailored for low- and middle-income settings such as India.[9] [10.] The use of different questionnaires across studies often results in inconsistent findings, making cross-country and within-country comparisons difficult.[11.]

To improve standardization in surveillance, the World Health Organization (WHO) introduced the Global Physical Activity Questionnaire (GPAQ) [12,] which assesses physical activity across work, transport, and leisure domains and is now widely used internationally.

The Global Physical Activity Questionnaire (GPAQ) has been validated in multiple countries, including India, using device-based methods such as pedometers and accelerometers, and is recommended by the World Health Organization for population surveillance.[25,]

[26.] However, studies have reported only moderate correlations with device measures and highlighted possible misclassification of activity intensity, underscoring the need

for careful cultural adaptation and validation in new settings.[14, 15, 16, 17.]

There are very few studies available on GPAQ in the Indian population.[18.19,23] To the best of the author's knowledge, no Gujarati adaptation of the GPAQ is available yet. To assist Gujarati researchers, we have translated and adapted the GPAQ into Gujarati.

The objective of this study is to translate the Global Physical Activity Questionnaire (GPAQ) into Gujarati & establish the reliability and validity of the Gujarati version of the GPAQ.

Material and Methods

This cross-sectional study was conducted in Ahmedabad, Gujarat, India, as part of a larger, yet unpublished project. Ethical approval for the study was obtained from the SSPC Ethics Committee, Ranip, Ahmedabad. Prior permission to translate and use the Global Physical Activity Questionnaire (GPAQ) was obtained from the World Health Organization (WHO).

The study was conducted in two phases:

(1) Translation and cultural adaptation of the English GPAQ into Gujarati, and

(2) Psychometric evaluation of the translated version among the Gujarati-speaking population.

The translation followed the standardized guidelines of Beaton and Guillemin, consisting of five stages: initial translation, synthesis, back-translation, expert committee review, and testing of the pre-final version.

Translation and Cross-Cultural Adaptation Procedure

1. Forward Translation (T1 and T2)

Two bilingual translators whose native language was Gujarati independently translated the English version of the GPAQ into Gujarati (T1 and T2).

2. Synthesis of Translations (T12)

A synthesized version (T12) was prepared by the two forward translators in consultation with a third independent translator and the primary author.

3. Backward Translation (BT1 and BT2)

Two translators whose first language was English, and who were blinded to the original questionnaire and study objectives, independently back-translated the synthesized Gujarati version into English (BT1 and BT2). Neither translator had a medical background.

4. Expert Committee Review

An expert committee comprising physiotherapists, language professionals, and translators reviewed all translated versions. The committee compared and evaluated semantic, idiomatic, experiential, and conceptual equivalence,

and subsequently developed the pre-final Gujarati version of GPAQ.

5. Field Testing of the Pre-final Version The pre-final version was administered to Gujarati-speaking individuals from the community. Feedback was documented, and necessary refinements were made. The finalized version was then subjected to psychometric evaluation, including face validity, content validity, cross-language concurrent validity, internal consistency, and test–retest reliability.

Results

A total of 30 participants were included in the study. The mean age of participants was 41.43 ± 14.60 years, with 60% males and 40% females.

Face validity of the Gujarati version of the Global Physical Activity Questionnaire (GPAQ) was assessed using a panel of 10 experts. Each expert rated all 16 items across three domains: clarity, relevance, and language appropriateness. Ratings were given on a five-point Likert scale (1 = Poor, 2 = Fair, 3 = Good, 4 = Very Good, 5 = Excellent).

For each item, the Item Clarity Index (ICI), Item Relevance Index (IRI), and Item Language Index (ILI) were computed as the mean of the expert ratings across domains. The Scale-Level Clarity Index (S-CLI), Scale-Level Relevance Index (S-RI), and Scale-Level Language Index (S-LI) were derived as the average of respective item-level indices.[21, 22]

Table 1 : Content Validity Assessment of the Guajarati Version of the Global Physical Activity Questionnaire using Item level and Scale Level Indices

Item No.	Item Clarity Index (ICI)	Item Relevance Index (IRI)	Item Language Index (ILI)	Remarks
1	4.7	5	4.9	
2	4.2	4.5	4	
3	4.8	5	4.7	
4	4.7	5	4.9	
5	4.8	4.8	5	
6	4.2	4.7	4	
7	4.9	5	5	
8	4.8	5	4.9	
9	4.4	5	4.7	
10	4.5	4.5	4.3	
11	4.9	5	4.8	
12	4.7	5	4.7	
13	4.4	5	4.5	
14	4.8	4.5	4.4	
15	4.5	4.5	4.4	
16	4.6	4.8	4.8	
Scale-Level Content Validity Index (S-CLI, S-RI, S-LI)	4.6	4.83125	4.625	

Content validity of the Gujarati version of the GPAQ was evaluated by a panel of 10 experts. Each item was rated on three aspects: 1) semantic equivalence(1 = not equivalent to 4 = highly equivalent), 2) conceptual agreement (Yes/No), and item similarity (1 = not relevant to 4 = highly relevant). For the purpose of Content Validity Index (CVI) calculation, ratings of 3 or 4 were considered as relevant/equivalent.

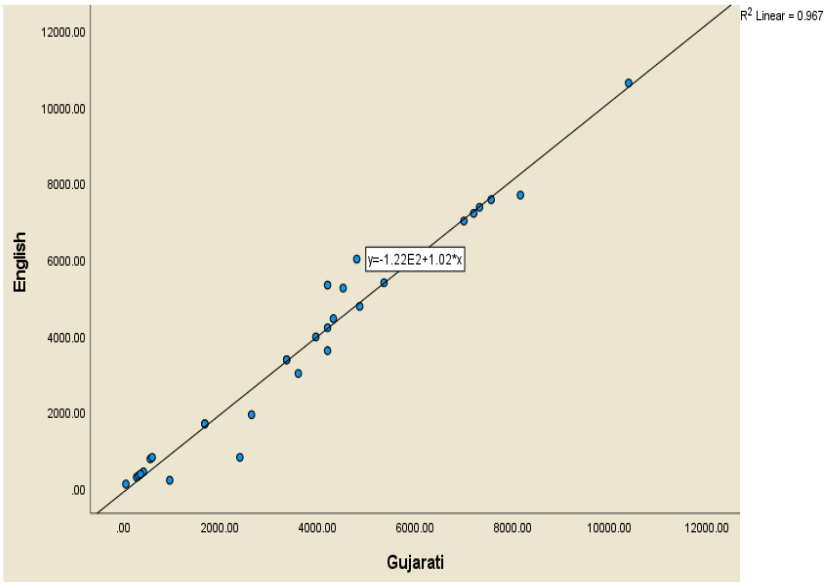
Content validity was evaluated using both Item-level CVI (I-CVI) and Scale-level CVI (S-CVI/Ave), with acceptable cut-offs of ≥0.78 and ≥0.90, respectively. The I-CVI, calculated as the proportion of experts assigning ratings of 3 or 4 to each item, ranged from 0.80 to 1.00, indicating strong agreement among experts regarding the clarity, relevance, and cultural equivalence of the translated items. These consistently high I-CVI values demonstrate that each item was perceived as conceptually sound and required no major linguistic or conceptual revisions. The S-CVI/Ave, obtained by averaging the I-CVI values across all items, was 0.93—surpassing the recommended threshold and confirming excellent overall content validity[21] (This high-level agreement underscores the robustness of the Gujarati GPAQ and supports its suitability for use among Gujarati-speaking populations in both epidemiological and public health research.

In addition, supporting indices further confirmed the adequacy of translation. The mean semantic equivalence scores across items ranged from 3.2 to 4.0 (mean = 3.7). Conceptual agreement exceeded 0.85 for all items, and mean item similarity ratings ranged from 3.3 to 4.0 (mean = 3.76). These findings suggest that the Gujarati translation of the GPAQ shows adequate semantic, conceptual, and item-level equivalence with the original English version, justifying its use among Gujarati-speaking populations.

Reliability analysis of the study shows strong internal consistency, with Cronbach's alpha values ranging from 0.999 to 0.991 across the major domains. Test–retest reliability, assessed using intra-class correlation coefficients (ICC), also showed excellent stability over time, with ICC values ranging from 0.999 to 0.991.

The Gujarati version of the GPAQ also demonstrated excellent cross-language concurrent validity relative to the original English version. Strong and statistically significant correlation coefficients were observed across all domains. Vigorous activity showed the highest correlation ($r = 0.997$, $p < 0.001$), followed by transport activity ($r = 0.982$, p

< 0.001) and moderate activity (r = 0.981, p < 0.001). Participants' sitting time similarly demonstrated a strong correlation (r = 0.979, p < 0.001). These findings indicate that the Gujarati GPAQ closely aligns with the English version across all activity domains.



Linear Relationship between Test and Retest Score Including Temporal Stability of Guajarati GPAQ.

Table 2: Reliability Indices of the Guajarati GPAQ

Domain	Cronbach's α	ICC	Remarks
Work domain	0.999	0.999	Good/Acceptable
Transport domain	0.994	0.994	Good/Acceptable
Recreation domain	0.818	0.818	Good/Acceptable
Sitting time	0.991	0.991	Good/Acceptable

Table 3: Cross language Concurrent validity of Gujarati GPAQ with English GPAQ score

Variable	Correlation coefficient (r)	p-value
Vigorous activity	0.997	<0.001
Moderate activity	0.981	<0.001
Transport activity	0.982	<0.001
Sitting time	0.979	<0.001

Table 4 : Statistical Analysis of Test Retest Reliability

		English
\ Gujarati	Pearson Correlation	0.983**
	P Value	<0.001
	N	30

A very strong positive correlation was also observed between the total MET-min/week scores of both versions ($r = 0.983$, $p < 0.001$, $n = 30$), confirming excellent concurrent validity. The scatter plot further illustrates a strong linear association between the Gujarati and English GPAQ scores.

Based on GPAQ classification, 53.5% of participants demonstrated high levels of physical activity, 29.5% moderate activity, and 16.5% low activity. The mean sitting time reported was 514 ± 184 minutes per day.

Discussion

Our study aimed to translate and cross-culturally adapt the Gujarati version of the Global Physical Activity Questionnaire (GPAQ) and to evaluate its psychometric properties. The findings of our study provide strong evidence that the Gujarati GPAQ is a valid, reliable, and culturally appropriate instrument for assessing physical activity among Gujarati-speaking populations.

The face validity assessment of our study revealed high item-level and scale-level indices across clarity, relevance, and language domains. All Item Clarity Index (ICI), Item Relevance Index (IRI), and Item Language Index (ILI) values exceeded the acceptable threshold, and scale-level means demonstrated excellent agreement among experts. These study findings indicate that the translated items were clear, linguistically appropriate, and conceptually relevant for the target population. Similar high face validity indices have been reported in GPAQ validation studies conducted in other Indian and international languages, supporting the cross-cultural robustness of the questionnaire.

Content validity analysis further confirmed the adequacy of the translation. The Item-level Content Validity Index (I-CVI) ranged from 0.80 to 1.00, and the Scale-level CVI (S-CVI/Ave) was 0.93, exceeding the recommended cutoff of 0.90 for excellent content validity. Additionally, the high semantic equivalence scores, strong conceptual agreement, and satisfactory item similarity ratings indicate that the Gujarati GPAQ retained the original meaning and intent of the English version without cultural distortion. Our study results suggest that the translation process successfully maintained semantic, conceptual, and experiential equivalence, which is essential for accurate physical activity surveillance.

Reliability analysis of this study demonstrated excellent internal consistency and temporal stability of the Gujarati GPAQ. Cronbach's alpha values across domains were very high, indicating strong homogeneity among items.

Similarly, test–retest reliability assessed using intra-class correlation coefficients (ICC) showed excellent reproducibility over time. These findings are consistent with previous GPAQ validation studies across different populations, which have reported high reliability for the instrument. The strong reliability observed in this study confirms that the Gujarati GPAQ provides stable, reliable measurements of physical activity.

The concurrent validity analysis revealed very strong and statistically significant correlations between the Gujarati and English versions of the GPAQ across all activity domains. Vigorous activity demonstrated the strongest correlation, followed by transport activity, moderate activity, and sitting time. We also found that an exceptionally strong correlation was observed between total MET-min/week scores across both versions ($r = 0.983$, $p < 0.001$). These results indicate that the Gujarati version measures physical activity in a manner almost identical to the original English instrument. In this study, the high correlation coefficients provide strong evidence that the translation preserved the GPAQ's conceptual framework, scoring structure, and measurement integrity. Comparable levels of concurrent validity have been reported in validation studies of GPAQ translations into other regional and international languages, further supporting the instrument's robustness.

The distribution of physical activity levels observed in this study showed that more than half of the participants were classified as high physical activity, while a smaller proportion were classified as moderate or low. The mean sitting time reported by participants indicates a substantial sedentary burden, consistent with trends observed in both Indian and global physical activity studies. These findings reinforce the growing public health concern about sedentary lifestyles and underscore the importance of using validated tools such as the GPAQ for large-scale surveillance and health promotion planning.

The major strengths of this study include the use of a standardized, internationally accepted translation protocol, systematic expert evaluation, and comprehensive assessment of multiple psychometric properties, including face validity, content validity, reliability, and concurrent validity. However, certain limitations must be acknowledged. The relatively small sample size may limit the generalizability of the findings. Additionally, the reliance on self-reported physical activity data may introduce recall and social desirability bias.

Despite these limitations, our study's results provide strong support for the Gujarati version of the GPAQ as a valid and reliable instrument for assessing physical activity. Its availability will facilitate accurate monitoring of physical activity behaviors in Gujarati-speaking populations and will support epidemiological research and public health policy formulation. Future research should focus on larger, more diverse samples to further strengthen the evidence base for the Gujarati GPAQ.

In conclusion, the Gujarati adaptation of the GPAQ demonstrates excellent psychometric properties and can be confidently recommended for use in both clinical and public health research settings to assess physical activity among Gujarati-speaking individuals.

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Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this study.

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Write us mail to get the Gujarati translation version of GPAQ.

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