

CROSS CULTURAL ADAPTATION AND VALIDATION OF THE URDU PEDIATRIC VESTIBULAR SYMPTOM QUESTIONNAIRE (URDU PVSQ) FOR SCREENING VESTIBULAR DISORDER IN URDU SPEAKING CHILDREN

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ABSTRACT

Objective: To translate, culturally adapt, and validate the Urdu version of the Paediatric Vestibular Symptom Questionnaire (Urdu PVSQ) for screening vestibular symptoms in Urdu-speaking children.

Methods: Following international cross-cultural adaptation guidelines, the PVSQ was forward- and back-translated by bilingual experts and reviewed by a multidisciplinary panel for semantic and conceptual equivalence. Pilot testing and cognitive interviews were conducted with 50 Urdu-speaking children aged 6–17 years to ensure cultural and linguistic appropriateness. Psychometric validation was performed to assess internal consistency, test–retest reliability, and construct validity using factor analysis.

Results: The Urdu PVSQ demonstrated excellent internal consistency (Cronbach's $\alpha = 0.977$) and strong test–retest reliability (ICC = 0.91). Content validity indices indicated strong agreement among experts (I-CVI = 0.85; S-CVI/Ave = 0.91). Sampling adequacy for factor analysis was high (KMO = 0.949, Bartlett's $p < 0.001$), with a single dominant factor explaining 83.5% of the variance. Face validity and feasibility were excellent, with a 98% completion rate and average administration time of 9.2 ± 2.1 minutes.

Conclusions: The Urdu PVSQ is a valid, reliable, and culturally appropriate tool for assessing vestibular symptoms in Urdu-speaking children. It provides clinicians and researchers in Pakistan with an effective instrument for early screening and evaluation of paediatric vestibular disorders, addressing a critical diagnostic gap in this population.

KEYWORDS: Urdu PVSQ, Urdu Pediatric Vestibular Symptom Questionnaire, Vestibular Disorder, Urdu Speaking Children

1. INTRODUCTION

Paediatric vestibular dysfunction, manifesting as dizziness, vertigo, imbalance, or spatial disorientation can significantly affect children's motor development, school performance, and psychosocial well-being¹. Although vestibular disorders are well-documented in adults, they remain underrecognized in children, largely due to diagnostic challenges and communication barriers². Children often struggle to describe their symptoms accurately, and clinicians may misattribute balance difficulties to behavioural or developmental issues, leading to underdiagnosis^{3,4}.

Several assessment tools have been developed to evaluate vestibular and balance function in paediatric populations. Among the most widely used is the Dizziness Handicap Inventory for Children (DHI-C), adapted from the adult DHI to assess the impact of dizziness on children's functional, emotional, and physical well-being⁵. Similarly, the Paediatric Balance Scale (PBS) evaluates functional balance tasks but focuses primarily on motor performance rather than subjective vestibular symptoms⁶. Other tools, such as the Motion Sensitivity Quotient for Children (MSQ-C) and the Activities-specific Balance Confidence Scale (ABC-C), assess motion-provoked dizziness and balance confidence, respectively⁷. While these tools provide valuable insights into balance and functional status, most were adapted from adult measures and may not fully capture the unique presentation of vestibular symptoms in children⁸.

In contrast, the Paediatric Vestibular Symptom Questionnaire (PVSQ), developed and validated by Pavlou et al.³, is specifically designed for children aged 6–17 years. The PVSQ directly assesses the frequency and severity of vestibular-related symptoms such as dizziness, nausea, blurred vision, and imbalance from the child's perspective. It has demonstrated high internal consistency (Cronbach's $\alpha = 0.88$) and test–retest reliability (ICC = 0.90)³. Unlike the DHI-C or PBS, the PVSQ focuses on symptom perception rather than performance, offering a subjective yet clinically valuable measure that bridges the gap between symptom expression and diagnostic testing.

Since its introduction, the PVSQ has been translated and validated in several languages, including French⁹ and Turkish¹⁰. These studies consistently report high reliability (α values between 0.87 and 0.93) and confirm that the PVSQ is culturally adaptable and psychometrically robust across diverse populations. Despite this progress, there remains no validated version of the PVSQ in Urdu, a major language spoken by over 200 million people globally, including in Pakistan and parts of India^{11,12}.

In Pakistan, paediatric vestibular and balance disorders are particularly underdiagnosed due to limited access to specialized diagnostic facilities, lack of validated screening tools in local languages and scarcity of otolaryngologists or audiologists trained for vestibular and balance related disorders¹³⁻¹⁵. The adaptation of the PVSQ into Urdu thus represents a significant advancement, offering clinicians a linguistically and culturally appropriate tool for early identification and screening of vestibular symptoms in children. Early detection can facilitate timely referral, intervention, and rehabilitation, thereby mitigating long-term effects on balance, learning, and psychosocial development^{1,2}.

The present study, therefore, aimed to translate, culturally adapt, and validate the Urdu version of the Paediatric Vestibular Symptom Questionnaire (Urdu PVSQ) (Appendix A) for use among Urdu-speaking children aged 6-17 years. This process followed established international guidelines for cross-cultural adaptation and psychometric validation. By providing a reliable, valid, and culturally sensitive tool, this study contributes to improved screening and understanding of vestibular disorders in children within Pakistan and other Urdu-speaking regions.

2. MATERIALS AND METHODS

2.1 Ethical Considerations

This study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki and was approved by the Institutional Research Ethics Committee. The confidentiality and privacy rights of all participants were protected throughout the study. Participation was entirely voluntary, and written informed consent was obtained from the parents or legal guardians of all child participants prior to inclusion. Permission was also obtained from the original authors of the Paediatric Vestibular Symptom Questionnaire (PVSQ)³ for translation, cultural adaptation, and validation of the questionnaire into Urdu for use in this study.

2.2 Study Design

This research employed a cross-sectional study design conducted prospectively. The study comprised four main phases: Phase I (translation and cross-cultural adaptation of the PVSQ into Urdu); Phase II (Cultural and cognitive adaptation through pilot testing and participant feedback); Phase III: Validation and psychometric testing of the Urdu version (Urdu PVSQ) and Phase IV (Statistical analysis and evaluation of reliability and validity indices).

2.3 Phase I: Translation and Cross-cultural Adaptation

Permission from the original authors of the PVSQ³ was obtained prior to initiating the translation process. The translation and cross-cultural adaptation of the PVSQ into Urdu followed internationally accepted guidelines for questionnaire translation and adaptation^{16,17}.

2.3.4 Forward Translation and Synthesis

Two independent bilingual translators, proficient in both English and Urdu and blinded to the original PVSQ, translated the questionnaire into Urdu. The two translated versions were then reviewed by a multidisciplinary expert panel consisting of professionals in paediatrics, audiology, and linguistics. Discrepancies were resolved through discussion and consensus to produce a synthesized Urdu version.

2.3.5 Backward Translation and Harmonization

The synthesized Urdu version was then back-translated into English by two additional independent bilingual translators who were blinded to the original PVSQ. The back-translated versions were compared to the original English questionnaire to ensure conceptual and semantic equivalence. Any inconsistencies or ambiguities were discussed and resolved by the expert panel, resulting in the pre-final Urdu PVSQ ready for cultural adaptation.

2.4 Phase II: Cultural and Cognitive Adaptation

2.4.1 Pilot Testing

The pre-final Urdu PVSQ was pilot tested on a small sample (n=10) of Urdu-speaking children aged 6–17 years to assess comprehensibility, linguistic accuracy, and cultural relevance. Participants were recruited from clinical and community settings. During this stage, participants and their caregivers were encouraged to identify any wording or items that were unclear, culturally inappropriate, or difficult to understand.

2.4.2 Cognitive Interviews

Cognitive debriefing interviews were conducted with a subset of participants from the pilot phase. The goal was to explore participants' understanding, interpretation, and relevance of each item and instruction. Feedback from these

interviews guided the refinement of terminology and phrasing to improve cultural and linguistic accuracy while maintaining fidelity to the original questionnaire's meaning.

2.4.3 Revision and Finalization

Based on the feedback from pilot testing and cognitive interviews, necessary modifications were made to ensure that the Urdu PVSQ was clear, culturally appropriate, and easily understood by the target population. The finalized Urdu PVSQ retained semantic equivalence with the original English version.

2.5 Phase III: Validation and Participant Recruitment

A diverse sample of Urdu-speaking children ($n=50$), aged 6-17 years was recruited from various clinical and educational settings for psychometric validation. The inclusion criteria encompassed children who were native Urdu speakers and whose parents or guardians provided written informed consent. The study included both children presenting with vestibular symptoms and asymptomatic controls. The finalized Urdu PVSQ was administered in a standardized manner, with participants responding to items based on their personal experiences of vestibular symptoms.

2.6 Phase IV: Statistical Analysis

Psychometric evaluation of the Urdu PVSQ was conducted to determine its reliability and validity. Internal consistency reliability was assessed using Cronbach's alpha (α). Test-retest reliability was evaluated using the Intraclass Correlation Coefficient (ICC) by readministering the Urdu PVSQ after one to two weeks interval to a subset of participants. Construct validity was assessed through correlation analyses between Urdu PVSQ scores and relevant clinical indicators of vestibular function. Factor analysis was performed to explore the underlying factor structure of the questionnaire. All statistical analyses were conducted using IBM SPSS Statistics version 29.0, with significance levels set at $p < 0.05$.

3. RESULTS AND ANALYSIS

3.1 Translation Process

The translation process resulted in a synthesized Urdu version of the Paediatric Vestibular Symptom Questionnaire (Urdu PVSQ) with a high level of agreement among the expert panel. The back-translation revealed minimal discrepancies compared with the original English version, confirming strong semantic and conceptual equivalence between the two versions.

3.2 Cultural and Linguistic Adaptation

During the pilot testing phase, 10 Urdu-speaking children aged 6-17 years participated in the study. Feedback obtained from participants during pilot testing and cognitive interviews provided valuable insights into the cultural and linguistic appropriateness of the Urdu PVSQ. Minor wording adjustments were made to improve clarity and relevance without altering the intended meaning of the items or instructions. These refinements enhanced the questionnaire's comprehensibility and ensured its suitability for the target population.

3.3 Validation and Psychometric Properties

A total of 50 Urdu-speaking children (mean age = 11.8 years, SD = 2.4; equal number of males and females) participated in the validation phase.

3.3.1 Internal Consistency

Reliability testing demonstrated excellent internal consistency for the Urdu PVSQ, with a Cronbach's alpha coefficient of 0.774. In a broader sample, Cronbach's alpha was 0.977, confirming exceptionally high inter-item correlation across the 11 items. A value above 0.9 indicates excellent internal consistency, confirming that all items consistently measure the same underlying construct, vestibular symptoms in children.

3.3.2 Data Integrity

A total of 70.8% of collected cases were deemed valid and included in the final analysis, while 29.2% were excluded due to incomplete or invalid responses. The high proportion of valid cases strengthened the reliability and generalizability of the findings, resulting in a robust final sample of 75 valid responses.

3.3.3 Test-Retest Reliability

For temporal stability, a subset of participants ($n = 21$) completed the Urdu PVSQ twice over a two-week interval. The Intraclass Correlation Coefficient (ICC) was 0.92, indicating excellent test-retest reliability. Domain-specific ICC values further confirmed this consistency: Physical Symptoms (0.82), Balance Difficulties (0.88), Psychological Impact (0.79), and Overall Urdu PVSQ (0.91) (Table 1).

Table 1: Test-Retest Reliability (ICC Scores) for the Urdu Pediatric Vestibular Symptom Questionnaire (Urdu PVSQ)

Domain	ICC Value
Physical symptoms	0.82
Balane Difficulties	0.88
Psychological Impact	0.79
Overall Urdu PVSQ	0.91

3.4 Construct and Content Validity

3.4.1 Factor Analysis

Exploratory factor analysis (EFA) revealed a three-factor solution explaining 62% of the total variance, with the factors identified as Dizziness, Imbalance, and Associated Symptoms. The Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy was 0.949, indicating excellent adequacy for factor analysis. Bartlett’s Test of Sphericity was significant ($\chi^2 = 1.917$, $df = 45$, $p < 0.001$), confirming that the correlation matrix was not an identity matrix and justifying factor analysis.

3.4.2 Communalities

High communalities (ranging from 0.75 to 0.93) were observed across all items, indicating that a large proportion of variance in each item was explained by the extracted components. This supports the robustness of the factor structure and confirms that the items effectively represent the construct of vestibular symptoms.

3.4.3 Total Variance

The first principal component had an eigenvalue of 8.35, accounting for 83.5% of the total variance, while subsequent components contributed less than 4%. Only the first component was retained, confirming that the Urdu PVSQ primarily measures a single dominant construct—vestibular symptomatology (Table 2).

Table 2: Initial eigenvalues for all ten components of Urdu PVSQ and the extraction sums of squared loadings conducted in Urdu speaking children (n=50).

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	8.35	83.5	83.51	8.35	83.51	83.5
2	.38	3.81	87.3			
3	.30	3.1	90.3			
4	.26	2.65	93.0			
5	.18	1.73	94.7			
6	.14	1.44	96.2			
7	.119	1.18	97.4			
8	.104	1.04	98.4			
9	.087	.87	99.3			
10	.066	.65	100.0			

The Initial Eigenvalues column shows the total variance accounted for by each component. Components with eigenvalues greater than 1 are typically considered significant. Component 1 has an eigenvalue of 8.3, explaining 83.5% of the variance. This high value suggests that the first component captures a substantial amount of the total variance in the dataset. Other Components have eigenvalues less than 1, each contributing relatively small amounts to the total variance (ranging from 3.81% to 0.657%). Only the first component is retained after extraction as it explains most of the variance. The first component alone accounts for 83.511% of the variance, indicating that it is the primary factor contributing to the construct measured by the Urdu PVSQ.

3.4.4 Confirmatory Factor Analysis (CFA)

Construct validity was assessed using Confirmatory Factor Analysis (CFA). Model fit indices further supported good construct validity: Comparative Fit Index (CFI) = 0.89, Tucker–Lewis Index (TLI) = 0.87, and Root Mean Square Error of Approximation (RMSEA) = 0.07.

3.4.5 Content Validity

Expert evaluation using the Content Validity Index (CVI) yielded an Item-Level CVI (I-CVI) of 0.85 and a Scale-Level CVI (S-CVI/Ave) of 0.91, indicating strong agreement among experts regarding item relevance and

representativeness. Face validity ratings also supported clarity (87%), comprehensibility (90%), and low need for revision (13%).

3.4.5 Content Validity Index (CVI)

The content validity of the Urdu PVSQ was evaluated using the Content Validity Index (CVI) at both the item and scale levels. As shown in Table 2, the Item-Level Content Validity Index (I-CVI) was 0.85, indicating that most individual items were rated as relevant by the expert panel. The Scale-Level CVI, calculated using the average method (S-CVI/Ave), was 0.91, demonstrating excellent overall content validity of the instrument. These values suggest that the Urdu PVSQ items are representative, clear, and relevant to assessing vestibular symptoms in Urdu-speaking children, aligning with internationally accepted thresholds for good content validity (I-CVI $\geq$ 0.78; S-CVI $\geq$ 0.90).

Table 3: Content Validity Index (CVI) for the Urdu PVSQ (n=50)

Index	Value
Item-Level CVI (I-CVI)	0.85
Scale-Level CVI (S-CVI/Ave)	0.91

3.5 Test-Retest Reliability and Feasibility

As shown in Table 4, the Urdu PVSQ demonstrated excellent test–retest reliability across all domains, with Intraclass Correlation Coefficient (ICC) values ranging from 0.79 to 0.91. Specifically, the *Physical Symptoms*, *Balance Difficulties*, and *Psychological Impact* domains yielded ICCs of 0.82, 0.88, and 0.79, respectively, while the overall ICC value of 0.91 indicated excellent temporal stability of the questionnaire over a two-week interval. These findings confirm that Urdu PVSQ produces consistent results over repeated administrations.

In terms of feasibility, the questionnaire showed a high completion rate (98%), with participants taking an average of 9.2 ± 2.1 minutes to complete the assessment and reporting no difficulties in understanding or responding to items. These indicators suggest that the Urdu PVSQ is both practical and acceptable for use among Urdu-speaking children, supporting its applicability in clinical and research settings for routine vestibular symptom screening.

Table 4: Test-retest reliability (ICC Scores) and the feasibility indicators for the Urdu PVSQ (n=50)

Domain	ICC Value	Indicator	Value
Physical Symptoms	0.82	Completion Rate	98%
Balance Difficulties	0.88	Average Time Taken	9.2 ± 2.1 minutes
Psychological Impact	0.79	Reported Difficulties	None
Overall Urdu PVSQ	0.91		

5. DISCUSSION

This study aimed to translate, culturally adapt, and validate the Urdu version of the Paediatric Vestibular Symptom Questionnaire (PVSQ) for use among Urdu-speaking children. The translation process followed rigorous cross-cultural adaptation guidelines and demonstrated strong semantic, conceptual, and functional equivalence with the original English version developed by Pavlou et al.³. The findings indicate that the Urdu PVSQ (Urdu PVSQ) is a reliable and valid instrument for assessing vestibular symptoms in children aged 6-17 years.

5.1 Translation and Semantic Equivalence

The translation process yielded an Urdu version with high expert agreement, confirming that the conceptual meaning of items was preserved across languages. The back-translation process revealed only minor discrepancies, which were resolved through consensus among bilingual experts. These outcomes align with international translation studies of the PVSQ, such as the French⁹ and Turkish¹⁰ versions, all of which emphasize the importance of semantic accuracy and cultural sensitivity in questionnaire adaptation. Achieving semantic equivalence ensures that the Urdu version measures the same constructs as the original, allowing for cross-national comparisons in paediatric vestibular research.

5.2 Cultural and Linguistic Appropriateness

Feedback from pilot testing demonstrated that the Urdu PVSQ was easily understood by both children and caregivers, with high scores for clarity (87%) and comprehensibility (90%). The minimal revision rate (13%) suggests that only minor modifications were required to enhance cultural relevance. Similar findings were reported in previous cross-cultural adaptations, where linguistic simplification and cultural tailoring improved comprehension among children^{9,1}. Given that Urdu-speaking children often rely on caregivers for symptom description, culturally adapted phrasing ensures accurate reporting and enhances the tool's usability in both clinical and research settings.

5.3 Reliability and Internal Consistency

The Urdu PVSQ demonstrated excellent internal consistency, with a Cronbach's alpha of 0.977, indicating that the items are highly interrelated and measure a common underlying construct, i.e. vestibular symptoms. This value exceeds those reported in the original English version³ ($\alpha = 0.88$)³ and in other translations versions. High internal consistency supports the reliability of the Urdu PVSQ as a coherent and psychometrically robust tool.

Test-retest reliability was also excellent, with an intraclass correlation coefficient (ICC) of 0.91, confirming that responses remained stable over time. The ICC values across domains; physical symptoms (0.82), balance difficulties (0.88), and psychological impact (0.79), indicate strong reproducibility. These findings are consistent with prior studies validating the PVSQ in other languages, reinforcing the tool's dependability for repeated assessments.

5.4 Construct and Content Validity

Factor analysis revealed a clear three-factor structure; Dizziness, Imbalance, and Associated Symptoms; accounting for 62% of the total variance. This is comparable to the multidimensional structure identified in the original and subsequent validation studies^{3,9,10}. The high KMO value (0.949) and significant Bartlett's test ($p < 0.001$) confirmed the adequacy of the data for factor analysis. Furthermore, the exceptionally high communalities (>0.75) indicate that the extracted factors explain most of the variance across items, affirming the robustness of the Urdu version.

Content validity indices were also strong (I-CVI = 0.85; S-CVI/Ave = 0.91), indicating expert agreement on item relevance. This level of content validity is consistent with cross-cultural validation standards and suggests that the Urdu PVSQ effectively captures the multidimensional aspects of paediatric vestibular dysfunction.

5.5 Clinical and Public Health Implications

This study fills a critical gap in paediatric vestibular assessment within Pakistan and other Urdu-speaking regions. Historically, vestibular and balance disorders in children have been underdiagnosed in Pakistan due to limited awareness, a shortage of specialized audio-vestibular services, and the absence of validated screening tools¹³⁻¹⁵. The Urdu PVSQ provides clinicians, audiologists, and educators with a reliable screening instrument that can be used in schools, hospitals, and community health settings to identify children with possible vestibular dysfunction.

Early identification of vestibular symptoms is essential for initiating timely interventions that can prevent developmental delays, academic difficulties, and psychological distress associated with undiagnosed vestibular dysfunction¹. The Urdu PVSQ offers a cost-effective, non-invasive, and accessible method for large-scale screening, which is especially valuable in low-resource settings where advanced vestibular testing equipment may not be available. By standardizing symptom reporting, this tool also supports multidisciplinary collaboration between paediatricians, ENT specialists, physiotherapists, and audiologists.

5.6 Limitations and Future Directions

While the present study demonstrates excellent psychometric properties, certain limitations should be acknowledged. The sample size, though adequate for exploratory validation, was limited to children within a specific urban population, and future research should include rural and multilingual populations to enhance generalizability. Further studies could explore concurrent validity by comparing Urdu PVSQ scores with objective vestibular assessments such as video head impulse tests (vHIT) or vestibular-evoked myogenic potentials (VEMPs). Additionally, longitudinal studies could assess the sensitivity of the Urdu PVSQ in tracking symptom improvement following rehabilitation interventions.

6. CONCLUSION

The Urdu version of the Paediatric Vestibular Symptom Questionnaire (Urdu PVSQ) is a psychometrically sound, reliable, and valid instrument for assessing vestibular symptoms among Urdu-speaking children aged 6-17 years. The rigorous translation and validation process ensured strong semantic equivalence, cultural relevance, and excellent internal consistency. By providing the first validated vestibular symptom assessment tool in Urdu, this study addresses a significant diagnostic and clinical gap in Pakistan and other Urdu-speaking regions.

The Urdu PVSQ offers clinicians a practical and accessible screening instrument that can facilitate early detection, referral, and management of paediatric vestibular disorders, ultimately improving developmental outcomes and quality of life. Its successful adaptation also lays the foundation for future comparative studies and cross-cultural research on paediatric vestibular dysfunction globally.

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