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ORIGINAL ARTICLE

Cross-Cultural Adaptation, Reliability, and Validity of the Gujarati Version of the Pain Disability Questionnaire in Chronic Musculoskeletal Pain Disorders

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ABSTRACT

Background: Chronic musculoskeletal pain disorders (CMPDs) are a leading cause of global disability, imposing substantial functional, psychological, and socioeconomic burden. Validated and culturally adapted outcome measures are essential for the equitable and accurate assessment of pain-related disabilities across linguistically diverse populations. The Pain Disability Questionnaire (PDQ), a 15-item self-report instrument encompassing Functional and Psychosocial domains, has demonstrated strong psychometric properties across multiple languages; however, a validated Gujarati version is lacking.

Objective: This study aimed to translate and culturally adapt the PDQ into Gujarati (PDQ-G) and evaluate its reliability and construct validity in individuals with CMPDs.

Methods: This study was conducted in two sequential phases. Phase I involved cross-cultural adaptation following Beaton *et al.*'s internationally recognized guidelines, which comprise forward translation, back translation, expert committee review, and cognitive debriefing. Phase II involved the psychometric evaluation of 150 Gujarati-speaking adults (25-60 years) diagnosed with CMPDs and recruited from physiotherapy and orthopedic outpatient clinics in Surat, Gujarat, India. Internal consistency was assessed using Cronbach's alpha, and test-retest reliability was assessed using the intraclass correlation coefficient (ICC) in 30 participants. Construct validity was examined through convergent and divergent

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validity analyses using Pearson's correlations with established measures, including the Numeric Pain Rating Scale (NPRS), Roland-Morris Disability Questionnaire-Gujarati (RMDQ-G), Fear- Avoidance Beliefs Questionnaire-Gujarati (FABQ-G), and Patient Health Questionnaire-9-Gujarati (PHQ-9-G). Exploratory factor analysis (EFA) was performed to investigate the underlying factor structures.

Results: The PDQ-G demonstrated acceptable internal consistency (Cronbach's α = 0.700) and excellent test-retest reliability (ICC = 0.999; 95% CI: 0.997–0.999), with a minimal Bland–Altman mean difference of 0.07 and narrow limits of agreement (−0.65 to 0.78). Construct validity was supported by strong convergent correlations with the NPRS (r = 0.691) and RMDQ (r = 0.574) scores. The PDQ-G total score showed a moderate correlation with the FABQ (r = 0.372) and PHQ (r = 0.491), indicating that fear-avoidance beliefs contribute meaningfully, albeit less dominantly, to overall pain-related disability than pain intensity or psychological distress. Exploratory factor analysis (EFA) revealed a five-factor solution Kaiser-Meyer-Olkin (KMO = 0.562; Bartlett's $p < 0.001$) that collectively explained 66.154% of the total variance, with the first component accounting for 22.833% of the variance. Following varimax rotation, the variance was more evenly distributed across all five components (range: 10.393%–14.623%), and most items loaded strongly (≥0.50) on a single component, supporting the multidimensional construct of the PDQ-G. The mean total PDQ-G score was 64.27 ± 15.12, with 73.3% of participants classified as having a mild disability.

Conclusion: The PDQ-G is a reliable, valid, and culturally appropriate instrument for assessing pain-related disability in Gujarati-speaking adults with CMPDs. It is suitable for use in both clinical and research settings.

KEYWORDS

• Pain Disability Questionnaire • Cross-cultural adaptation • Chronic musculoskeletal pain • Gujarati • Reliability • Validation

INTRODUCTION

Chronic musculoskeletal pain disorders (CMPDs) encompass a clinically heterogeneous group of conditions, including chronic low back pain (CLBP), osteoarthritis (OA), rheumatoid arthritis (RA), fibromyalgia, and neck and shoulder pain, characterized by persistent pain lasting more than three months.[1,2] MSDs are one of the leading causes of disability globally, accounting for approximately 149 million years lived with disability (YLDs) worldwide, representing 17% of total global YLDs.[2] Low back pain (LBP) remains the single greatest contributor, followed by OA and neck pain; their prevalence is expected to increase further as populations age and sedentary work becomes more prevalent.[3,4]

The consequences of CMPDs extend beyond physical impairment. Depression, anxiety, fear avoidance behavior, and pain catastrophizing compound functional disability, creating a self-reinforcing cycle that is difficult to interrupt.[5,6] Social participation diminishes, occupational and familial roles erode, and the economic burden is formidable. In the United States, the total economic costs of chronic pain were estimated at $722.8 billion in 2021, comprising $530.6 billion in medical care costs and $192.2 billion in lost work productivity.[7] In India, the burden is further amplified by limited rehabilitation access, delayed diagnosis, and the relative marginalization of musculoskeletal health in public health policies.[8]

An accurate, standardized assessment of pain-related disability is fundamental to clinical decision-making and outcome evaluation in CMPDs. The World Health Organization's (WHO) International Classification of Functioning, Disability and Health (ICF) conceptualizes disability as an interaction between health conditions and contextual factors and demands multidimensional assessment tools that capture both physical and psychosocial dimensions.[9] Instruments such as the Oswestry Disability Index (ODI) and the Roland-Morris Disability Questionnaire (RMDQ) have demonstrated utility in specific populations, particularly those with LBP; however, their scope is confined primarily to

physical function.[10,11] Health-related Quality of life (HRQoL) instruments, such as the SF-36, offer broader coverage but lack the specificity needed for pain-related disability assessment.[12]

The Pain Disability Questionnaire (PDQ), developed by Anagnostis *et al*.[13] in 2004, addresses these limitations by offering a comprehensive biopsychosocial framework for understanding pain-related disability.[14] The PDQ comprises 15 items across two components: The Functional component includes nine items (items 1, 2, 3, 4, 5, 6, 7, 12, and 13) that evaluate pain intensity, self-care activities, lifting, walking, sitting, standing, sleep, participation in social activities, and traveling. The Psychological component consists of six items (items 8, 9, 10, 11, 14, and 15) that assess financial changes, dependence on medications, hospital visits, personal relationships, mood changes, and psychological problems. Each item was scored on a 10- centimeter Visual Analog Scale (VAS), yielding a total score ranging from 0 to 150. Higher scores indicate greater disability, stratified across five categories: no disability (0), mild (1–70), moderate (71–100), severe (101–130), and extreme (131–150).[15] The PDQ has been validated in Brazilian-Portuguese,[16] Korean,[15] and Serbian[17] populations, demonstrating consistent psychometric integrity across cultural contexts.

India's remarkable linguistic diversity (22 officially recognized languages and countless regional dialects) presents a significant challenge for standardized clinical assessment. This diversity necessitates culturally adapted tools that address India's heterogeneous population while maintaining clinical accuracy. Gujarati, spoken by 55 million people in Gujarat and the surrounding regions, is a major regional language with distinct characteristics.[18-20] It has its own grammatical logic, idioms for expressing discomfort and limitations, and cultural frame for understanding disabilities. Despite this demographic weight, validated Gujarati-language outcome measures for pain-related disabilities remain scarce. Existing instruments include the RMDQ-G,[21] the FABQ-G,[22] and the PHQ-9-G;[23] however, none provides the comprehensive biopsychosocial disability assessment that the PDQ framework offers.

The absence of a validated PDQ-G restricts equitable healthcare delivery and limits Gujarati-speaking populations' participation in clinical research. When clinicians rely on informal translations or English-language instruments, assessment accuracy suffers, and patient care is compromised.[24] Although validated Gujarati instruments such as the RMDQ-G for functional disability in LBP, the FABQ-G for fear-avoidance beliefs, and the PHQ-9-G for depression screening are available, these tools assess isolated domains and do not capture the comprehensive biopsychosocial dimensions that the PDQ framework was designed to evaluate. Therefore, to address this gap, the present study aimed to (1) translate and cross-culturally adapt the PDQ into Gujarati according to internationally recognized guidelines and (2) evaluate the reliability and construct validity of the resulting PDQ-G in adults with CMPDs.

MATERIALS AND METHODS

Study Design

This study employed a two-phase methodological approach. Phase I involved the cross-cultural adaptation of the PDQ into Gujarati, following the five-step guidelines of Beaton *et al*.[25] Phase II comprised a prospective observational psychometric evaluation. All participants provided written informed consent in Gujarati prior to their enrolment.

Participants

Participants were Gujarati-speaking adults aged 25–60 years with a clinical diagnosis of CMPDs, characterized by pain persisting for more than three months and an NPRS score greater than 4. Recruitment occurred across physiotherapy and orthopaedic outpatient clinics in Surat, Gujarat, using a purposive sampling strategy. Both men and women were eligible, provided they could read and write Gujarati. The exclusion criteria were as follows: previous brain surgery, history of malignancy, cardiovascular or respiratory conditions, spinal or urinary tract infections, cognitive impairment, prior spinal or joint surgery, systemic disease, and communication difficulties.

The sample size was determined using G*Power 3.1.9.4. Based on a correlational design with a small effect size (r = 0.20), alpha of 0.05, and power of 0.80, a minimum of 150 participants were required.[26,27] A subsample of

30 clinically stable participants was selected for the test-retest reliability assessment.

Phase I: Cross-Cultural Adaptation

The adaptation process adhered to the guidelines established by Beaton *et al.*,[25] which represent the internationally recognized gold standard for translating patient-reported outcome measures (PROMs).[28] Two independent bilingual translators with Gujarati as their native language produced forward translations (T1 and T2) from the original English version of the PDQ. One had a clinical background, and the other did not. These were reconciled through a structured meeting to produce a unified, synthesized version (T-12). Two independent native English speakers fluent in Gujarati and blinded to the original PDQ independently back-translated T-12 into English (BT1 and BT2), with discrepancies resolved by consensus.

A multidisciplinary expert committee of 20 professionals, including physiotherapists, orthopaedic surgeons, a psychiatrist, a psychologist, a nurse, and teachers, reviewed the pre-final version for semantic clarity, idiomatic appropriateness and conceptual accuracy. The pre-final version was subsequently administered to 20 Gujarati-speaking adults with CMPDs in a cognitive debriefing phase, during which structured interviews assessed the comprehension, clarity, and cultural relevance of each item. No items required major revisions.

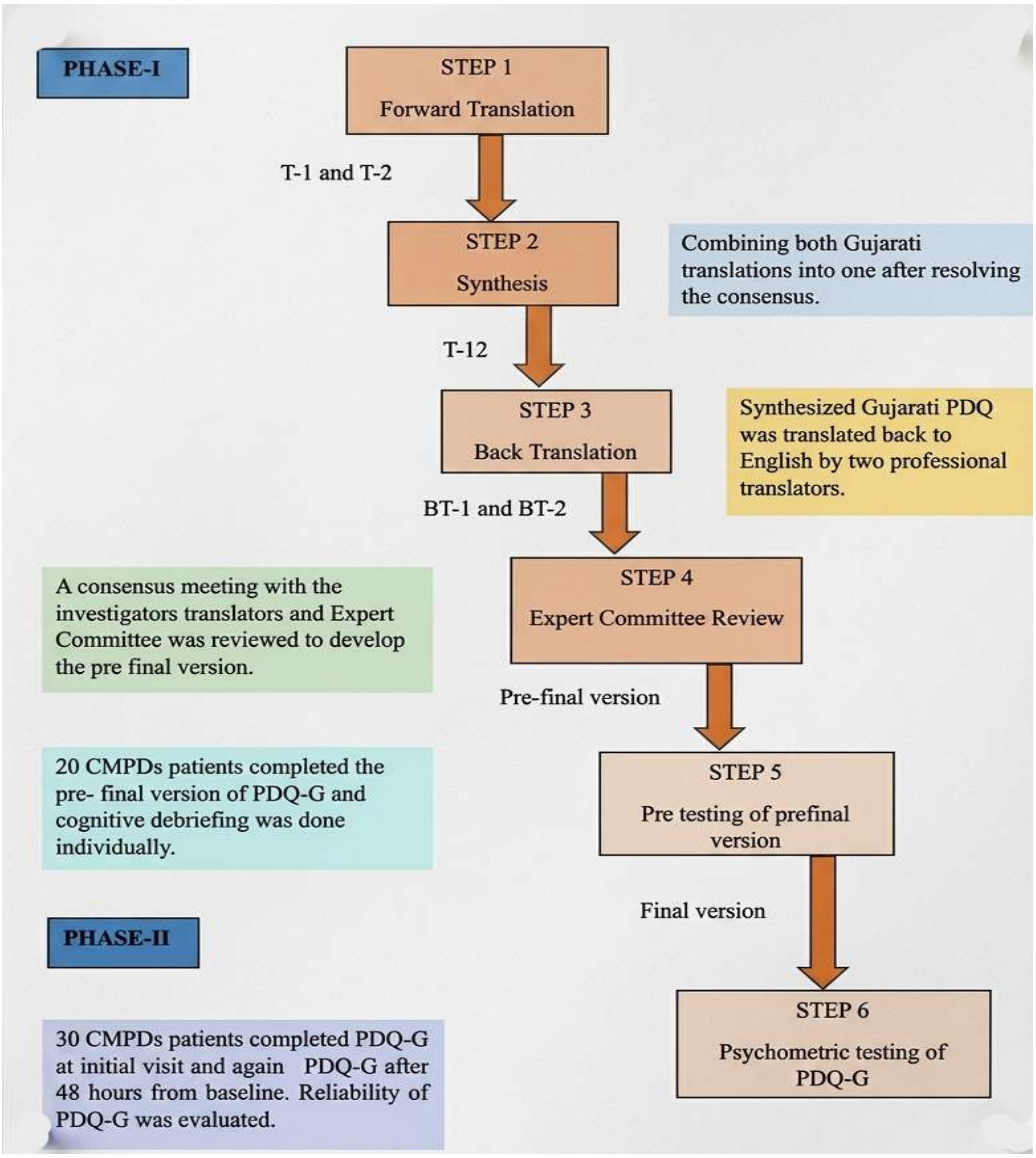


Figure 1: Flowchart of the study design of PDQ-G

Phase II: Psychometric Evaluation

The PDQ-G (15 items; total score, 0–150) was used as the primary outcome measure. Comparator instruments included the NPRS (0–10 scale),[29] FABQ-G (16 items; 7-point Likert scale),[22] RMDQ-G (24 items; yes/no scale; scores, 0–24),[21] and PHQ-9-G (9 items; scores, 0–27).[23]

Face validity was assessed using participant feedback during cognitive debriefing. Content validity was evaluated by a 20-member expert panel using a 7-point Likert scale. Item-level content validity indices (I-CVI) were calculated for each item, and the scale-level content validity index average (S-CVI/Ave) was computed. I-CVI values ≥ 0.78 were considered adequate.[30]

Internal consistency was assessed using Cronbach's alpha, with values ≥ 0.70 considered acceptable.[31] Test-retest reliability was evaluated in 30 stable participants who completed the PDQ-G twice at a 48 hours interval, with no therapeutic intervention between assessments. ICC using a two-way mixed-effects model with absolute agreement was calculated, with values ≥ 0.90 classified as excellent.[32,33] Agreement was further assessed using the Bland–Altman method.[34] SEM was derived as SEM = SD × √(1 − ICC), and MDC_h was derived as 1.96 × √2 × SEM.

Construct validity was assessed through convergent and divergent validity using Pearson's correlation coefficients, with correlation magnitudes interpreted according to conventional benchmarks: very weak (0.00–0.19), weak (0.20–0.39), moderate (0.40–0.69), strong (0.70–0.89), and very strong (0.90–1.00).[35] A priori hypotheses were established: a strong convergent correlation with the NPRS, moderate convergent correlations with the RMDQ-G and FABQ-G, and low-to-moderate divergent correlations with the PHQ-9-G. The EFA used Principal Component analysis (PCA) with varimax rotation. The KMO measure and Bartlett's test of sphericity were computed prior to extraction. Kaiser's criterion (eigenvalue > 1.0) determined the number of factors retained, with primary loadings of ≥ 0.50 considered acceptable. All analyses were performed using IBM SPSS Version 20.0, with statistical significance set at $p < 0.05$ (two-tailed).

RESULTS

Participant Characteristics

Of the 150 participants enrolled, 110 (73.3%) were women and 40 (26.7%) were men, with a mean age of 43.77 ± 9.99 years (range, 25–60 years). Most participants were aged 35–54-year age bracket. Homemakers and non-employed individuals constituted the largest occupational group (62.0%), followed by manual or labor workers (18.0%), professional or skilled workers (13.3%), and those in business or self-employment (6.7%). Regarding BMI, 40% were in the normal weight range, and a further 40% were overweight, with smaller proportions in the obese classes I (14.0%), II (4.0%), and III (1.3%). Clinically, CLBP was the predominant diagnosis (74.7%), followed by knee pain and osteoarthritis (22.0%) and neck or shoulder pain (3.3%).

Table 1: Descriptive Statistics of Outcome Measures (N = 150)

Outcome Measure	Min	Max	Mean ± SD	Score Range / Interpretation
PDQ-G Total Score	31	119	64.27 ± 15.12	0–150 (higher = greater disability)
Functional subscale	28	78	44.86 ± 9.43	0–90
Psychosocial subscale	1	44	19.44 ± 8.52	0–60
NPRS	5	9	6.35 ± 1.22	0–10 (higher = greater pain intensity)
RMDQ-G	7	21	14.74 ± 2.87	0–24 (higher = greater disability)
FABQ-G Total	34	87	66.03 ± 11.37	0–96 (higher = greater fear-avoidance)
FABQ-PA subscale	10	24	19.87 ± 3.30	0–24
FABQ-W subscale	12	42	31.51 ± 6.80	0–42
PHQ-9-G	3	24	14.30 ± 3.62	0–27 (higher = greater depressive symptoms)

Note: PDQ-G, Pain Disability Questionnaire – Gujarati; NPRS, Numeric Pain Rating Scale; RMDQ-G, Roland-Morris Disability Questionnaire – Gujarati; FABQ-G, Fear-Avoidance Beliefs Questionnaire – Gujarati; PHQ-9-G, Patient Health Questionnaire-9 – Gujarati; SD = Standard Deviation.

Table 1 summarizes the descriptive statistics for outcome measures in a sample of 150 participants, showing moderate levels of pain, disability, fear-avoidance beliefs, and depressive symptoms based on the mean scores across all scales.

Cross-Cultural Adaptation

The adaptation process was successfully completed with minimal difficulty. Forward translation yielded two linguistically equivalent versions that were reconciled without major discrepancies between them. Back-translation confirmed conceptual equivalence to the original English PDQ. The expert committee introduced minor linguistic refinements to enhance idiomatic appropriateness within the Gujarati cultural context while preserving the original constructs. Cognitive debriefing with 20 patients confirmed that all 15 items were clearly understood and perceived as relevant across diverse educational backgrounds of the participants. No items required major revisions, and the pre-final version was accepted as the final version of the PDQ-G.

Face and Content Validity

Face validity was confirmed through participant feedback during the cognitive debriefing. All items were rated as clear, comprehensible, and relevant to pain-related daily activities. No items were considered to be culturally inappropriate. Content validity indices were excellent; I-CVI values ranged from 0.80 to 1.00 across all items, meeting the recommended minimum threshold of 0.78,[30] and the S-CVI/Ave was 0.95, reflecting a high degree of expert consensus regarding the relevance and representativeness of the PDQ-G content.

Reliability

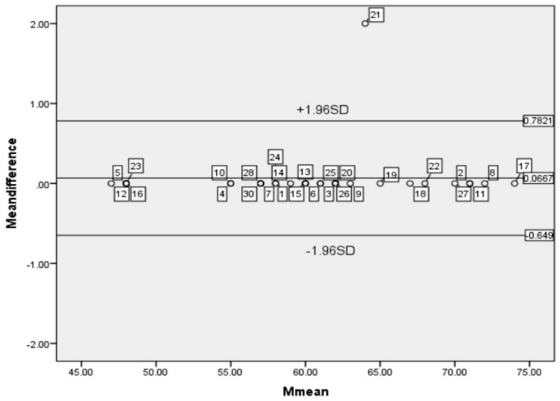
Internal consistency was acceptable, with Cronbach's alpha of 0.700 (n = 150), meeting the minimum recommended threshold for clinical measurement instruments.[31] Test-retest reliability, assessed in 30 stable participants at a 48-hours interval, was outstanding. The ICC was 0.999 (95% CI: 0.997–0.999), substantially exceeding the threshold for excellent reliability.[32,33] Reliability data for the total score and both subscales are shown in Table 2.

Table 2. Test-Retest Reliability of the PDQ-Gujarati (PDQ-G; n = 30)

Outcome Measure	Test Mean ± SD	Retest Mean ± SD	ICC (95% CI)	SEM	MDC_h	Bland-Altman Bias (LOA)
PDQ-G Total Score	64.27 ± 15.12	60.63 ± 7.26	0.999 (0.997–0.999)	0.48	1.33	0.07 (−0.65 to 0.78)
Functional subscale	39.52 ± 10.46	38.87 ± 6.14	0.998 (0.995–0.999)	0.47	1.30	0.05 (−0.58 to 0.68)
Psychosocial subscale	24.75 ± 8.31	21.76 ± 4.52	0.997 (0.993–0.999)	0.46	1.27	0.02 (−0.52 to 0.56)

Note: ICC = Intraclass Correlation Coefficient; SEM = Standard Error of Measurement; MDC_h = Minimal Detectable Change at 95% confidence level; LOA = Limits of Agreement. SEM = SD × √(1 − ICC); $MDC_h = 1.96 \times \sqrt{2} \times SEM$.

Bland–Altman analysis demonstrated excellent agreement between the test and retest scores, with a negligible mean bias of 0.07 (SD = 0.37) and narrow 95% limits of agreement (−0.65 to 0.78) relative to the PDQ's 150-point range. The SEM of 0.48 points indicates a very low absolute measurement error. An MDC_h of 1.33 points provides clinicians with a statistically grounded threshold above which observed score changes represent true change beyond measurement error. The Bland–Altman plot (Graph 1) (Table 2) illustrates the distribution of differences across the range of mean scores, confirming the absence of a proportional bias.



Graph 1: Bland-Altman Plot for PDQ-G Test-Retest Agreement (n = 30)

Construct Validity

Pearson's correlation analysis revealed significant positive associations between the PDQ-G total score and all comparator instruments (all $p < 0.001$). A strong convergent correlation was observed with the NPRS ($r = 0.691$) and RMDQ-G ($r = 0.574$), confirming that higher pain-related disability scores were associated with greater pain intensity. Moderate convergent correlations were observed with the PHQ-9-G ($r = 0.491$). The correlation with the FABQ-G was moderate ($r = 0.372$), consistent with the theoretical position that fear-avoidance beliefs contribute meaningfully but less dominantly to disability than to pain intensity or psychological distress. The full correlation matrix is presented in Table 3.

Subscale analysis revealed that the functional subscale was strongly correlated with the NPRS ($r = 0.617$) and moderately correlated with the RMDQ-G ($r = 0.445$), reflecting its sensitivity to physical performance limitations. The Psychosocial subscale demonstrated moderate-to-strong correlations with the NPRS ($r = 0.544$), RMDQ-G ($r = 0.528$), and PHQ-9-G ($r = 0.467$), underscoring its capacity to capture the emotional and relational consequences of chronic pain. All a priori construct validity hypotheses were confirmed.

Table 3: Pearson Correlation Matrix: PDQ-G Total Score and Comparator Measures (N = 150)

Variables	PDQ Total	PDQ Functional status	PDQ Psychological status	NPRS	FABQ Total	RMDQ Total	PHQ Total
PDQ Total	1	0.862**	0.818**	0.691**	0.372**	0.574**	0.491**
	–	0.000	0.000	0.000	0.000	0.000	0.000
PDQ Functional status	–	1	0.416**	0.617**	0.348**	0.445**	0.371**
	–	–	.000	0.000	0.000	0.000	0.000
PDQ Psychological status	–	–	1	0.544**	0.283**	0.528**	0.467**
	–	–	–	0.000	0.000	0.000	0.000
NPRS	–	–	–	1	.404**	0.558**	0.375**
	–	–	–	–	0.000	0.000	0.000
FABQ Total	–	–	–	–	1	0.429**	0.320**
	–	–	–	–	–	0.000	0.000
RMDQ Total	–	–	–	–	–	1	0.509**
	–	–	–	–	–	–	0.000
PHQ Total	–	–	–	–	–	–	1
	–	–	–	–	–	–	–

**Correlation is significant at the 0.01 level (2-tailed). Effect sizes were interpreted as weak (0.10–0.29), moderate (0.30–0.49), and strong (≥0.50).

Exploratory Factor Analysis

Prior to EFA, the KMO measure of sampling adequacy was 0.562, at the minimum acceptable threshold, and Bartlett's test of sphericity was significant ($\chi^2 = 247.243$, $df = 105$, $p < 0.001$), confirming that the data were suitable for the factor analysis. PCA with varimax rotation identified five components with eigenvalues greater than 1.0. Collectively, they explained 66.154% of the total variance, exceeding the commonly accepted 60% threshold in social science research.[36] The pre-rotation eigenvalues were 3.425, 2.280, 1.880, 1.320, and 1.019 for components 1–5, explaining 22.8%, 15.2%, 12.5%, 8.8%, and 6.8% of the variance, respectively. Following varimax rotation, the variance was more evenly distributed, which improved interpretability. The results of the factor analysis are presented in Table 4.

Rotated component matrix analysis showed that most PDQ-G items loaded strongly (≥ 0.50) on a single component. Component 1 was characterized by high loadings from items PDQ-15 (0.867), PDQ-14 (0.800), and PDQ-9 (0.574), representing the emotional consequences of pain. Component 2

encompassed items reflecting social recreational and participation restrictions, and Component 3 captured daily functional activities (PDQ-8 loading 0.840; PDQ-1 loading 0.776). Component 4 represented physical mobility limitations (PDQ-7: 0.822; PDQ-4: 0.767). Component 5 reflected upper extremity function and personal care (PDQ-5: 0.792; PDQ-2: 0.623).

Table 4: Factor Analysis Results: KMO, Bartlett's Test, and Principal Component Summary

Component	Initial Eigen value	% Variance (Pre-rotation)	Cumulative % (Pre-rotation)	Rotated Eigen value	% Variance (Post-rotation)	Cumulative % (Post-rotation)
1	3.425	22.833	22.833	2.193	14.623	14.623
2	2.280	15.198	38.032	2.175	14.499	29.121
3	1.880	12.532	50.564	2.121	14.140	43.262
4	1.320	8.798	59.362	1.875	12.500	55.762
5	1.019	6.793	66.154	1.559	10.393	66.154
Total (5 components)	–	66.154%	66.154%	–	66.154%	66.154%

Component	Primary Items (≥ 0.50)	Highest Loading	Thematic Interpretation
1	PDQ-15, PDQ-14, PDQ-9	0.867 (PDQ-15)	Emotional consequences of pain
2	PDQ-12, PDQ-13, PDQ-11, PDQ-3, PDQ-10	0.657 (PDQ-12)	Social recreational and participation restrictions
3	PDQ-8, PDQ-1	0.840 (PDQ-8)	Daily functional activities
4	PDQ-7, PDQ-4, PDQ-6	0.822 (PDQ-7)	Physical mobility limitations
5	PDQ-5, PDQ-2	0.792 (PDQ-5)	Upper-limb function & personal care

Note: KMO = Kaiser-Meyer-Olkin; PCA = Principal Component Analysis; EFA = Exploratory Factor Analysis. Extraction method: Principal Component Analysis. Rotation method: Varimax with Kaiser normalisation. Rotation converged in 5 iterations. Components were retained based on the Kaiser criterion (eigenvalue > 1.0). The total variance explained was 66.154%.

DISCUSSION

This study presents the first cross-cultural adaptation and comprehensive psychometric evaluation of the Gujarati version of the Pain Disability Questionnaire (PDQ-G). The PDQ-G demonstrated acceptable internal consistency, outstanding test-retest reliability, excellent content validity, and robust construct validity, establishing it as a psychometrically sound and culturally appropriate instrument for assessing pain-related disability in Gujarati-speaking adults with CMPDs in India.

Cross-Cultural Adaptation

The adaptation adhered rigorously to Beaton *et al.*'s[25] internationally recognized guidelines, ensuring semantic, idiomatic, experiential, and conceptual equivalence between the English PDQ and the Gujarati version. This is the same methodological framework used in prior PDQ adaptations in Brazilian Portuguese,[16] Korean,[15] and Serbian[17] which facilitates meaningful cross-cultural comparisons. The successful completion of cognitive debriefing, confirming the consistent interpretation of all 15 items across diverse educational backgrounds, reflects both the quality of the adaptation and the cultural resonance of the instrument. This is noteworthy, given the literacy heterogeneity of Gujarati-speaking communities, suggesting that the PDQ-G is accessible to individuals across educational strata.

Reliability

Cronbach's alpha of PDQ-G (0.700) meets the minimum recommended threshold.[31] This value is lower than those reported for the original English PDQ (alpha = 0.96),[13] Brazilian-Portuguese (alpha = 0.86),[16] Korean (alpha = 0.938),[15] and Serbian (alpha = 0.92)[17] versions; however, it remains satisfactory. The comparatively modest alpha is better understood as a reflection of the instrument's inherently multidimensional structure, designed to span disparate aspects of biopsychosocial disability rather than any deficiency in translation quality. A tool that spans physical function, financial consequences, medication dependence, and psychological distress should not produce homogeneous inter-item correlations typical of more narrowly defined constructs.

The test-retest ICC of 0.999 (95% CI: 0.997–0.999) is the highest reproducibility value reported to date for all PDQ language adaptations. It surpasses the Korean (ICC = 0.958),[15] Brazilian-Portuguese (ICC = 0.95),[16] and Serbian (ICC = 0.869)[17] versions and matches the upper bound of the original English PDQ (ICC = 0.94–0.98).[13] The 48-hour retest interval was chosen to balance minimizing recall bias against the risk of true clinical change, in line with recommendations for chronic pain reliability studies.[37] Bland-Altman analysis confirmed exceptional agreement, with a mean bias of 0.07 points and limits of agreement spanning −0.65 to 0.78 on a 150-point scale, which is clinically negligible. An MDC_h of 1.33 points provides a practically useful threshold: any change in a patient's PDQ-G score that exceeds this value can be attributed to a genuine clinical change rather than measurement noise.

Construct Validity

The construct validity of the PDQ-G has been examined and holds up well under scrutiny. The strong convergent correlation with the NPRS (r = 0.691) is consistent with prior PDQ validation studies, which have shown moderate-to-strong relationships between pain intensity and overall disability.[13,17] Pain intensity and functional disability are related but not identical constructs; therefore, a perfect correlation would indicate redundancy rather than validity. The observed coefficient is, therefore, theoretically appropriate.

The moderate correlation with the RMDQ-G (r = 0.574) reflects the expected overlap in the physical disability domain, while acknowledging that the PDQ-G evaluates a broader biopsychosocial construct than the RMDQ-G's primarily physical focus.[21] The PHQ-9-G correlation (r = 0.491) was clinically meaningful. Psychological distress and pain disability are intertwined; depression amplifies disability, and disability fosters depression.[5,14] A moderate rather than a strong correlation is expected, given that the PHQ-9-G screens for depressive symptoms specifically rather than pain-related disability per se.

The moderate convergent correlation with the FABQ-G (r = 0.372) was similarly appropriate. Fear-avoidance beliefs are recognized mediators of chronic pain disability;[6] however, the PDQ-Gujarati version encompasses financial consequences, medication dependence, and social participation restrictions, domains that extend beyond fear-avoidance cognitions. This pattern aligns with Vlaeyen and Linton's fear-avoidance model,[6] which positions fear-avoidance beliefs as an important determinant of disability.

Factor Structure

The EFA identified a five-factor solution that explained 66.154% of total variance. This diverges from the two-factor structure (Functional and Psychosocial) established in the original English PDQ[13] and the bifactor model of the Serbian adaptation.[17] This departure is notable rather than problematic. This may reflect how Gujarati-speaking individuals conceptualize and compartmentalize pain-related disability, perceiving financial consequences, medication dependence, social participation, emotional distress, and physical functioning as more discretely separable constructs than the binary functional/psychosocial framework suggests. Culturally influenced disability conceptualization has been observed in other cross-cultural instrument adaptations,[36] and differences in educational background, occupational profile, and cultural norms surrounding pain expression may all contribute to this divergence.

The five factors identified here are coherent and clinically interpretable: emotional and psychological consequences of pain, social participation and healthcare utilization, daily functional activities, physical mobility limitations, and upper extremity function and personal care. Most items demonstrated strong primary loadings and acceptable cross-loadings. Items PDQ-10, PDQ-13, and PDQ-3 showed notable cross-loadings, suggesting construct overlap and warranting attention in future scale refinement work.

Contribution to the Gujarati Assessment Landscape

The PDQ-G makes a distinctive contribution to the existing portfolio of validated Gujarati-language psychological instruments. The RMDQ-G[21] is restricted to physical disability

in low back pain, the FABQ-G[22] captures fear-avoidance beliefs, and the PHQ-9-G[23] screens for depressive symptoms. None provides a comprehensive, multidimensional assessment of pain-related disability encompassing physical function, psychological impact, social participation, financial consequences, and healthcare utilization within a single 15-item tool. The PDQ-G addresses this gap. Its brevity, combined with a clinically actionable five-category disability classification system, makes it well-suited for high-volume outpatient settings across India.

The finding that 73.3% of participants fell into the mild disability category is consistent with the outpatient recruitment setting and the instrument's sensitivity across a clinically meaningful range. The absence of extreme disability cases likely reflects a selection bias, as severely impaired individuals are often unable to access ambulatory services and would be underrepresented in outpatient recruitment.

Limitations

This study has several limitations. Recruitment from urban outpatient settings in Surat may limit the generalizability of the findings to rural Gujarati-speaking populations, where literacy levels, cultural expressions of pain, and healthcare-seeking behaviors may differ substantially. The cross-sectional design precluded the assessment of responsiveness to treatment-related changes, which is a critical psychometric property of longitudinal outcome measures. Confirmatory factor analysis was not conducted; the five-factor exploratory solution is provisional and should be validated using structural equation modelling in independent samples.

CONCLUSION

The PDQ-G is a reliable, valid, and culturally appropriate instrument for the comprehensive assessment of pain-related disability in Gujarati-speaking adults with CMPDs. The instrument demonstrated acceptable internal consistency, outstanding test-retest reliability, excellent content validity, and robust convergent and divergent construct validity. The exploratory five-factor structure suggests that Gujarati-speaking individuals conceptualize pain-related disability as a multidimensional, culturally nuanced construct that extends beyond the original two-component framework.

The PDQ-G addresses a meaningful assessment gap in Gujarat's healthcare landscape and represents an important tool for equitable pain management and rehabilitation research. Future work should evaluate responsiveness to therapeutic change, establish the MCID, conduct confirmatory factor analysis, and extend validation to rural and peri-urban settings to enhance the generalizability of the findings.

Author Contributions

KD contributed to the data collection, statistical analysis, and manuscript preparation.

DNB contributed to the study conception, manuscript preparation, and editing of the manuscript.

Ethical Approval

Ethical approval was obtained from the Institutional Ethics Committee of the Sarvajanik College of Physiotherapy, Surat (reference: SMT/SCOP/IEC/24-25/682; dated December 16, 2024).

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