RESEARCH ARTICLE   **OPEN ACCESS**

RELIABILITY AND VALIDITY OF THE GUJARATI VERSION OF THE INTERNATIONAL PHYSICALACTIVITY QUESTIONNAIRE-SHORT FORM (IPAQ-SF) IN GUJARAT

*1Dr. Muhammad Nauman Kazi, 2Ummeafifa Shaikh, 2Surbhi Thummar, 2Maitry Nasit
and 2Neel Limbachiya

1Assistant Professor, The Sarvajanik Collage of Physiotherapy, Surat Gujarat India
2Intern, The Sarvajanik Collage of Physiotherapy, Surat Gujarat India

ARTICLE INFO

ABSTRACT

The International Physical Activity Questionnaire (IPAQ) is a widely used self-reported instrument for assessing physical activity across various intensities. This study aimed to culturally adapt and evaluate the reliability and validity of the Gujarati version of the IPAQ-Short Form (IPAQ-SF) for use within the Gujarati-speaking community. Following the IPAQ manual guidelines, the English version of the IPAQ-SF was translated into Gujarati using a forward-backward-forward translation process. To assess reliability, test-retest procedures were conducted, and the intraclass correlation coefficient (ICC) was calculated. Results showed strong test-retest reliability for the Gujarati IPAQ-SF, with an ICC average measure of 0.785 (95% CI: 0.537–0.899, $p = 0.000$), demonstrating significant consistency. The factorial validity of the Gujarati IPAQ-SF was also evaluated, confirming its effectiveness in measuring physical activity and sedentary behaviors. The findings indicate that the Gujarati IPAQ-SF is a reliable and valid tool for assessing vigorous physical activity and sedentary lifestyles in individuals aged 16–60. This culturally adapted version of the IPAQ-SF can be effectively utilized for physical activity assessments in the Gujarati-speaking population.

INTRODUCTION

Physical inactivity has emerged as a significant global health concern, contributing to an increasing burden of non-communicable diseases (NCDs) worldwide. However, the diverse methods used to measure physical activity make international comparisons challenging. To address this issue, the International Physical Activity Questionnaire (IPAQ) was developed as a standardized tool to assess physical activity and sedentary behavior across populations and cultural contexts[1].Sedentary lifestyles, characterized by prolonged sitting and reduced movement, have been associated with severe health risks in both developed and developing nations. Prolonged sedentary behavior in workplaces, schools, religious settings, and homes, combined with modern reliance on automobiles and technology, has led to a notable decline in physical activity. This reduction significantly increases the risk of hypertension, obesity, cardiovascular diseases, cancer, and other chronic health conditions[2].Physical inactivity contributes to over 3 million deaths annually worldwide, ranking fourth in global mortality. They examinestrategies to address this pressing health crisis, predominantly driven by non-communicable diseases[3, 4] Physical activity is defined as any bodily movement produced by skeletal muscles that requires energy expenditure, encompassing various activities such as work, household chores, sports, and active transportation. According to the World Health Organization (WHO), adults aged 18–64 years should engage in at least 150 minutes of moderate-intensity or 75 minutes of vigorous-intensity physical activity weekly to reap health benefits [5].Moderate physical activity prevents chronic diseases, reduces mortality, and enhances physical and psychological well-being significantly[6]. The IPAQ, particularly its short form (IPAQ-SF), is a widely accepted self-reported tool that assesses physical activity across four intensities: vigorous, moderate, walking, and sitting over the previous seven days[7]. However, various demographic, lifestyle, and environmental factors contribute to sedentary behavior. Older age, female gender, low education, higher BMI, depressive symptoms, and full-time employment are all associated with increased sedentary time. Furthermore, lack of green spaces, unsafe neighborhoods, and extreme weather conditions can exacerbate inactivity[8]. Given that physical inactivity and sedentary behavior[9]are independent risk factors for cardiovascular disease, type 2 diabetes, certain cancers, and poor mental and cognitive health, it is essential to monitor and evaluate these behaviors within different populations. This study focuses on the cultural adaptation and validation of the Gujarati version of the IPAQ-SF, aiming to provide a reliable and valid tool for assessing physical activity levels and sedentary behavior in the Gujarati-speaking community[10].

MATERIALS AND METHODS

The International Physical Activity Questionnaire-Short Form (IPAQ-SF) was translated into Gujarati using the forward-backward-forward translation technique, following the guidelines outlined in the IPAQ manual to ensure reliability and validity. Two proficient bilingual experts independently translated the original English version into Gujarati. The preliminary Gujarati version was then back-translated into English by another bilingual translator to identify and address any discrepancies. After cultural adaptation and linguistic modifications, a third bilingual translator finalized the Gujarati version of the IPAQ-SF.

Pilot Testing: Pilot testing of the pre-final Gujarati version of IPAQ-SF was conducted on 15 participants who could read, write, and understand Gujarati. These participants were recruited from the Department of Physiotherapy based on predetermined inclusion and exclusion criteria. Prior to participation, all individuals were informed about the study's purpose, procedures, and their rights, and written informed consent was obtained.

Reliability Testing: To evaluate test-retest reliability, the Gujarati IPAQ-SF was administered twice within a one-week interval. Participants were instructed to recall and report their physical activity over the same 7-day period during both test administrations, ensuring consistency. The 7-day recall period aligns with the IPAQ-SF structure, which focuses on physical activity undertaken in the past week.

Factorial Validity: Factorial validity of the Gujarati IPAQ-SF was examined in a sample of 70 physically active participants. This analysis aimed to confirm whether the items in the questionnaire measure the same underlying constructs (vigorous activity, moderate activity, walking, and sitting). The participants were selected based on their ability to engage in physical activity and communicate effectively in Gujarati. The study employed a systematic translation process, pilot testing, test-retest reliability evaluation, and factorial validity analysis to ensure the Gujarati IPAQ-SF is both culturally appropriate and psychometrically sound.

Statistical Analysis: Intraclass Correlation Coefficient (ICC) and Pearson's Product-Moment Correlation were used to evaluate the reliability and validity of the Gujarati version of the IPAQ-Short Form (IPAQ-SF). The ICC was employed to assess test-retest reliability, providing a measure of consistency between the two administrations of the questionnaire over a one-week interval. Pearson's correlation was used to determine the relationship between the English (IPAQ-SF) and Gujarati (IPAQ-G) versions, indicating concurrent validity. All statistical analyses were performed using SPSS v20.0, with the level of significance set at $p \leq 0.05$. Descriptive statistics, including means and standard deviations, were also calculated to summarize participant characteristics and questionnaire scores.

RESULTS

The Gujarati IPAQ-SF's test-retest reliability was evaluated by administering it twice within a one-week interval, with participants recalling physical activity from the initial testing over the previous 7 days. Factorial validity, assessing how well questionnaire items measure a shared construct, was tested in a sample of 70 physically active individuals.

Descriptive statistics: The results indicate that the IPAQ-G data include both consistent and highly variable responses. The low variability observed in V1, V3, and V5 highlights areas of uniformity, while the substantial variability in V7 underscores the heterogeneity of participant responses.

Test-Retest Reliability: The Gujarati IPAQ-SF demonstrated strong test-retest reliability with an ICC average measure of 0.785 (95% CI:

0.537–0.899, p = 0.000). The single measures ICC was 0.646 (95% CI: 0.367–0.817, p = 0.000), reflecting moderate reliability.

Cross-Language Reliability: The Gujarati IPAQ-SF showed excellent cross-language reliability with an ICC average measure of 0.880 (95% CI: 0.748–0.943, p = 0.000).

Factorial Validity: Principal Component Analysis identified four components corresponding to vigorous activity, moderate activity, walking, and sedentary behavior, explaining 89.325% of the total variance. Varimax rotation confirmed the factorial structure, with Component 1 explaining 28.807% of the variance.

Table 1. Descriptive statistics

Factor	Mean	St. Deviation
V1	6.91	.288
V2	12.87	4.015
V3	6.91	.288
V4	14.57	4.785
V5	6.96	.209
V6	17.13	7.194
V7	221.74	147.453

Table 2. Test -retest reliability

	Intraclas Correlation	95% Confidence Interval			
		Lower Bound	Upper Bound	Value F	sig
Single Measures	.646[a]	.367	.817	5.195	.000
Average Measures	.785[c]	.537	.899	5.195	.000

Table 3. Cross-Language Reliability

English vs Gujarati	Intra class Correlation	95% Confidence Interval			
		Lower Bound	Upper Bound	Value F	Sig
Single Measures	.786[a]	.597	.892	8.833	.000
Average Measures	.880[c]	.748	.943	8.833	.000

Table 4. Factorial Validity

Compon ent	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.238	31.979	31.979	2.016	28.807	28.807
2	1.588	22.689	54.667	1.528	21.831	50.638
3	1.377	19.671	74.338	1.527	21.813	72.451
4	1.049	14.987	89.325	1.181	16.874	89.325
5	.427	6.102	95.427			
6	.320	4.573	100.000			

DISCUSSION

The results of this study highlight the successful cultural adaptation and validation of the Gujarati IPAQ-SF. Test-retest reliability metrics indicate that the instrument consistently measures physical activity over time. The factorial validity, as confirmed by Principal Component Analysis, demonstrates that the questionnaire appropriately captures distinct domains of physical activity and sedentary behaviour. The cultural adaptation process was a critical step in ensuring the tool's relevance to Gujarati-speaking populations. The forward-backward-forward translation method, combined with pilot testing, ensured clarity and cultural appropriateness, addressing linguistic nuances and contextual differences.The strong cross-language reliability underscores the robustness of the translation process and the applicability of the Gujarati IPAQ-SF alongside the original English version. This is particularly useful in bilingual or multilingual research settings. Despite the strengths, self-reported tools like the IPAQ-SF are prone to overestimating physical activity levels due to recall and social desirability biases. Objective measures, such as accelerometers or pedometers, may provide complementary insights and help validate self-reported data. Future studies should aim

to include these tools for a comprehensive understanding of physical activity patterns. This research highlights the challenges of using self-report tools like the IPAQ-SF in physical activity surveillance. Previous studies have shown that self-reported methods often yield lower correlations with objective measures. For example, in African epidemiological studies, significant discrepancies were observed between the IPAQ-SF and objective tools like the BPAQ, affecting the consistency of physical activity estimates over time[11]. Similarly, studies using the ActiHeart® device reported discrepancies in physical activity classifications. Nearly all adolescents in one study were categorized as having low physical activity based on ActiHeart® data, whereas the IPAQ-SF indicated a broader range of activity levels, with 43% in low to moderate activity and 57% in high-intensity activity categories. These findings underscore the inherent limitations of subjective self-report tools in accurately capturing physical activity levels[12]. Poor diet and inactivity drive India's non-communicable disease epidemic, requiring gender-sensitive strategies and addressing urbanization impacts[13]. Health promotion programs in India may benefit from incorporating the IPAQ-SF due to its effectiveness in reliably measuring physical activity levels[14]. The findings of this study highlight the test-retest reliability of the Gujarati version of the International Physical Activity Questionnaire-Short Form (IPAQ-SF) and its comparability to the original English version[15]. The Hungarian adaptation of the IPAQ-SF demonstrated excellent test-retest reliability but showed low-to-fair concurrent validity for moderate and vigorous physical activity, walking, and sitting time when compared to the objective criterion measure in Hungarian adults[1, 16]. Similarly, the concurrent criterion validity of the IPAQ-SF was found to be low in patients with osteoarthritis[17]. Previous studies, such as Ács et al., have reported limitations in the validity of the IPAQ-SF for capturing intense activity[5]. Despite its demonstrated reliability, it is essential to interpret the results of the IPAQ-SF with caution, particularly regarding high-intensity physical activity levels[18]. This limitation may stem from the inherent subjectivity of self-reported data, compounded by daily fluctuations in physical activity, particularly among elderly populations. While the IPAQ-SF remains a valuable tool for assessing physical activity at a population level, it is less suited for precise individual-level measurements of intense activity. The IPAQ-SF's reliability makes it a useful instrument for population prevalence studies and public health policy development. However, researchers and practitioners should remain cautious when interpreting results related to specific activity intensities or individual-level applications. To enhance accuracy, the IPAQ-SF could be complemented with objective measures, such as wearable activity trackers, particularly in contexts where detailed assessments of physical activity intensity are critical.

Limitation: A key limitation of this study is the recall bias associated with the IPAQ-SF, potentially affecting the accuracy of self-reported activity levels. The focus on a sedentary Gujarati population likely influenced the low MET values, limiting generalizability to more active groups. Future research should validate the IPAQ-SF across diverse populations for broader applicability.

CONCLUSION

The Gujarati version of the IPAQ-SF demonstrates acceptable test-retest reliability and validity, particularly for vigorous activity and sitting time. Enhancing its validity by including detailed descriptions of activities could improve recall accuracy, especially for older adults. Overall, the IPAQ-G is a valuable tool for assessing physical activity levels in Gujarati-speaking individuals, with potential for further refinement.

ACKNOWLEDGEMENT

REFERENCES

Craig CL, Marshall AL, Sjöström M, Bauman AE, Booth ML, Ainsworth BE, et al. International physical activity questionnaire: 12-country reliability and validity. Medicine and Science in Sports and Exercise. 2003;35(8):1381-95.

Iosr J, Dr. MPI, Okey-Orji S, editors. Sedentary Lifestyle: Health Implications2015.

Pratt M, Sarmiento OL, Montes F, Ogilvie D, Marcus BH, Perez LG, et al. The implications of megatrends in information and communication technology and transportation for changes in global physical activity. Lancet (London, England). 2012;380(9838):282-93.

Kohl HW, 3rd, Craig CL, Lambert EV, Inoue S, Alkandari JR, Leetongin G, et al. The pandemic of physical inactivity: global action for public health. Lancet (London, England). 2012;380(9838):294-305.

Ács P, Betlehem J, Oláh A, Bergier J, Melczer C, Prémusz V, et al. Measurement of public health benefits of physical activity: validity and reliability study of the international physical activity questionnaire in Hungary. *BMC public health.* 2020;20(1):1198.

Kruk J. Physical activity in the prevention of the most frequent chronic diseases: an analysis of the recent evidence. Asian Pacific journal of cancer prevention: APJCP. 2007;8(3):325-38.

Freyberg J, Brage S, Kessing LV, Faurholt-Jepsen M. The association between self-reported physical activity and objective measures of physical activity in participants with newly diagnosed bipolar disorder, unaffected relatives, and healthy individuals. *Nordic Journal of Psychiatry.* 2021;75(3):186-93.

Koyanagi A, Stubbs B, Vancampfort D. Correlates of sedentary behavior in the general population: A cross-sectional study using nationally representative data from six low- and middle-income countries. PloS one. 2018;13(8):e0202222.

Pinto AJ, Bergouignan A, Dempsey PC, Roschel H, Owen N, Gualano B, et al. Physiology of sedentary behavior. *Physiological reviews.* 2023;103(4):2561-622.

Meh K, Sember V, Đurić S, Vähä-Ypyä H, Rocha P, Jurak G. Reliability and Validity of Slovenian Versions of IPAQ-SF, GPAQ, and EHIS-PAQ for Assessing Physical Activity and Sedentarism of Adults. *International Journal of Environmental Research and Public Health.* 2021;19(1).

Oyeyemi AL, Moss SJ, Monyeki MA, Kruger HS. Measurement of physical activity in urban and rural South African adults: a comparison of two self-report methods. *BMC public health.* 2016;16(1):1004.

Monyeki MA, Moss SJ, Kemper HCG, Twisk JWR. Self-Reported Physical Activity is Not a Valid Method for Measuring Physical Activity in 15-Year-Old South African Boys and Girls. *Children (Basel, Switzerland).* 2018;5(6).

Tripathy JP, Thakur JS, Jeet G, Chawla S, Jain S, Prasad R. Urban rural differences in diet, physical activity and obesity in India: are we witnessing the great Indian equalisation? Results from a cross-sectional STEPS survey. *BMC public health.* 2016;16(1):816.

Rai RH, Asif M, Malhotra N. Reliability of International Physical Activity Questionnaire – short form ipaq-sf for Young Adults in india. 2018. 2018.

Lee PH, Macfarlane DJ, Lam TH, Stewart SM. Validity of the international physical activity questionnaire short form (IPAQ-SF): A systematic review. *International Journal of Behavioral Nutrition and Physical Activity.* 2011;8(1):115.

Ács P, Veress R, Rocha P, Dóczi T, Raposa BL, Baumann P, et al. Criterion validity and reliability of the International Physical Activity Questionnaire – Hungarian short form against the RM42 accelerometer. *BMC public health.* 2021;21(1):381.

Joseph KL, Dagfinrud H, Christie A, Hagen KB, Tveter AT. Criterion validity of The International Physical Activity Questionnaire-Short Form (IPAQ-SF) for use in clinical practice in patients with osteoarthritis. *BMC musculoskeletal disorders.* 2021;22(1):232.

Chun MY. Validity and reliability of korean version of international physical activity questionnaire short form in the elderly. *Korean Journal of Family Medicine.* 2012;33(3):144-51.