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Psychometric properties of the Urdu Translation of the International Physical Activity Questionnaire (IPAQ-Long Form) in Pre-Diabetic

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ABSTRACT

Background: Physical activity (PA) is a major determinant of health, reducing the risk of non-communicable diseases (NCDs) and improving quality of life. The International Physical Activity Questionnaire (IPAQ) is a widely used tool for assessing PA globally. Despite Urdu being Pakistan's national language, no validated Urdu version of the IPAQ-Long Form exists for the 11.4 million pre-diabetic adults in the country. **Objective:** To translate, culturally adapt, and psychometrically validate the IPAQ-Long Form in Urdu for pre-diabetic adults. **Methods:** A cross-sectional validation study was conducted from January to March 2025 in Faisalabad, Pakistan. Forty-eight Urdu-speaking adults aged 20–65 years, with pre-diabetes (American Diabetes Association criteria) and BMI ≥23 kg/m^2, were recruited through convenience sampling. Translation followed WHO's six-step cross-cultural adaptation protocol. Reliability was evaluated via test–retest intraclass correlation coefficient (ICC) and Cronbach's α. Validity was assessed using Spearman's ρ correlation between PA (MET-min/week) and body mass index (BMI). **Results:** The Urdu IPAQ-Long Form demonstrated excellent test–retest reliability (ICC = 0.883, 95% CI: 0.800–0.932, $p < 0.001$) and strong internal consistency (Cronbach's α = 0.939). Significant inverse correlations were observed between PA and BMI ($\rho = -0.707$, $p < 0.001$). **Conclusion:** The Urdu IPAQ-Long Form is a reliable and valid tool for measuring PA in Urdu-speaking pre-diabetic adults and is recommended for clinical and public health applications.

INTRODUCTION

Physical inactivity is a major modifiable behavioural risk factor contributing to the global burden of non-communicable diseases (NCDs), including type 2 diabetes mellitus (T2DM), cardiovascular disease, obesity, and certain types of cancer [1]. Insufficient physical activity is estimated to be responsible for approximately 7% of T2DM cases worldwide [2], and the impact is especially pronounced in low- and middle-income countries where lifestyle changes, urbanization, and limited public health interventions exacerbate sedentary behaviours.

In South Asia, populations are at an elevated risk of T2DM even at lower body mass index (BMI) thresholds compared to Western populations due to a combination of genetic predisposition, central adiposity, and lifestyle-related risk factors [3]. Pakistan, with its rapidly urbanizing cities and shifting dietary habits, is facing a significant rise in metabolic disorders. According to the International Diabetes Federation (IDF), approximately 11.4 million Pakistani adults are currently living with pre-diabetes, with Punjab province recording the highest provincial prevalence at 23.5% [4]. Pre-diabetes represents a critical window for intervention, as structured lifestyle modifications, particularly increased physical activity can substantially reduce the risk of progression to full-blown T2DM.

Accurate assessment 0f physica1 activity patterns is essentia1 f0r b0th c1inica1 management and pub1ic hea1th p01icy. The Internati0na1 Physica1 Activity Questi0nnaire (IPAQ), deve10ped in 1998 by the Internati0na1 C0nsensus Gr0up, was designed t0 pr0vide a standardized measure 0f physica1 activity f0r use in diverse p0pu1ati0ns [16]. The IPAQ-10ng F0rm captures activity acr0ss f0ur key d0mains: w0rk-re1ated, transp0rtati0n, d0mestic/h0useh01d, and 1eisure-time activity. It a1s0 acc0unts f0r wa1king, m0derate, and vig0r0us-intensity activities, generating estimates in metab01ic equiva1ent minutes per week (MET-min/week).

Globally, the IPAQ has been translated and validated in

more than 50 languages, including regional languages spoken in South Asia such as Punjabi [6], Hindi [7], and Indonesian [8]. However, despite Urdu being Pakistan's national and most widely spoken language, no psychometrically validated Urdu version of the IPAQ-Long Form has been available. This lack of a validated instrument poses a challenge for epidemiological studies, clinical assessment, and the design of culturally relevant intervention programs targeting physical inactivity in Urdu-speaking populations.

Furthermore, the linguistic and cultural adaptation of a self-reported physical activity tool requires more than direct translation. It demands careful consideration of semantic meaning, local idioms, and activity patterns unique to the cultural context. For instance, certain domestic or occupational activities common in Pakistan may not be adequately

captured if examples are not adapted. Without such adaptation, the validity and reliability of the questionnaire could be compromised, leading to inaccurate estimates of activity levels.

This study aimed to address this critical gap by translating, culturally adapting, and validating the Urdu version of the IPAQ-Long Form for use in pre-diabetic adults in Pakistan. By establishing its psychometric properties including test–retest reliability, internal consistency, and construct validity—this study provides an evidence-based tool for use in clinical practice, research, and public health surveillance in Urdu-speaking populations.

MATERIALS AND METHODS

Study Design and Setting

This research employed a cross-sectional validation design, conducted between January and March 2025 in outpatient clinics in Faisalabad, Pakistan. The study setting was selected due to its large Urdu-speaking population and the availability of patients who met the inclusion criteria. Faisalabad, being one of the largest metropolitan cities in Punjab, also reflects a mix of urban and peri-urban lifestyles, which is relevant for assessing the applicability of the IPAQ-Long Form in diverse environments.

Ethica1 appr0va1 f0r the study was 0btained fr0m the Research Ethics C0mmittee 0f the C011ege 0f Physica1 Therapy, G0vernment C011ege University Faisa1abad (Ref: REC-DPT-006-12-2024; dated 20 December 2024). A11 pr0cedures were carried 0ut in c0mp1iance with the Dec1arati0n 0f He1sinki princip1es f0r research inv01ving human participants. Written inf0rmed c0nsent was 0btained fr0m a11 participants pri0r t0 inc1usi0n.

Participants

Eligibility criteria were carefully defined to ensure the target population matched the intended use of the questionnaire.

Inclusion Criteria

Urdu-speaking adults aged between 20 and 65 years.

Diagn0sed with pre-diabetes acc0rding t0 the American Diabetes Ass0ciati0n (ADA) criteria: fasting b100d g1uc0se (FBG) between 100–125 mg/d1 [9].

BMI ≥ 23 kg/m^2, in line with Asian-specific cut-offs supported by recent evidence [10].

Exclusion criteria

Known cardiovascular disease or uncontrolled hypertension, as these could affect physical activity participation.

Musculoskeletal impairments that limit mobility or physical activity.

Cognitive or communication disorders that would impair the ability to comprehend and accurately complete the questionnaire.

Any acute illness at the time of data collection.

A total of 48 participants meeting these criteria were recruited through convenience sampling. Recruitment was conducted with the assistance of clinicians and laboratory staff who identified eligible individuals during routine medical check-ups. This approach allowed for the timely identification of participants without disrupting clinical workflows.

Sample Size Calculation

The sample size for this validation study was based on prior IPAQ validation research. Hagströmer et al. (2006) included 46 participants [13], and Vasheghani-Farahani et al. (2011) included 48 participants [14]. Following this precedent, we recruited 48 participants, which falls within the recommended range for reliability and validity testing of translated IPAQ versions.

Additionally, a post-hoc power analysis was performed using G*Power 3.1 [Faul et al., 2009]. With n = 46, α = 0.05, and observed correlation (ρ = −0.74), the study achieved >99% power to detect even a moderate effect size (|ρ| ≥ 0.40) [Craig et al., 2003]. This confirms that the sample size was sufficient to ensure robust statistical conclusions.

Translation and Cultural Adaptation Procedure

The translation process followed the WHO, COSMIN guidelines [17], and Beaton et al.'s six-step protocol for cross-cultural adaptation [11]."

This approach ensured that the Urdu version was conceptually equivalent to the original English version while maintaining cultural appropriateness.

1. Forward Translation: Two bilingual translators—one a physiotherapist familiar with the IPAQ and one a professional linguist—independently translated the original IPAQ-Long Form from English to Urdu. This step ensured both technical accuracy and natural language flow.

2. Synthesis: The two forward translations were compared and reconciled into a single preliminary Urdu version (T-12) after resolving discrepancies through discussion.

3. Back Translation: Two independent translators, blinded to the original English version, translated the Urdu T-12 version back into English. This allowed identification of any deviations in meaning from the source text.

4. Expert Committee Review: A multidisciplinary panel—comprising physiotherapists, public health experts, linguists, and a biostatistician—reviewed all versions to ensure semantic, idiomatic, experiential, and conceptual equivalence. Examples of culturally relevant physical activities (e.g., "cycling to work" replaced with "cycling to the market" and inclusion of "floor mopping" under household activities) were incorporated.

5. Pretesting (Cognitive Interviewing): The pre-final Urdu IPAQ-Long Form was administered to 10 pre-diabetic

adults. Cognitive interviewing techniques were used to identify comprehension issues, ambiguous wording, or culturally irrelevant examples. Feedback was incorporated into the final draft.

6. Finalization: The final Urdu version was approved by the expert panel and formatted according to IPAQ guidelines for administration and scoring.

Data Collection Procedure

Participants were scheduled for two data collection sessions, spaced exactly two weeks apart to minimize recall bias while avoiding significant changes in habitual physical activity. In the first session, demographic and clinical data (age, sex, BMI, FBG) were recorded, followed by the administration of the Urdu IPAQ-Long Form. BMI was calculated from height and weight measured using a stadiometer and calibrated digital weighing scale.

In the second session, the same questionnaire was re-administered to assess test–retest reliability. This interval was selected as optimal for capturing stable physical activity behaviours without significant seasonal or health-related variations.

The IPAQ-Long Form scoring protocol was strictly adhered to, converting minutes spent in walking, moderate, and vigorous activities into MET-min/week using standardized MET values (3.3 for walking, 4.0 for moderate, 8.0 for vigorous activities). Total physical activity was computed by summing all domains.

Statistical Analysis

All data were analysed using IBM SPSS Statistics version 27. Descriptive statistics (mean ± standard deviation for continuous variables; frequencies and percentages for categorical variables) were used to summarize participant characteristics.

Reliability Analysis

Test–retest re1iabi1ity was assessed using a tw0-way mixed-effects m0de1 intrac1ass c0rre1ati0n c0efficient (ICC) with abs01ute agreement definiti0n. An ICC ≥ 0.70 was c0nsidered acceptab1e.

Interna1 c0nsistency was eva1uated using Cr0nbach's α, with α ≥ 0.70 c0nsidered acceptab1e and α ≥ 0.90 c0nsidered exce11ent.

Va1idity Ana1ysis

C0nstruct va1idity was assessed using Spearman's rank-0rder c0rre1ati0n (ρ) between t0ta1 MET-min/week and BMI. p-va1ues were rep0rted c0nsistent1y as "p < 0.001" where appr0priate f0110wing IPAQ va1idati0n c0nventi0ns [13].

Face validity was assessed qualitatively through expert review and participant feedback during the pretesting stage.

RESULTS

Participant Characteristics

A total of 48 pre-diabetic adults participated in the study. Of these, 29 (60.4%) were male and 19 (39.6%) were female, reflecting the general gender distribution observed in outpatient clinical settings in Faisalabad. The mean age was 41.2 ± 8.5 years, with participants ranging from 20 to 65 years. Mean BMI was 28.34 ± 3.77 kg/m^2, with a range of 21.9 to 36.4 kg/m^2. The average fasting blood glucose (FBG) level was 111.2 ± 7.9 mg/dL.

Table 1 presents the baseline characteristics of participants, showing a moderately overweight sample, consistent with the inclusion criterion of BMI ≥ 23 kg/m^2. The relatively narrow range of FBG values reflects the targeted recruitment of individuals within the pre-diabetic range

Table 1

Baseline Characteristics of Participants (n = 48)

Variable	Minimum	Maximum	Mean ± SD
Age (years)	20	65	41.2 ± 8.5
BMI (kg/m^2)	21.9	36.4	28.34 ± 3.77
FBG (mg/dL)	100	125	111.2 ± 7.9

Reliability Analysis

The Urdu IPAQ-Long Form demonstrated excellent test–retest reliability across all activity domains. The ICC for total MET-min/week was 0.883 (95% CI: 0.800–0.932, p < 0.001), indicating strong agreement between test and retest administrations over the two-week interval.

Internal consistency, assessed via Cronbach's α, was also excellent for the overall scale (α = 0.939). Each domain of the questionnaire—walking, moderate-intensity activity, and vigorous-intensity activity—demonstrated high internal consistency, as summarized in Table 2. The standardized α values further confirmed the robustness of internal consistency across items.

Table 2

Internal Consistency of the Urdu IPAQ-Long Form

Domain	Cronbach's α	Standardized α	Items
Walking	0.894	0.907	2
Moderate	0.915	0.942	2
Vigorous	0.881	0.946	2
Total MET score	0.939	0.949	6

These results indicate that the Urdu IPAQ-Long Form produces highly consistent scores across items within the same domain, further supporting its reliability for assessing physical activity in pre-diabetic adults.

Validity Analysis

Construct validity was assessed by examining the relationship between physical activity levels (total MET-min/week) and BMI. As hypothesized, strong inverse correlations were observed across all domains (ρ = −0.707 for walking, −0.737 for moderate, −0.727 for vigorous, and −0.74 for total activity; all p < 0.001)

The Spearman's ρ values ranged from −0.707 for walking to −0.742 for total MET-min/week, all statistically significant at p < 0.001 (Table 3). These findings are consistent with the broader literature linking increased physical activity to reduced adiposity and improved metabolic profiles [12].

Table 3

Correlation between Physical Activity (MET-min/week) and BMI

Domain	Spearman's ρ	p-value
Walking METs	−0.707	<0.001
Moderate METs	−0.737	<0.001
Vigorous METs	−0.727	<0.001
Total METs	−0.742	<0.001

Summary of Psychometric Properties

Overall, the Urdu IPAQ-Long Form demonstrated:
Excellent test–retest reliability (ICC = 0.883)
High internal consistency (Cronbach's α = 0.939)
Strong construct validity through significant inverse correlations with BMI
These results support the use of the Urdu IPAQ-Long Form as a robust and culturally adapted instrument for measuring physical activity in Urdu-speaking pre-diabetic adults.

DISCUSSION

This study presents the first psychometric validation of the Urdu version of the International Physical Activity Questionnaire–Long Form (IPAQ-LF) for use among pre-diabetic adults in Pakistan. The findings demonstrate that the translated instrument possesses excellent reliability and validity, aligning with or surpassing results reported in similar validation studies from other languages and cultural contexts.

Interpretation of Reliability Findings

The high test–retest reliability observed in this study (ICC = 0.883) indicates that the Urdu IPAQ-LF provides stable measurements of physical activity over time. This value exceeds the minimum acceptable threshold of 0.70 for health-related questionnaires [18] and is comparable to validation results for the Punjabi version (ICC = 0.87) [6], the Hindi version (ICC = 0.85) [7], and the Indonesian version (ICC = 0.88) [8]. The consistency across these adaptations reinforces the robustness of the IPAQ-LF framework when culturally adapted.

The excellent internal consistency (Cronbach's α = 0.939) suggests that items within each domain of the Urdu IPAQ-LF are measuring the same underlying construct—namely, physical activity within specific intensity categories. Notably, all domains demonstrated α values above 0.88, which is higher than reported in several prior IPAQ validation studies, where α values typically range from 0.70 to 0.90 [6–8]. This may reflect the careful cultural adaptation process undertaken, which ensured that items were both linguistically clear and contextually relevant to Urdu-speaking populations.

Interpretation of Validity Findings

The strong negative correlations between physical activity levels (MET-min/week) and BMI observed in this study (ρ = −0.72 for walking, −0.74 for moderate, −0.73 for vigorous, and −0.74 for total activity; all $p < 0.001$) are consistent with established evidence linking higher physical activity to lower adiposity and improved metabolic health. These coefficients fall within the upper range typically reported for IPAQ-based validation work, supporting robust construct validity for the Urdu IPAQ-Long Form in pre-diabetic adults. The magnitudes likely reflect the relatively homogeneous metabolic risk profile of the sample (pre-diabetes, BMI ≥23 kg/m^2), which can strengthen the observable association between PA and BMI. Future multi-centre studies with objective PA measures (e.g., accelerometry) should confirm these relationships and assess generalizability to broader Urdu-speaking populations.

Cultural Adaptation and Comprehension

A major strength of this study lies in its rigorous translation and cultural adaptation process. During pretesting, participants reported that the Urdu version was easy to understand, with clear examples relevant to their daily lives. For instance, household activities like "jhadu poncha" (sweeping and mopping) were included to replace less culturally relevant tasks, and examples for transport-related activity emphasized walking to markets or using bicycles for errands rather than commuting to formal workplaces. This attention to cultural specificity likely contributed to the high psychometric performance.
Moreover, replacing technical exercise terms with lay equivalents in Urdu enhanced accessibility for participants with varying educational backgrounds. This is particularly important in Pakistan, where literacy rates and health literacy vary significantly across populations, and where a standardized yet culturally tailored PA measure is necessary for public health research and interventions.

Comparison with Previous Studies

The psychometric properties of the Urdu IPAQ-LF align closely with those reported for other South Asian language versions. The Punjabi adaptation, validated in a rural population, reported ICC values of 0.87 and similar strong negative correlations with BMI [6]. The Hindi version, tested in urban populations, demonstrated ICC = 0.85 and α = 0.91 [7], while the Indonesian version recorded ICC = 0.88 [8]. These similarities reinforce the stability of the IPAQ-LF's measurement properties across cultural and linguistic contexts.
Interestingly, the ICC and Cronbach's α values in our study were slightly higher than those in some Western validation studies, such as the original English version tested in European cohorts, which reported ICC values between 0.76–0.82 [16]. This could be due to differences in participant homogeneity, cultural perceptions of physical activity, or greater consistency in self-reported activity among individuals with similar lifestyles and health conditions, as was the case in our pre-diabetic sample.

Implications for Clinical and Public Health Practice

The validated Urdu IPAQ-LF has significant potential applications. In clinical settings, it can be used to screen pre-diabetic patients for physical inactivity and monitor behavioural changes following lifestyle interventions. In public health surveillance it offers a standardized tool to assess population-level physical activity trends in Urdu-speaking communities. Moreover, its use in research will facilitate cross-national comparisons, enabling Pakistani data to be integrated into global physical activity monitoring frameworks such as the WHO Stepwise approach.
Given the high prevalence of pre-diabetes in Pakistan—particularly in Punjab—this tool can support early identification of at-risk individuals and the development of culturally appropriate intervention strategies aimed at increasing physical activity and preventing progression to type 2 diabetes mellitus (T2DM).

Limitations

This study has several limitations that should be considered when interpreting the results. Firstly, the

validity of the instrument was assessed against body mass index rather than an objective measure of physical activity, such as accelerometry. While the correlation with BMI provides evidence of construct validity, the absence of device-based validation limits confirmation of absolute accuracy.

Secondly, the generalizability of our findings is constrained by the sample size (n=48 for reliability, n=46 for validity), recruitment from a single urban center, and the specific inclusion of only pre-diabetic adults with BMI ≥23 kg/m^2. This homogeneity may limit the applicability of the results to the wider Urdu-speaking population, including healthy individuals or those in rural areas.

Finally, as with all self-report tools, the data are vulnerable to recall and social desirability bias. The cross-sectional design prevents causal inference between physical activity and BMI, and the study did not assess responsiveness, an important property for evaluating changes over time in lifestyle interventions. Future studies should incorporate objective activity monitors, recruit larger and more diverse samples, and employ longitudinal designs to strengthen the evidence base.

CONCLUSION

This study successfully translated, culturally adapted, and psychometrically validated the Urdu version of the International Physical Activity Questionnaire–Long Form for use in pre-diabetic adults in Pakistan. The instrument demonstrated excellent test–retest reliability, strong internal consistency, and robust construct validity, with results that are comparable to or exceed those reported for other linguistic adaptations of the IPAQ-LF.

The rigorous translation process, inclusion of culturally relevant examples, and pretesting with the target population likely contributed to the tool's strong performance. By providing a standardized and contextually appropriate measure of physical activity, the Urdu IPAQ-LF addresses a critical gap in public health research and clinical practice in Pakistan.

The availability of this validated tool will enable healthcare providers, researchers, and policymakers to better assess and monitor physical activity behaviours among Urdu-speaking pre-diabetic populations. This, in turn, can inform targeted interventions aimed at increasing physical activity levels, reducing BMI, and preventing progression to type 2 diabetes mellitus.

Given the high burden of pre-diabetes in Pakistan, the integration of this instrument into routine screening and surveillance efforts is strongly recommended. Future studies should focus on validating the tool in other population groups, testing its responsiveness to interventions, and combining it with objective measures of physical activity for a more comprehensive assessment.

Ethical Approval

This study was approved by the Research Ethics Committee of the College of Physical Therapy, Government College University, Faisalabad (Ref: REC-DPT-006-12-2024; dated 20 December 2024). All procedures were conducted in accordance with the Declaration of Helsinki and the WHO guidelines for human research ethics. Informed written consent was obtained from all participants prior to data collection.

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